American Journal of Computational Linguistics Microfiche 59

the FINITE STRING

NEWSLETTER OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS

VOLUME 14 - NUMBER 1 FEBRUARY 1977

NEW MANAGING EDITOR Donald E Walker has accepted the responsibilities of Managing Editor of AJCL along with those of Secretary-Treasurer of the Association He needs time to obtain and sort the records and stocks formerly held by the Center for Applied Linguistics, but will soon be ready to provide prompt service to members and institutional subscribers

EDITORIAL BOARD CHANGES Five new members have joined the Board Jonathan Allen, Gary G Hendrix, C Raymond Perreault, Jane Robinson, and William C Rounds See frames 3-5 of this fiche

FORMAT SHIFT To conserve production money, AJCL now uses blank frames following the text of some contributions for news and other material formerly collected in The Finite String

AMERICAN JOURNAL OF COMPUTATIONAL LINGUISTICS is published by the Association for Computational Linguistics

EDITOR David G Hays, Professor of Linguistics and of Computer Science, State University of New York, Buffalo

EDITORIAL ASSISTANT William Benzon

EDITORIAL ADDRESS 5048 Lake Shore Road, Hamburg, New York 14075

TECHNICAL ADVISOR Martin Kay, Xerox Palo Alto Research Center

MANAGING EDITOR Donald E Walker

PRODUCTION AND SUBSCRIPTION ADDRESS Artificial Intelligence Center, Stanford Research Institute, Menlo Park, California 94025

CONTENTS

EDITORIAL BOARD: Three-year terms inaugurated 3
EULOGY of A Ljudskanov by G Rondeau 6
LETTERS concerning Igor Mel'chuk 8
IFIP CONGRESS 77 Invited speakers, etc 22
COMPCON Spring 1977 Program excerpts 25
COLING 76 Invited papers published in SMIL 26
SMIL Journal of Linguistic Calculus (new policy) 27
RESEARCH IN PROGRESS SSIE search service 28
EPIGRAPHY Informatic methods - papers published 30
LINGUISTICS AND PHILOSOPHY (new journal) 31
CANADIAN LINGUISTIC INSTITUTE 33
PATENT INFORMATION AND DOCUMENTATION Symposium, Munich 34
LACUS Forum 35
IFIP on Selection and acquisition of Data Base Systems 36
National Computer Conference 1977 Major speakers, etc 37
INFORMATION INDUSTRY ASSOCIATION Conference 38
ASIS Officers for 1977 39
TAXONOMY of computer science 40
MEETINGS ACM, Computer performance modeling, Data communications, ASIS midyear, ACM New York regional, Parallel and distributed processing, Computing in Humanities 41
AFIPS seminar for FCC on data communications 43
NOTICE TO AJCL CONTRIBUTORS Short-paper format 46
REVIEW Dynamic Information and Library Processing, by Gerard Salton, reviewed by Ronald E Wyllys 48
CURRENT BIBLIOGRAPHY 57

E D I T O R I A L B O A R D

In accordance with a new policy adopted by the Executive Committee of ACL at its 1976 meeting, members of the Editorial Board are to serve three-year terms The Editor, whose term is certainly limited but not to three years, thanks the members whose terms expired at the end of 1976, and welcomes those who now join the Board

Terms expire December 31, 1976

Joseph Grimes
Martin Kay, who continues as technical advisor
Ignatius G Mattingly
William A Woods, Jr

Terms expire December 31, 1977

Joyce Friedman
Winfred P. Lehmann
Christine A Montgomery
Donald E Walker, who continues as Managing Editor
Terry Winograd

Terms expire December 31, 1978

Robert Barnes
Fred J Damerau
Gary R. Martins
John Olney
Naomi Sager

Terms expire December 31, 1979 See following frames

Jonathan Allen

Dr Allen is Professor in the Department of Electrical Engineering and Computer Science and the Research Laboratory of Electronics of the Massachusetts Institute of Technology, Cambridge. He took his doctorate at MIT in 1968, for a thesis on specification of prosodic features of speech from grammatical analysis of text, after studying at Cambridge University on a Henry Fellowship and at Dartmouth College and the Thayer School of Engineering. He has also worked at the Bell Telephone Laboratories

Dr Allen's main fields are man-computer interaction and computer architecture for digital signal processing He is concerned with speech synthesis and recognition, natural language processing, discourse structure, and generally in the relation of speech to linguistic structures He has published a number of papers in these fields, and edited a book, Scientists, Students, and Society (MIT Press, 1970)

Dr. Allen is Vice-president of ACL for 1977.

Gary G Hendrix

A research engineer in the Artificial Intelligence Center of the Stanford Research Institute, Dr. Hendrix was educated at the University of Texas. His doctorate, 1975, was in computer science, following a master's degree in the same field and a baccaulaureate in mathematics

Dr Hendrix's fields are natural language semantics, the architecture of semantic networks, robot problem solving, continuous process modeling, and temporal semantics Outside these fields, he has worked and published in anthropology, where he developed mathematical models of Indian cultures

C Raymond Perreault

Dr. Perrault took his doctorate at Michigan in 1975 for a thesis on augmented transition network parsers and their relation to tree-manipulating systems. His undergraduate work was in mathematics at McGill University. Dr Perrault is now Assistant Professor of Computer Science at the University of Toronto.

Dr. Perrault is a specialist in artificial intelligence and the theory of computation, and in particular in (computational) linguistics, logic, and the theory of automata and formal languages

Jane Robinson

A senior research linguist at Stanford Research Institute, Dr. Robinson was trained at the University of California, Los Angeles, where she took her doctorate in 1946 She has taught as visiting professor at Harvard and Michigan, and conducted research at the University of Michigan, the IBM Research Center in Yorktown Heights, and The RAND Corporation

Dr. Robinson, a member of Phi Beta Kappa, publishes on pure and computational linguistics. She specializes in syntax, semantics, and discourse, with a taste for case and performance grammars,

William C. Rounds

Dr. Rounds is Associate Professor of Computer and Communication Sciences in the University of Michigan, Ann Arbor He took a doctorate in mathematics at Stanford University in 1968 for a thesis on trees, transducers, and transformations. His undergraduate work was taken at Bowdoin College He taught at Case Western Reserve University before going to Michigan in 1973

Dr. Rounds's fields of interest are formal languages, automata theory, linguistic applications, logic, and programming language semantics.

Dr Rounds, a member of Phi Beta Kappa, has been a member of the Mathematical Social Science Board and a guest editor of the Journal of Computer and System Science

A L E X A N D R E L J U D S K A N O V

Alexandre Ljudskanov n'est plus L'Academie des Sciences Bulgare nous apprenait recemment son deces, survenu le 2 novembre 1976.

Chercheur infatigable, il aura été actif jusqu'a l'extrême limite de ses forces, car encore en juillet dernier, apres avoir participe à COLING 76, puis à la reunion du Comite international de l'AILA, il consacrait deux jours a des seances de travail au Secretariat d'Etat avant de quitter le Canada D'un courage indomptable devant la maladie, il n'aura permis qu'à la mort de mettre un terme a ses travaux

Son départ premature prive la linguistique computationnelle d'un de ses chefs de file internationaux Le message qu'A. Ljudskanov avait commencé à nous livrer, suite à ses réflexions sur la traduction automatique, demeurera inachevé Il en est ainsi de ses réflexions sur les problèmes linguistiques que pose au monde moderne la terminologie

Sur le plan international, A Ljudskanov avait su s'assurer des amitiés durables et le respect de tous, grace à son sens aigu de l'analyse critique, à sa profonde honnêteté intellectuelle et à ses qualités d'entregent

Le curriculum vitae d'A Ljudskanov est trop long pour qu'on puisse en faire ici une mention complète, qu'il nous suffise d'en reproduire les extraits suivants

> Professeur titulaire de la chaire de linguistique générale à la Faculté de Philologie de l'Université de Sofia et directeur du groupe d'études pour la Linguistique mathématique et la traduction automatique à l'Institut de

Mathématiques de l'Académie des sciences Bulgare, vice-président de l'Association internationale de Semiotique et de l'Association internationale de linguistique appliquée, membre du Comité international de linguistique computationnelle

A Ljudskanov est également l'auteur de nombreux textes scientifiques portant sur la linguistique, la traduction humaine, la traduction automatique et la linguistique computationnelle, publiés en francais, en anglais, en bulgare, en russe ou en allemand

A Madame Ljudskanova et à la famille de notre regretté collègue, je désire transmettre nos condoléances les plus sincères

Le président de l'AILA,

Guy Rondeau,
Canada

LETTERS: CONCERNING I G O R M E L ' C H U K

On 14 July 1976, I received "An Open Letter to Colleagues" from Dr. Igor A. Mel'cuk, a prominent Soviet computational linguist. He had sent it to me on 16 May, but it reached me only through an indirect routing. The contents indicate that Dr. Mel'cuk has been fired from his position as Senior Research Fellow of the Institute of Linguistics of the Soviet Academy of Sciences. The motivation for this action is ascribed to a letter, published in the New York Times on 26 January 1976, in which he criticized Soviet actions against Andrei Sakharov and Sergei Kovalev.

Dr. Mel'cuk asked me to make the information about his dismissal available to American scientists. On his behalf, I have written to a number of relevant periodicals asking them to publish his letter. The Executive Committee of the Association for Computational Linguistics considered this request and decided that the letter should be published, along with other relevant material, in The Finite String. Accordingly, I am attaching, in order, a copy of the letter he transmitted to me, dated 16 May 1976; the original New York Times letter of 26 January 1976; a short item in the March 27 New York Times describing his firing; a letter to the editor in the 10 April New York Times from Chomsky and Evers expressing their concern; two articles, one by Robert Toth published in the 2 June 1976 Los Angeles Times and one by Christopher Wren published in the 16 June 1976 New York Times; and a letter to the editor by Igor Troyanovsky, a Soviet journalist, published in the Los Angeles Times on 7 August 1976, which presents the Soviet view of the action taken against Mel'cuk.

The letter Dr. Mel'cuk sent me also has appeared or will appear, with various amounts of editing, in the Bulletin of the Linguistic Society of America, in the Los Angeles Times, in the New York Review of Books, in the Bulletin of the American Association of University Professors, and possibly in other publications.

Cordially,

Donald F. Walker
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025

AN OPEN LETTER TO COLLEAGUES

Dear Colleague:

On March 25, 1976, at a session of the Faculty Board (or, perhaps, the Scientific Council: Ucenyj Sovet) of the Institute of Linguistics, Soviet Academy of Sciences, Moscow, I was not re-elected senior research fellow, the position I had been holding up to the said date. (In accordance with regulations any research fellow of any Soviet Academy institution is supposed to be re-elected by the respective Faculty Board every three years--for junior fellows or every five years--for senior fellows, which happens to be my case. It is ordinarily quite a routine procedure which as a rule should not even be attended by the person concerned. In case he is not re-elected the researcher is to be fired by the administration in no more than a year after the decision by the Faculty Board took place).

The Faculty Board met 24 members being present: Victoria N. Yartseva (the director of the Institute of Linguistics), Yurij S. Fliseev (the assistant director), Valentin A. Ffimov (the scientific secretary), Vladimir D. Arakin, Nikolaj A. Baskakov, Trofim A. Bertagaev, Nikolaj S. Cemodanov, Yunus D. Deseriev, Ninel Z. Gadzieva, Myrrha M. Guxman, Georgij A. Klimov, Renat G. Kotov, Gennadij V. Kolsanskij, Muxammed A. Kumaxov, Klara E. Majtinskaja, Sergej A. Mironov, Kenesbaj M. Musaev, Vera S. Rastorgueva, Natalja A. Sljusareva, Aleksandr D. Svejtser, Edgem R. Tenisev, Oleg N. Trubacev, Said M. Xajdakov, and Igor' F. Vardul'. Here are the results of the secret ballot: 19 votes against my re-election, 2, for, and 3 have been considered not valid (which essentially means abstention). In view of such a decision of the Faculty Board, April 8 the assistant director of the Institute, Yurij S. Fliseev informed me that I am fired beginning from May 18 this year.

I have been with the Institute of Linguistics since 1956. During this period I have authored and published more than 150 linguistic works, including several books; many of my papers are translated and published in the USA, France, Spain, West Germany, Poland, Hungary, and East Germany. Many times I was invited to take part in international linguistic conventions, to present lectures, to serve on editorial boards of some Western linguistic periodicals, etc.

Yet the Faculty Board did not judge me worth holding my job. The only reason explicitly stated was my letter published in The New York Times on January 26, 1976. The letter expressed my disagreement with the campaign waged against Andrej D. Saxarov by the Soviet press as well as my protest against the arrest and the trial of the eminent Soviet scientist, biophysicist Sergej Kovaljov who has been sentenced to 7 years in prison and 3 more years in exile (under purely political accusations).

Yet the Soviet Union ratified the International Pact on Civil and Political Rights (adopted December 16, 1966, by the XXI Session of the General Assembly of the United Nations) which--in accordance with the Soviet legislation (see Art. 569 of the Civil Code of the Russian Soviet Federative Socialist Republic)--has become eo ipso a Soviet law. Art. 19 of the said Pact gives me "a full right to freely express my opinions including the freedom of disseminating any kind of information and ideas independently of national borders--orally, in writing or by means of the press." Consequently, addressing my letter to The New York Times I have by no means violated the laws of my country. (Even if it were not the case I should have been persecuted by the Soviet justice and not, for that matter, by the Faculty Board of an academic institution!)

Contrary to what has been presented in the preceding paragraph, those taking the floor at the Faculty Board meeting said: the letter by I. Mel'cuk "besmirches our country and covers with shame any research worker,... such an action is inadmissible not only in the scientific community of the Institute, but in the community of all Soviet people as well" (V. Yartseva, the director);* "slandering against our country I.A. Mel'cuk does serious harm not only to it but also to all progressive mankind... so that his hostile action makes impossible further presence of I. Mel'cuk in the Institute of Linguistics" (M. Guxman); "it is in vain that I.A. Mel'cuk refers to some obscure [sic!] pacts and tries to artificially limit the range of criticisms aimed at the 'moral-political' image (moral'no-politiceskij oblik) of himself as a Soviet scholar" (Yu. Eliseev, the assistant director); "the position of I. Mel'cuk borders on war propaganda,... and all his behavior produces a very bad impression: we hoped to hear words of repent but what we actually heard is a firm conviction (N. Gadzieva), etc. Those speeches were summed up in the second address by V. Yartseva: "The world is split in two, and I. A. Mel'cuk turns for help to our enemies!"

It should be emphasized that in the Institute where I have worked for almost 20 years and where I thought I had enough friends since I maintained with many not only professional but also warm human relations for a long time, there was no one who would side with me or at least say a few words in my favor. More than that: as far as I know, no one of the Soviet scientists (my personal friends excluded) found it possible or necessary to defend me in some form they would consider appropriate.

The purely political character of my firing makes it practically impossible for me to find another job anywhere in the USSR--the more so for even before the above-mentioned decision by the Faculty Board my position in the Soviet science was a very difficult and precarious one. For several years I have had practically no possibility to publish my

---

* The quotations are given from a tape recorded during the above speeches, which is in my possession.

papers in leading Soviet linguistic journals. (The appearance of each of my papers required no less than a heroic deed on the part of some member of editorial board). The second volume of my monograph Toward a Theory of Linguistic Models of the Meaning<=>Text Type (the product of many years of painstaking work) waited for publication more than 8 years and failed to be, after all, published. I was and am forbidden to teach, to take part in many scientific conventions, to go abroad for contacts with Western colleagues. Immediately after the appearance of my letter in The New York Times Soviet linguistic periodicals and publishing houses began suppressing references to my works, acknowledgements by other authors mentioning my name (e.g. Sergej Ya. Fokin, head of the editorial staff of Naucnotexniceskaja informacija, National Institute of Technological Information--VINITI, Moscow) and even my name as the editor or translator (as did Prof. Nikolaj S. Cemodanov and Klavdija T. Bogdanova of the Progress publishers).

Under such conditions and having no permanent job I am left without the least possibility for normal continuation of my linguistic research. Which amounts to putting me before a tragic choice: either a meaningless existence in my country, which needs not my work and effort, or emigration meaning the lifelong separation (such is the Soviet law) from my native land as well as from my relatives, friends, and colleagues.

I understand quite clearly that my situation cannot even be compared with the terrible lot of those people who, deprived of their freedom, are serving their terms in Soviet prisons and labor camps for political reasons and whose health and perhaps life are in danger. But still I feel I have the moral right to address the public opinion since it is not my personality that is of importance here. My case is but a modest yet very vivid illustration of the moral life of the top layer of Soviet intellectual society--of what used to be known as the famous Russian intelligentsia. It is an additional touch to the monstrous chronicle of felonies and base toadyism which were and are so easily practiced in the USSR by many persons holding scientific degrees and often posts of responsibility in the Soviet science hierarchy.

The aim of this letter is too make its readers seriously ponder once again over the fate of Soviet scholars and scientists forced to choose between low-down behavior and emigration. (Bright times now! not so long ago they had to choose between felony and a bullet or, in the best case, years behind the barbed wire). Do not forget, please, that each of them with the exclusion of a few active militants like Andrej D. Saxarov or Igor R. Safarevic is either a victim, or a hangman, or--which is perhaps the most dangerous thing--a tacit accomplice of hangmen.

I.A. Mel'cuk
40/17, Bajkal'skaja Str., flat 113, Moscow 107207, USSR
(Formerly Senior Research Fellow, Institute of Linguistics,
Academy of Sciences of the USSR).

(New York Times, January 25, 1976, Part IV, page 16)

Sakharov: World Symbol of Redemption

To the Editor:

I am writing this letter to a Western newspaper because I am not allowed to express my opinions in the U.S.S.R. My subject is the great Soviet physicist and Nobel Prize winner Andrei Sakharov.

Except for party- or government-inspired press attacks on him, in my country the silence over Sakharov is complete. But the West should know that there are many people here--and I am one of them--who strongly disapprove of the dirty campaign waged against the man who is perhaps the only absolutely honest person among our eminent scientists.

The most absolute lack of overt support for Sakharov among highly placed Soviet scientists and scholars clearly demonstrates that there is no such thing as the Russian intelligentsia any more. If Sakharov's colleagues and former friends, such as Khariton and Zee'dovic (not to speak of the sixty other academicians and professors) signed the "letter" denouncing Sakharov, it can mean only that moral considerations are fully excluded from the mentality of those who should base the whole of their activities and lives on moral principles.

It is difficult to compare different ordeals, but last month a tribunal in Vilnius sentenced to seven years' imprisonment plus three years of exile the biophysicist Sergei Kovalev, a member of Sakharov's Committee for Human Rights. For a scientist of more than forty years of age this means death--spiritually and mentally, if not literally. Not one Soviet scientist protested. The members of the Soviet Academy of Sciences have become soulless puppets, devoid of convictions and conscience.

As for the West, I cannot understand the attitude of your scientists and scholars. Perhaps they do not fully realize that a powerful nation of 250 million, guided by the unscrupulous and having at its disposal first-class brains with no hearts and souls, may prove highly dangerous.

The examples of Cuba, Czechoslovakia, Laos, Cambodia, and Angola show the impotence of the West in the face of the Communist machine. And real freedom and human rights in the Soviet Union are as important (if not more important) to the world as they are to us.

Please do not forget that there are many here kept in jails, labor camps and prison psychiatric hospitals who are suffering also for your freedom. Sakharov is for us--and should be for the world--a symbol of redemption.

I.A. Mel'cuk Moscow, Jan. 4, 1976

(New York Times, March 27, 1976, page 6)

Soviet Linguist Is Ousted For a Letter to The Times

MOSCOW, March 26(AP)--Igor A. Melchuk, a dissident Soviet linguist, said today that he had lost his job because of a letter he wrote to The New York Times defending Andrei D. Sakharov, the Soviet physicist and human rights activist.

Mr. Melchuk said he appeared yesterday before the faculty board of the the Institute of Linguistics to answer for himself and his "moral political image."

The board members charged that his letter, printed Jan. 25, "besmirched our country" and committed "a slander against our way of life," Mr. Melchuk said. He was ousted from his post as a senior research fellow by a secret ballot, 19 to 2, with three abstentions.

The vote does not automatically remove him from the institute, Mr. Melchuk said, but he doubts that he will be offered a new position.

****

(New York Times, April 10, 1976, page 26)

Moscow vs. a Linguist

To the Editor:

According to a March 27 news story, the well-known Russian linguist Igor A. Mel'cuk has been dismissed from his position at the Linguistic Institute in Moscow, where he has worked for the past twenty years. This represents a severe intensification in the harassment of Mel'cuk, who has been attacked in the past for his defense of other Soviet citizens, including Daniel and Sinyavsky.

The latest act of repression follows Mel'cuk's outspoken support for Sakharov and Kovolev, both members of the Russian Committee for the Rights of Man, and may have been a direct result of a letter of Mel'cuk's published in The Times [Jan. 25].

The loss of employment is serious indeed, and may be a prelude to worse. As members of the international community of linguists we feel compelled to express our great concern.

Noam Chomsky, Arnold Evers Cambridge, Mass., March 30, 1976

The writers are, respectively, professor of linguistics at M.I.T. and chairman of the Dutch Linguistics Society.

(Los Angeles Times, June 2, 1976, Part I, pages 1 & 7)

Soviet Linguist Fired for 'Ideological Mistakes'

By Robert C. Toth

MOSCOW—On the face of it, the scientific council of the Institute of Linguistics of the Soviet Academy of Science was meeting to review the work of a senior researcher before his recertification to his post. Normally it would be a matter of form.

But in reality, the senior scientist—Igor Alexandrovich Melchuk, said by U.S. and Soviet linguists to be the best in his field—was being tried behind closed doors for political nonconformity.

The secretly taped proceedings of March 25 show what criteria his judges used. A transcript of the tape has been obtained by The Los Angeles Times and its authenticity has been verified.

"It doesn't matter if your [scientific] theories are successful or not," declared one council member. "Scientific and political positions are not of the same importance."

"Mistakes in scientific work are one thing, but ideological mistakes," insisted another, "are quite another thing. They are simply awful... and must be judged most harshly."

"Evaluating the work of a Soviet scientist cannot be narrowly academic," said a third, citing official rules for certifying scientists that require "definite political and moral standards as well."

"Igor. Alexandrovich is trying to claim that it is a personal matter, this statement against Soviet ideology," said a fourth. "That is impermissible."

And so it went, focusing on his political faults and virtually ignoring his scientific capabilities. Melchuk, 43, who has been compared to the outstanding U.S. linguist Noam Chomsky, was fired from the institute. His books were to be withdrawn from libraries. Other books footnoting his works must be revised.

Melchuk knew well the limits of the nonconformity permitted in the Soviet system and he stepped beyond them.

His career has been marked both by academic brilliance and difficulties in his personal relationships. "Outspoken," admitted a friend; "impudent," complained a judge.

He had trouble entering graduate school despite a straight-A average at the university. His graduate advisor was fired for associating with the late Nobel laureate Boris Pasternak, the dissident

author, and Melchuk wrote a letter to the higher education ministry defending the professor.

He then left graduate study to work on language translation by machine. A series of articles on the subject earned him a candidate degree (between masters and doctors) in an unprecedented recognition of his abilities.

But he was not permitted to defend his doctorate thesis, for by that time he had signed other letters. One had asked "understanding" for dissidents Yuli Daniel and Andrei Sinyavski in 1966; another protested the 1968 Soviet invasion of Czechoslovakia.

Then he recanted.

"Yes," Melchuk acknowledged during the March trial. "I expressed my regret for past statements. Frankly, I did so only because I was afraid. I acted cowardly. But I'm tired of fear. I have no more fear."

The recanting had done him little good. At least seven times between 1971 and 1975, the transcript shows, he was not allowed to travel abroad to scientific conferences, even when the conference offered to pay his way.

"We did not send Igor Alexandrovich abroad," said Victoria N. Yartseva, institute director, "because every Soviet scientists represents our system and our Soviet ideology abroad, and Igor Alexandrovich always emphasizes: 'It's mine, it is my personal opinion'... Either Igor Alexandrovich is with us or he is with them."

Professionally, Melchuk had more than 150 publications to his credit in 20 years. A West German publishing house offered in 1971 to publish his major work, "Sense:Text," but the Soviet linguistic institute refused permission. The first volume of that work appeared here in 1974 but the second half, which should have appeared simultaneously, still has not come out and is now badly outdated.

Linguistics ranges from the study of grammar and language origins to information and communication theory and learning. Melchuk's book, said an American linguist who read it all, "is a masterpiece of organization and comprehensiveness.

"Had it been published promptly when written ... the result would have been a classic, if not a bible, of linguistic theory. It is an ambitious and explicit attempt to integrate the Soviet analytical approach and the American descriptive approach at a time when synthesis of the two is in the air."

Another American linguist said, "He has not blazed new frontiers in the sense that Chomsky has. On the other hand Melchuk is by far the best Soviet linguist."

Melchuk abandoned his several-year public silence with a letter to the New York Times defending Nobel Peace Prize winner Andrei D. Sakharov. It appeared January 25.

"I am not allowed to express my opinions in the U.S.S.R.," he wrote. Many Soviets "strongly disapprove the dirty campaign" against Sakharov who is "perhaps the last honest scientist" here, he continued.

Members of the science academy were "soulless puppets," he wrote. "A powerful nation of 250 million, guided by the unscrupulous and having at its disposal first-class brains with no hearts, may prove highly dangerous," he warned. Cuba, Czechoslovakia, Vietnam and Angola show Western impotence, he concluded.

Whatever its merits, that letter apparently had not been read by any of Melchuk's judges. A voice from the audience, from which "outsiders" were barred, asked to know its contents. The institute's deputy director replied that he had not seen it. "but so far as I know it is written in support of Sakharov and reduces to three points," which he recounted accurately. Melchuk then offered to read and discuss the letter with anyone, but only after the council's decision on his future. "I consider it impermissible to mix the question of my recertification with my letter.

He cited a United Nations resolution of 1966, ratified by the Soviet Union and incorporated into Soviet law, that guarantees the freedom of expression, within a state or across borders.

But institute deputy director Yuri S. Eliscev countered that the certifying rules for Soviet scientists set political as well as scientific standards, and he brushed off the international treaty.

Criticism of Melchuk rose in pitch toward the end of the session.

Ideological mistakes, said M. Khaidov, trade union member of the scientific council, "must be judged most harshly ... Igor Alexandrovich, you stand on the cliff. We wanted to pull you away."

"You become the puppet in somebody's dirty hands!" shouted institute director Yartseva.

"I had hoped to hear words of repentance but I heard only deep conviction," said Ninel Z. Gadrieva, the People Control Commission's representative on the scientific council: "Your action borders on the propaganda war and under the Soviet constitution, that's a crime. It hurts me but we have lost you."

"If you tried out there in the West, in the FRG [West Germany], for example, to stand up with Communist propaganda," said a pensioned professor on the council, "they wouldn't keep you on the state payroll for one day."

"For many years we tried to save you, Igor Alexandrovich," concluded Yartseva, "but you treated us badly. You don't respect our collective. We could help you remain with us but you don't want it ... We know very well that world is divided into two parts, and you appeal to our enemies."

"I think that this open discussion has been useful," she then said abruptly.

Melchuk asked for a final word. Yartseva refused. "Everything is clear," she said.

****

(New York Times, June 16, 1976, page 16)

Dismissal of Soviet Linguist Exemplifies
Moscow's Political Curbs on Science

By Christopher S. Wren
Special to The New York Times

MOSCOW, June 13--"Errors of a scientific character are one thing, but ideological errors are entirely another--these are absolutely terrible," declared an official at the Institute of Linguistics of the Soviet Academy of Sciences.

The occasion was a meeting reviewing the activities of Igor A. Melchuk, a prominent Soviet linguist, for a nominally routine reappointment to the institute staff. The outcome was that Mr. Melchuk was ousted from his post as senior research fellow.

His scientific credentials were not criticized--professionally he has been compared with the American linguistic scholar Noam Chomsky--but his ideological errors included writing a letter to The New York Times last January in defense of another dissident scientist, the Nobel peace laureate Andre D. Sakharov.

Consequently, Mr. Melchuk was discharged. "The whole session was a monstrous farce," the 43-year old linguist related. "I worked at the institute for 20 years and published 150 books and papers. And no one there had the courage to stand up and say a kind word about me."

Political Reliability

The case highlights the priorities set by the Soviet scientific establishment, which the Soviet Union says, has a quarter of the world's scientists.

Their advancement depends on political reliability as well as scientific curiousity. The price for running against the political grain is stiff. Scientists showing signs of dissidence are promptly shorn of prestige and position; their work, perhaps based on years of research, is removed from libraries or is published with their names expunged.

When the physical chemists Veniamin G. Levich, a corresponding member of the Academy of Sciences, applied to emigrate to Israel in 1972, he was not merely removed from his institute post, five scientific committees and two editorial boards; the chair he held at Moscow State University was abolished.

Moreover, in virtually every similar case, the response of colleagues has been silence. A number of scientists interviewed attribute this more to the prevailing system of rewards than to fears of repression. Orthodox scientists reap escalating benefits that place them among the elite materially as well as intellectually, and these and their careers could be threatened if they got involved.

"Under Stalin it was a question of life or death," said Dr. Levich's wife, Tanya. "Now it has become a question of being allowed to go abroad for a longer period."

The Soviet Communist Party chief, Leonid I. Brezhnev, defined the code of behavior at the Academy of Sciences' 250th anniversary celebration last October: "Whatever the field in which Soviet scientists are working, they are always distinguished by one characteristic--a high standard of Communist consciousness and Soviet patriotism."

Less Than Factory Wage

The primary incentive is built into a pay scale that rises sharply with promotions. A Soviet physicist outlined it this way: While a junior scientist fresh from the university earns only 100 rubles a month--about $130--or 40 rubles less than the average industrial wage, the salary of a senior scientist jumps to 300 rubles a month, and a laboratory chief or full professor earns 500, plus the opportunity to draw more by teaching or writing on the side.

Upon election to the Academy of Sciences, there is an additional stipend of 500 rubles for full members, who also get such benefits as chauffeur-driven cars, and 250 rubles for corresponding members.

The promotions do not involve scientific ability alone. Also involved is "obshchestvennaya aktivnost," which translates--somewhat misleadingly--as "social activity," that is, activity on behalf of party and state.

The assessment begins in the university, where Young Communist League activists are entitled to higher scholarship stipends. The same criterion is applied to admission to work toward advanced degrees. "If you want a doctorate you could be Isaac Newton himself, but if you don't have your political activity, you will never get a doctorate," said Valentin F. Turchin, a physicist who earned his before becoming a dissident.

Similar evaluations are made for job assignments. Dr. Levich recalls that when he visited his institute's party organizations with recommendations for promotions among his staff, "the first question was their social behavior and whether they were party members."

Travel Most Valued

The most valued privilege is the opportunity to travel abroad, where a scientist can learn firsthand what foreigners are doing in his field. The right to travel is dispensed only to those who are examined and found trustworthy. Political and social nonconformity, even contact with dissidents on or off the job, is reason enough for the refusal.

According to one Soviet scientist who has traveled abroad, the crucial document is a kharakteristika, or character reference, from one's institute. While the applicant may be questioned by the regional party committee, it is the obscure "departure commission" of the Central Committee that dispenses final approval.

Before a scientist leaves he is instructed by party officials how to behave. Upon his return, he must prepare a written report on what he did and whom he saw. Eventually, he is considered cleared for repeated trips abroad or as Russian slang puts it, "in the clip" like a pistol bullet.

If doubts arise, the travel privilege can be revoked. A scientist who visited Czechoslovakia in the late 1960's said that he was forbidden to go abroad for several years after a colleague reported that he had become too friendly with their hosts.

Scientists who get in trouble politically can also cast a shadow on superiors and coworkers. Institutes with nonconformists on their staffs may find it harder to compete for project funds or foreign-made laboratory equipment. Since administrators have a vested interest in maintaining ideological respectability, retaliation against someone stepping out of line need not be instigated by higher authority.

Professional Setbacks

Dissident scientists say they have suffered professionally under such political constraints. Dr. Turchin believes that the system's inflexibility explains at least in part why the Soviet Union still lags behind the West technologically. Others have noted that Soviet science excels in abstract fields like pure mathematics and astronomy but becomes weaker in applied fields, particularly if they touch upon ideology, as the social sciences do.

A Western scientist familiar with the Soviet scene believes that Moscow has compensated by drawing on vast numbers of applicants and is filling gaps through scientific exchange with the West. Moreover, he commented, Western scientists have not been significantly bolder in jeopardizing their careers.

Some Soviet scientists, like the physicist Pyotr L. Kapitsa, have become so internationally respected as to stay aloof from political pressures. Dr. Kapitsa declined to join the denunciation campaign against Dr. Sakharov, also a physicist, with no apparent ill effect. A few others, Dr. Sakharov among them, have broken with the system, but most scientists prefer to go along.

"A lot of them may have sympathy for the dissidents," the Western scientific observer said, "but they wouldn't do anything to support them because it would risk a comfortable life."

****

(Los Angeles Times, August 7, 1976, Part II, page 4)

LETTERS TO THE TIMES

Soviet Dismissal of Igor Melchuk

Your Moscow correspondent, Robert Toth, at the beginning of June reported that Igor Melchuk, "the most outstanding Soviet linguist," had been dismissed from the Institute of Linguistics of the U.S.S.R. Academy of Sciences. He had failed to pass a recertification (which is held once in five years) and lost his position as senior research associate for his political, so Toth asserts, "nonconformism."

It is true, Igor Melchuk had published slanderous statements in the Western press. But, supposing this was the motivation behind the decision of the institute's administration, as Toth alleges, we may ask:

How is it that Melchuk was able to work at the institute for as many as 20 years? Why were dozens of his books and articles published in the U.S.S.R., and why was the scientific degree of candidate of science conferred on him? Why was Melchuk not dismissed much earlier--five or 10 years ago?

Here is comment by Dr. Victoria Yartseva, director of the institute: "We had always condemned the actions of Igor Melchuk, but never raised the question of his leaving the institute. We considered Melchuk to be an able scientist. He was given a concrete sector of research--the development of an Anglo-Russian machine translation system. The project is of enormous importance. However, his investigations throughout these years did not lead to practical results. The project is very far from completion."

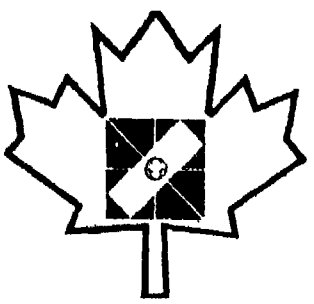
The learned council of the Institute of Linguistics, by a majority of votes (the voting was secret) did not re-elect Melchuk for a new five-year period.

It is known that in the West applied research is conducted within the framework of fairly rigid programs, the financing of which depends on the results obtained. Clearly, there they would not have kept for so many years a man violating the terms of a contract.

Igor Melchuk was dismissed from his position not because of his views, but because of the neglect of the job entrusted to him.

IGOR TROYANOVSKY
Moscow

Editor's Note: Troyanovsky is a Soviet journalist. His letter was forwarded to The Times by the information officer of the Soviet Embassy in Washington.



IFIP CONGRESS 77

International Federation for Information Processing
August 8-12 Toronto Canada

INVITED SPEAKERS

PROF. ALGIRDAS AVIZIENIS, University of California, U.S.A.
"FAULT-TOLERANT COMPUTING"

PROF. J.W. DE BAKKER, Mathematisch Centrum, The Netherlands
"SEMANTICS AND THE FOUNDATIONS OF PROGRAM PROVING"

MR. PAUL BARAN, Cabledata Associated, U.S.A.
"PERSPECTIVES ON NETWORKS: PAST, PRESENT AND FUTURE"

PROF. F.P. BROOKS, University of North Carolina, U.S.A.
"MOLECULAR GRAPHICS - THE COMPUTER "SCIENTIST" AS "TOOLSMITH"

DR. J.C. EMERY, Educom Inc., U.S.A.
"ECONOMICS OF INFORMATION PROCESSING IN DISTRIBUTED SYSTEMS"

PROF. M.A. GAVRILOV, Institute of Problems of Control, U.S.S.R.
"COMPUTER-AIDED CIRCUIT DESIGN - AN OVERVIEW"

MR. J.A. GOSDEN, The Equitable Life Assurance Society, U.S.A.
"IMPACT OF DATA BASE TECHNOLOGY ON BUSINESS SYSTEM DESIGN"

DR. J. HATVANY, Hungarian Academy of Sciences, Hungary
"TRENDS AND DEVELOPMENTS IN CAD"

PROF. J. HEBENSTREIT, Ecole Superieure d'Electricite, France
"TRENDS IN COMPUTERIZED EDUCATION SYSTEMS"

PROF. J.N.P. HUME, University of Toronto, Canada
"EDUCATION IN COMPUTING VERSUS USER NEEDS"

PROF. N.N. KRASSOVSKY, Institute of Mathematics and Mechanics, U.S.S.R.
"PROCESS CONTROL WITH FAULTY INFORMATION"

PROF. B. LEVRAT, Universite de Geneve, Switzerland
"EDUCATION IN COMPUTING - IMPACT ON SCIENTIFIC APPLICATIONS"

PROF. J.L. LIONS, Domaine de Voluceau, France
"NUMERICAL METHODS FOR VARIATIONAL INEQUALITIES - APPLICATIONS IN PHYSICS AND IN CONTROL THEORY"

PROF. D.C. LUCKHAM, Stanford University, U.S.A.
"PROGRAM VERIFICATION AND VERIFICATION ORIENTED PROGRAMMING"

PROF. D. MORRIS, University of Manchester, England
"A PORTABLE OPERATING SYSTEM"

PROF. N. NEGROPONTE, School of Architecture and Planning (MIT), U.S.A.
"ON BEING CREATIVE IN CAD"

MR. G.M. NIJSSEN, Control Data Europe, Belgium
"ARCHITECTURE OF NEXT GENERATION OF DATA MANAGEMENT SYSTEMS"

PROF. TOSHIO NISHIMURA, Tsukuba University, Japan
"FORMALIZATION OF CONCURRENT PROCESSES"

PROF. D. PARNAS, Technische Hochschule, Germany
"USING PRECISE SPECIFICATIONS IN THE DEVELOPMENT OF SOFTWARE"

DR. L. POUZIN, IRIA - Domaine de Voluceau, France
"PACKET NETWORKS: ISSUES AND CHOICES"

DR. L. ROBERTS, Telenet Corporation, U.S.A.
"THE FUTURE POTENTIALS OF PACKET SWITCHING"

MR. MAYFORD ROARK, Ford Motor Corporation, U.S.A.
"SUCCESSFUL APPROACH TO THE MANAGEMENT OF CHANGE"

DR. R.I. TRICKER, Oxford Centre for Management Studies, U.K.
"IMPACT OF INFORMATION SYSTEMS ON ORGANIZATIONAL THINKING"

PROF. M.V. WILKES, University of Cambridge, U.K.
"BEYOND TODAYS COMPUTERS"

Registration fees Until April 30, 1977 $125, thereafter $145

Address Canadian Information Processing Society
212 King Street West, Suite 214
Toronto, Ontario, Canada M5H 1K5 416-366-4586

RELATED SYMPOSIA

ACM Symposium on Complexity Issues in Symbolic Computation
Royal York Hotel, Toronto
August 4-6
ACM SIGACT & SIGSAM
Program chairman Shmuel Winograd, IBM Research Center,
P O Box 218, Yorktown Heights, New York 10598

ACM Symposium on Artificial Intelligence and Programming Languages
Rochester, New York
August 15-16
ACM SIGART & SIGPLAN
Program chairman. James Low, Computer Science Department,
University of Rochester, New York 14627

MISCELLANEOUS

Chess championship August 7, 8, 9
Address Professor Zvonko G Vranesic through the Organizing Committee

Science Theatre
Address Adrian J Basili, AT&T, P O Box 2016, New Brunswick, New Jersey 08903, 201-463-7645

1977 SPRING COMPCON

IEEE COMPUTER SOCIETY

SAN FRANCISCO

MARCH 1-3, 1977

PROGRAM EXCERPTS

MASS STORAGE: TECHNIQUES AND APPLICATIONS

CHAIRMAN: Stephen W Miller, Stanford Research Institute

LIMITS AND ALTERNATIVES IN ARCHIVAL STORAGE TECHNIQUES
Charles Dollar, National Archives

VIDEO DISC FOR DIGITAL STORAGE
George Kenny, North American Philips

OPTICAL MASS STORAGE
Ed Kacgorowski, Precision Instruments

MIDAS--AN ONLINE REAL-TIME MATERIAL SYSTEM
Richard S. Hall, Martin Marietta

DEVELOPMENT OF AN EXPERIMENTAL DISPLAY WORD PROCESSOR

CHAIRMAN: Jack E Shemer, Xerox Corporation

DEVELOPMENT OF AN EXPERIMENTAL DISPLAY WORD PROCESSOR FOR OFFICE APPLICATIONS
Jack E Shemer, Dave Cronshaw, Dave Hartke, Richard Keddy, Warren Sterling, and Bill Turner, Xerox Corporation

DESIGN OF A MICROPROGRAMMED CONTROLLER FOR A PAGED HIERARCHICAL MEMORY SYSTEM
Dave Cronshaw, Jack E Shemer, and Bill Turner, Xerox Corporation

A RASTER SCAN DISPLAY PROCESSOR FOR TYPEWRITER EMULATION
Dave Hartke, Warren Sterling, and Jack E. Shemer, Xerox Corporation

OVERVIEW OF FUNCTIONAL FEATURES AND SOFTWARE DESIGN FOR A DISPLAY WORD PROCESSOR
Richard Keddy, M. Hadjioannou, R. Muntz, and Jack E Shemer, Xerox Corporation

S M I L 1 9 7 6

INVITED PAPERS FROM C O L I N G 7 6

THE NEED FOR A FRAME SEMANTICS WITHIN LINGUISTICS
Charles J Fillmore

QUESTION AND ANSWER IN LINGUISTICS AND IN MAN-MACHINE COMMUNICATION
Eva Hajicova

SOME PROBLEMS OF INFERENCING: RELATION OF INFERENCING TO DECOMPOSITION OF PREDICATES
A K Joshi and S J Rosenschein

SOME RECENT CONTRIBUTION TO STATISTICAL LINGUISTICS
Charles Muller

OBSERVATIONS ON CONTEXT FREE PARSING
B. A Sheil

TOWARDS A MODEL OF LANGUAGE PRODUCTION: LINGUISTIC AND COMPUTATIONAL FOUNDATIONS
Henry Thompson

AUTOMATIC TRANSLATION
B. Vauquois

ORDER FROM SMIL/SKRIPTOR
FACK
S-104 65 STOCKHOLM
SWEDEN

PRICE: SKR 30

New Editorial Policy

S M I L QUARTERLY JOURNAL OF LINGUISTIC CALCULUS

The editor says

Our journal once dedicated to statistical methods in linguistics has successively widened its scope and from 1977 onwards the scope will be officially defined as computational linguistics in general.

As we see it, this is a study where the emphasis is on derivation of linguistic results--numerical as in statistical work and/or non-numerical as in algebraical syntax--by applying strict rules.

The essence of computational linguistics is not the employment of a computer--a computational study may be performed manually as in statistical analysis.

To make the distinction clearer between computational linguistics and the technique for computation within linguistics, we shall prefer the term "linguistic calculus"

In order to cater for this widened scope SMIL shall from 1977 onwards be published 4 times a year, starting March 1977

Rate Skr 75 (4 issues)

Address SMIL/SKRIPTOR
Fack
S-104 65 Stockholm
Sweden

SMITHSONIAN SCIENCE INFORMATION EXCHANGE

ONGOING RESEARCH ON LANGUAGE

SSIE collects, indexes, stores, and disseminates information about basic and applied research in all fields of the life and physical sciences that is supported by over 1,300 organizations --Federal, state, and local government agencies, nonprofit associations and foundatons, colleges and universities, and foreign research organizations The active file, which covers projects initiated or initiated and completed during the past two Government fiscal years, contains descriptions of more than 200,000 projects in agriculture, behavioral science, biology, chemistry, earth science, electronics, engineering, materials, mathematics, medical science, social sciences, physics, and interdisciplinary fields

The basic record in the SSIE system is the single-page Notice of Research Project It contains the name of the supporting organization, name and address of the performing organization and investigators, period and level of funding, and usually a 200-word description, among other data

Packages can be ordered by topic Each contains current notices, and is revised at least every 90 days The price is based on an annual average size $35 up to 25 entries, $45 for 26-100, $55 for 101-200, $65 for 201-300, and so on

Address SSIE
1730 M Street, NW
Washington DC 20036

SEE NEXT FRAME FOR LIST OF PACKAGES ON LANGUAGE AND COMMUNICATION

BEHAVIORAL SCIENCES

Communication and Language

DT01B Alternative communication systems for the physically and mentally handicapped: Vibrotactile vocoders, braille, sign language, and others $45

DT02B – American Indian languages $45

DT03B – Language and communication among the deaf and hard of hearing $45

DA03B – Behavioral and psychophysiological aspects of noise $45

DJ05B – Language acquisition and development in young children $45

DL07B – Nonverbal communication such as body language and gestures $45

DL10B – Bilingualism and behavioral and social problems of speaking a dialect or nonstandard English $45

DL15B – Impact and effects of mass communication on behavior $45

DO20B – Increasing public understanding of science by means of education and mass communication $45

DS05B – Speech perception, speech intelligibility, and speech discrimination $45

IQ02B – Underwater acoustics: Transmission and attenuation characteristics of fresh- and seawater, underwater imaging and detection $35

IQ07B – Noise physics: Noise fields, noise generation, noise detection, basic acoustics $75

IZ03B – Underwater optics: Transmission, scattering, and optical properties of fresh- and seawater; underwater surveillance; optical source development $45

JJ02B – Speech communication systems $45

JJ05B – Marine and underwater communication systems (excludes sonar) $45

JJ07B – Telecommunication systems theory and information theory $45

JJ14B – Cable television systems $35

JJ15B – Microwave communication systems $45

JJ16B – Satellite communication systems $45

JJ18B – Low light level television $35

JJ21B – Underground communication systems $35

JJ22B – Radio communication systems $45

JJ23B – Tactical and military communication systems $55

JJ24B – Broadcasting systems $45

JM02B – Video display devices $45

KC21B – Cybernetics: Control and communication in computerized information handling systems, man-computer interaction, automata and artificial intelligence $55

KC43B – Machine linguistics $45

LO01B – Oceanographic acoustics and applications: Acoustical characteristics of seawater and marine sediments, sonar and sofar bioacoustics $65

American Journal of Computational Linguistics Microfiche 59 : 30

ANTIQUITES AFRICAINES

TOME 9. 1975

APPLICATIONS A L'EPIGRAPHIE DES METHODES DE L'INFORMATIQUE

I. — Conception et réalisation des *indices*. 13

E.J. JORY. — Problems and prospects for the production of computer compiled *indices* to epigraphic works. 15

P. BALDACCI, O. IANOVITZ, E. MARETTI, G.P. ZARRI. — Notes pour un programme de re-edition et de mise à jour du volume V du *C.I.L.* comportant une rédaction automatique des index. 23

E. EVRARD. — Une expérience de traitement automatique des inscriptions latines à l'Universite de Liège. 39

P. CORBIER. — Principes généraux du Sycil. 59

II. — Le Sycil, un système documentaire pour l'exploitation d'un corpus d'inscriptions latines par E. CHOURAQUI, P. CORBIER, M. JANON et J. VIRBEL. 63

— Structure du Sycil 65

— Le bordereau « contexte » 73

— Les codes formels 75

— Le lexique documentaire 81

— La syntaxe documentaire 86

— La consultation du système 89

III. — Contributions des traitements formalisés aux études historiques. 97

A. STEFAN. — Paléographie grecque et sériation automatique des inscriptions. 99

M. CLAUSS. — Les problèmes de la statistique de l'âge d'après les inscriptions funéraires romaines. 109

J. AGUILELLA ALMER, M.A. LOPEZ CERDA, F. MONTES SUAY, G. PEREIRA MENAUT. — Détermination de la représentativité des inscriptions latines grâce à la statistique inférentielle. 115

M. BORILLO, W. FERNANDEZ DE LA VEGA, A. GUENOCHE, M. JANON, J. VIRBEL. — Une expérience de recherche historique à partir de l'analyse d'un corpus d'inscriptions funéraires latines. 127

ACTES DE LA TABLE RONDE C.N.R.S. ORGANISÉE LE 8 DÉCEMBRE 1972 A MARSEILLE
PAR L'INSTITUT D'ARCHÉOLOGIE MÉDITERRANÉENNE
ET LE CENTRE D'ANALYSE DOCUMENTAIRE POUR L ARCHÉOLOGIE

ÉDITIONS DU CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

15, quai Anatole France, 75700 PARIS

1976

American Journal of Computational Linguistics *Microfiche 59 : 31*

New Journal

LINGUISTICS AND PHILOSOPHY

An International Journal

Scope of Journal

Linguistics and Philosophy is a journal for studies focused on natural language, and will be of interest to both disciplines mentioned in the title Although the field thus described is so extensive that a complete listing of relevant topics is precluded, at least the following specifically fall within it

- traditional areas in the philosophy of language such as meaning and truth, reference, description, entailment, speech acts
- traditional areas of linguistics such as syntax, semantics and pragmatics (when the studies are of sufficient explicitness and generality to be also of philosophical interest)

systems of logic with strong connections to natural language: modal logic, tense logic, epistemic logic, intentional logic

philosophical questions raised by linguistics as a science: linguistic methodology, the status of linguistic theories, the nature of linguistic universals

philosophically interesting problems at the intersection of linguistics and other disciplines: language acquisition, language and perception, language as a social convention

CONTENTS

Volume 1 – No. 1

Editorial

The Picture Theory of Meaning
by Asher Seidel

Syntax and Semantics of Questions
by Lauri Karttunen

Transformations Grammars with Restricted Deletions
by John Myhill

Toward a Semantic Analysis of Verb Aspect and the English Imperfective' Progressive
by David R. Dowty

On The Grammar of Case
by Laurie Bauer and Winifred Boagey

One volume will be published in 1976. Commencing with 1977 two volumes will be published yearly. Institutional subscription price per volume of 3 issues (approx. 450 pages) Dfl. 90,– / US $ 36.00, plus Dfl. 12.50 / US $ 5.00 for postage and handling.

Private persons (no institutions, libraries, etc.) may subscribe at the reduced rate of Dfl. 42.50 / US $ 17.00 per volume, including postage and handling.

Private subscribers should declare that the subscription is for their own personal use, that it will not replace any existing or new library subscription and will not be put at the disposal of any library.

Subscriptions can be sent to D. Reidel Publishing Company, P.O. Box 17, Dordrecht, Holland, or to any subscription agent and will start after receipt of payment.

Private subscriptions should be sent direct to the publisher.

Volume 1, No. 1 will appear August 1976

D. REIDEL PUBLISHING COMPANY

P.O. Box 17
DORDRECHT - HOLLAND

Lincoln Bldg., 160 Old Derby Str.
HINGHAM, Mass. 02043, U.S.A.

CANADIAN LINGUISTIC INSTITUTE

Sponsored by the Canadian Linguistic Association
hosted by McGill University, Montreal

JUNE 20 - AUGUST 13, 1977

In addition to Core Courses, other offerings will be in the following areas: Applied Linguistics, Neurolinguistics, Psycholinguistics, Sociolinguistics, and Linguistics Studies of several Amerindian Language Types.

An official programme will soon be available

For further information, write to -

Canadian Linguistic Institute
C/O Department of Linguistics
McGill University
1001 Sherbrooke St. West
Montreal H3A 1G5 Canada
Telephone: (514) 392-4433
392-8294

INTERNATIONAL SYMPOSIUM

PATENT INFORMATION & DOCUMENTATION

SHERATON HOTEL, MUNICH

MAY 16 - 18, 1977

EXPERT LECTURES	Facilities and services for patent publication and search in national offices Characteristics, suitability, accessibility Proposals for improvement & standardization
LANGUAGES	English, French, German, interpretation
EXHIBITION.	Publications Information services Documentation handling equipment
FEE:	DM 250 (about $100)
ADDRESS	DGD/APD, International Symposium Postbox 710 D-8000 Munich 1 Federal Republic of Germany

LACUS/ALCEU, Inc.

Linguistic Association of Canada and the United States
Association de Linguistique du Canada et des Etats-Unis
P.O.B. #101 Lake Bluff, Illinois 60044 USA T : (312) 234-3997

LACUS was founded in 1974 out of a desire to give a Forum to linguists of every theoretical bent. The Association today counts over 300 members.

The Fourth LACUS Forum will be held at McGill University in Montreal, 13-17 August 1977.

Papers on ASPECTS OF BILINGUALISM (neurolinguistic, pedagogical, psycholinguistic, sociolinguistic, theoretical, etc.) are particularly encouraged, though some papers unrelated to this theme will also be accepted. An official call for papers shall be sent out in March. Put the dates in your calendar now and plan to participate.

For further information concerning the Fourth LACUS Forum please write to Michel Paradis, Chairman, Local Organizing Committee, Fourth LACUS Forum, Department of Linguistics, McGill University, 1001 Sherbrooke St. W., Montreal H3A 1G5, Canada.

LACUS membership fee of $15.00 includes a free copy of the Proceedings of the current LACUS Forum (circa 600 pages). For further information concerning membership and previous volumes please write to Valerie Becker Makkai, Secretary, LACUS, P.O. Box 101, Lake Bluff, Illinois 60044, U.S.A.

IFIP APPLIED INFORMATION PROCESSING GROUP

SELECTION AND ACQUISITION OF DATA BASE MANAGEMENT SYSTEMS

A report of the CODASYL Systems Committee

1 Reasons supporting the use of data base management systems and prerequisite conditions for organizational readiness to install a dbms
2 Characteristics of the user environment which bear on the selection and use of a dbms
3 The spectrum of capabilities considered to be part of dbms to other software systems and to computer hardware
4 Systematic methods for evaluation, selection, and acquisition of dbms

252 pages, softcover

$12.00

ACM Order Department
P.O Box 12105
Church Street Station
New York, New York 10249

1977 NATIONAL COMPUTER CONFERENCE
DALLAS CONVENTION CENTER
JUNE 13-16, 1977

KEYNOTE SPEAKER MARK SHEPHERD, JR

Mr. Shepherd is chairman and chief executive officer of Texas Instruments, Inc., which evolved from Geophysical Service, Inc three years after he joined GSI. Mr Shepherd is an engineer

AFIPS PRESIDENTIAL ADDRESS THEODORE J. WILLIAMS

Dr Williams is professor of engineering and director of the Purdue Laboratory for Applied Control, a past president of the Instrument Society of America and of the American Automatic Control Council

PERSONAL COMPUTING EXPOSITION

Commerical exhibits and a Fair for the display of noncommercial systems and equipment

FIRST NATIONAL INFORMATION CONFERENCE & EXPOSITION

THE EMERGING INFORMATION MANAGER: BRIDGING THE GAP

SHOREHAM AMERICANA HOTEL, WASHINGTON

APRIL 18-21, 1977

SPONSORED BY THE INFORMATION INDUSTRY ASSOCIATION

Management seminars

Workshops on hot topics

Career advancement seminars

Exposition of information products, systems, and services

Information product of the year award

Keynote luncheon, receptions, dinner

Address Information Industry Association

4720 Montgomery Lane

Bethesda, Maryland 20014

AMERICAN SOCIETY FOR INFORMATION SCIENCE

OFFICERS 1977

PRESIDENT	Margaret T Fischer Consultant, Greenwich, Connecticut
PRESIDENT ELECT	Audrey N Grosch Associate professor, University of Minnesota
COUNCIL	Wesley T Brandhorst ERIC Processing and Reference Facility, Bethesda
	Margot B McBurney University of Alberta, Edmonton
	Gerard O Platau Chemical Abstracts Service, Columbus, Ohio
	Frank Slater University of Pittsburgh, Pennsylvania
CONTINUING	Melvin S Day, past president
	Douglas S Price, treasurer
	Joe Ann Clifton
	C David Batty
	Marilyn C Bracken
	Manfred Kochen
	Samuel B Beatty, managing director & secretary

TAXONOMY OF COMPUTER SCIENCE

Toward a definition of computer science and engineering
A hierarchy of four or five levels, with brief definitions
of all terms included

Sponsor Institute of Computer Science and Technology,
National Bureau of Standards

Committee Anthony Ralston, SUNY Buffalo, chairman
David Batty, University of Maryland
Sam Conte, Purdue University
Patrick Fischer, Pennsylvania State University
Bernard Galler, University of Michigan
George Glaser, consultant
Gerard Salton, Cornell University
Jean Sammet, IBM
Stephen Yau, Northwestern University

MEETINGS

ASSOCIATION FOR COMPUTING MACHINERY - 1977 CONFERENCE

Olympia Hotel, Seattle, Washington, October 17-19

Technical program chairman Harvey J Kriloff, Boeing Computer Services, Inc ,, P O Box, 24346 M/S 3N - 18, Seattle WA 98124

COMPUTER PERFORMANCE MODELING, MEASUREMENT, AND EVALUATION

IFIP WORKING GROUP 7.3 ON COMPUTER SYSTEM MODELING

IBM Research Center, Yorktown Heights, New York, August 16-18

Contact Professor K M Chandy, Department of Computer Science, University of Texas, Austin 78712, 512-471-4353

FIFTH DATA COMMUNICATIONS SYMPOSIUM

IEEE COMPUTER SOCIETY

Snowbird, Utah, September 27-29

Call for papers 4 copies of paper and 500-word abstract

March 15

Address Frank E. Heart, Bolt Beranek and Newman Inc , 50 Moulton Street, Cambridge, Massachusetts 02138

AMERICAN SOCIETY FOR INFORMATION SCIENCE - 1977 MIDYEAR MEETING

Syracuse University, New York, May 19-21

Registration ASIS, 1155 16th Street, NW, Washington 20036

NEW YORK REGIONAL CONFERENCE - ACM

Biltmore Hotel, May 23-24
Program chairman Jay-Louise Weldon, Graduate School of Business, NYU, Room 603, Tisch Hall, 40 West 4th Street, New York 10003 212-598-2204

PARALLEL AND DISTRIBUTED PROCESSING

IEEE Computer Society and Wayne State University
Shanty Creek Lodge, Bellaire, Michigan, August 23-26
Circuits, architecture, networks, languages, applications
Program chairman J L Baer, Department of Computer Science, University of Washington, Seattle 98165, 206-543-9344

COMPUTING IN THE HUMANITIES - THIRD INTERNATIONAL CONFERENCE

Waterloo, Ontario, Canada, August 2-5, 1977
Address Paul Bratley, Département d'informatique, Université de Montréal, C P 6128, Succursale A, Montréal, Canada H3C 3J7

American Journal of Computational Linguistics Microfiche 59 : 43

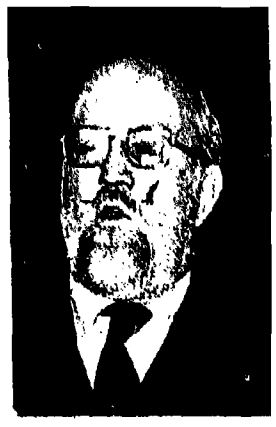
FCC Computer Communications Planning Conference

'No Logical Technical Boundary' Between Computing and Communications

By Pender Mc Carter

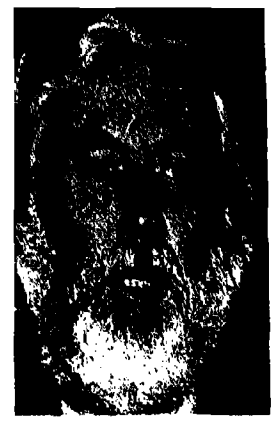
Wiley

Cerf



Hopewell

Curran



Dunn

Summarizing the technical presentations at the FCC Planning Conference on Computer Communications, Dr. Vinton G. Cerf of the Information Processing Technique Office, Defense Advanced Research Projects Agency (ARPA), noted (1) there is no "logical technical boundary" between computing and communications, (2) packet switching is having an "important effect" on computer communications today, and will have a "profound effect" on frequency allocation in the future, (3) high local access costs, international link costs, and user learning costs are "limiting" the growth of computer communications services, (4) the prime opportunities for network cost and tariff improvement lie in the development of new facilities for local access and for intercontinental links, and (5) a regulatory climate is needed "which encourages innovation, ensures reliable interconnection of primary services, and promotes the acquisition of capital for growth."

Opening the Conference, FCC chairman Richard Wiley stated his view that a computer is a communications device, not a data processing device when it is used in a traditional communications service. However, Wiley also noted that the use of computer technology may result in an enhanced service, offering more than traditional communications.

He predicted that similar technological forces will develop in several areas of communications service. Wiley said, "I firmly believe that, in this great free enterprise society of ours, government regulations must not be permitted to stand in the way of technological development. If the new technology creates administrative difficulties for the government, it is the regulations that must be conformed and not the technology."

In the Conference's first presentation on "Computer Communications: An Introduction and Overview," Lynn Hopewell (chairman, IEEE Computer Society Technical Committee on Computer Communications; member, executive staff, Computer Sciences Corp.) said that computer communications systems had first been used in controlling "complex" operations of industry and government. Hopewell added that the most common use of computer communications is in data base applications.

The speaker suggested that the computer communications industry accounts for 20 percent of all expenditures in the computer field. Examples of industrial areas affect-

d by computer communications technology ere listed as law enforcement, securities rokerage, insurance, reservations systems, nd banking. Hopewell said that 75 per- ent of the top 500 industry corporations re now using computer communications.

While distributing samples of a micro- computer on a chip to the audience, Hope- well noted that technological changes have produced a 1976 microcomputer CPU costing $20 in contrast to a 1960 IBM CPU costing $30,000. He added that micro- processors which cost $20 today cost $100 only a year ago. He indicated that such differentials represent only the beginning of low cost computing.

Hopewell said that the proposed defini- tions employed in the new "Computer Inquiry" aid in "clarifying the permitted uses of computers by common carriers, but in no way allow the proposed abandonment of the 'hybrid' service concept." He noted that the hybrid concept should be retained "because some service offerings have mixes of both computing and communications functions," not retained because of unclear definitions.

Since "hybrid services will become even more common in the future," Hopewell con- tinued, elimination of the hybrid concept will "inevitably suppress innovation be- cause any services that have communications functions inextricably bound into them will be defined as subject to regulation." The speaker concluded that he saw no "techno- logical or economic reason for the regu- lation of the resale industry."

In his presentation on "Research Topics in Computer Communication," Vinton Cerf summarized technological factors influ- encing the development of computer com- munications: the availability of wideband transmission media; the use of computers to control the switching and allocation of transmission bandwidth; the trend toward all-digital telephone networks; and inter- connection of computer communications net- works.

Cerf said the "technology is leading away from separate, distinct narrowband services ...toward integrated wideband services. The potential social impact is pervasive; the possibilities for new wealth-creating ac- tivity, almost incalculable; and the need for regulatory adjustment, inevitable."

With the juxtaposition of computing and communication, he suggested that the FCC could reallocate the radio spectrum using computer-controlled demand access; mandate computer communication network interconnec- tion through the enforcement of interconnec- tion standards; and consider proposals by regulated carriers as well as others "to provide previously impossible combinations of information processing and traditional communication services."

In his presentation on the "Dimension of the Need for Computer Communications," Alex Curran, president, BNR, Inc., suggested that domestic users must seek to reduce the cost of network access for smaller users, especially in the "smaller urban centers." FCC Interconnection Chief Louis Feldner, in a question-and-answer period following Curran's presentation, stressed the "need for computer power" in rural areas.

In his formal presentation, Curran con- tinued that the cost of intercontinental transmission must also be reduced. Accord- ing to the speaker, these measures would help to insure that "the common carrier networks can cope with the data communica- tions traffic of commercial users."

Curran stated that some of the office and home services associated with computer

communications could require reintegration of voice and data capabilities. Curran provided several current examples of personal computing including: Viewdata, the embryonic electronic newspaper in the United Kingdom; Incasting, instantaneous voting and data collection in Canada; Mailgram, a precursor of electronic mail in the U.S.,; and CAI, computer-assisted instruction.

Curran also said that other services will require switching machines "capable of recognizing information interest specifications as valid addresses." For example, switching machines could recognize selective information dissemination [interest] specifications as valid addresses. Curran concluded, "Thus, the boundary between communicating and computing will become more blurred. There are economic arguments for suggesting that the boundary definitions be relaxed to encourage a new cycle of innovation."

In his presentation entitled, "Limitations on the Growth of Computer-Communication Services," Professor Donald A. Dunn, Engineering Economic Systems Department, Stanford University, indicated that user learning costs will limit the rate at which new computer communication services can be introduced to markets serving non-computer professionals. Dunn suggested that, in future regulatory decision, integrated service packages (designed to minimize user learning and operation costs) might be used as the unit of service that is judged communications or data processing in lieu of individual component services. He added that regulatory limitations on the rate of return and regulatory policies on depreciation allowances can restrict technological changes as well as limit the rate of introduction of new equipment by carriers.

According to the speaker, the earlier "Computer Inquiry" rule, requiring data processing services to be provided by carriers through a separate affiliate, may limit the growth of carriers. But he added that the rule does not limit the growth of the data processing industry since unregulated suppliers can respond to this market. Dunn also noted that the resale and sharing decision, imposing regulation on resale carriers, would not necessarily inhibit the growth of the industry "since separate data processing affiliates will not be required of resale carriers that do not provide monopoly services."

He stated that the resale and sharing decision "removed some of the most serious limits to the growth of this industry by opening the market for network services to essentially any firm willing to operate as a resale carrier." Dunn concluded, "Pressures are likely to develop soon to regulate providers of information service packages that may offer computer message services to users that obtain network service from resale carriers. Such regulation would inhibit the growth of the industry, and is not needed to protect the interests of users."

In their presentation on "The Future of Computer Communications," Vinton Cerf and Alex Curran said that "we cannot offer a solution to the definition of a boundary between communicating and computing -- in fact, technical considerations convince us that there is no natural boundary."

Cerf and Curran urged the FCC to support the development of "competitive services;" insure that a "sufficient set" of standards is created to facilitate interconnection of "prime services;" create a climate in which both computing and carrier interests profit from the installation of "reliable" facilities; and broaden the base for the acquisition of capital so as to eliminate a possible constraint on growth.

The Proceedings of the Special Planning Conference has been published by AFIPS Press, 210 Summit Avenue, Montvale, New Jersey 07645. (Price: $10.00)

In response to the success of the Planning Conference, Richard Wiley extended the FCC's appreciation of AFIPS' effort in the following letter.

Dear Dr. Rector:

On behalf of the Federal Communications Commission I want to extend our most sincere thanks to AFIPS for its presentation

NOTICE TO AJCL CONTRIBUTORS

S H O R T - P A P E R F O R M A T

AUTHOR'S NAME

Institutional Address

SUMMARY

To produce a journal as large as AJCL for a society with as small a membership as ACL, while keeping dues at their present low level, the Assqciation must call on contributors for help The preparation of camera-ready copy is a substantial help This and the following frames are intended to save authors the inconvenience of retyping accepted manuscripts. This frame is laid out as the first frame of a short article (up to 25 manuscript pages) would be The following frame contains explicit suggestions.

SHORT CONTRIBUTIONS TO AJCL

FORMAT

On the first page, the contributor supplies the title of the article, the names of authors, their institutional addresses, and a 100-word summary. This page will be retyped by the editorial office. On following pages, the contributor leaves 9 blank lines at the top and a full inch on sides and bottom. The editorial office types in Running head and page number at the positions indicated above. The contributor does not number pages.

Illustrations, tables, and notes are best mixed with the text to spare the reader searches on the microfiche.

References can begin immediately following the end of the text; it is not necessary to start a new page.

Double-spaced typing is used throughout.

EDITORIAL REVIEW

On first submission, three copies are needed for members of the Editorial Board. Comments are generally returned in about a month. The author should save the original for submission after acceptance; the original or a very sharp, black photocopy with clean white background is needed for reproduction.

DYNAMIC INFORMATION AND LIBRARY PROCESSING

GERARD SALTON

Cornell University

PRENTICE-HALL, INC.
Englewood Cliffs, N J 07632

xiv + 523 pages
$19.95

ISBN 0-13-221325-7

REVIEWED BY RONALD E. WYLLYS

University of Texas Austin 78712

First, an overall characterization of the book It is an outstanding work. Time may well establish it as a masterpiece Salton has succeeded in combining. (1) the presentation of an interesting and, more importantly, a challenging concept--the "dynamic library" --toward which he believes libraries and information agencies ought to direct their research, developmental, and organizational efforts, (2) extensive guides to the relevant literature in several fields, through late 1974, (3) a textbook for at least two semester-length courses, for which my suggested titles would be "Language Processing for Information Storage and Retrieval" and "Library Systems Analysis", plus a good part of a third semester on "Library Automation", and (4) an invaluable reference work for computational linguists, information scientists, and librarians.

Now to the details. Since this review is being prepared for the American Journal of Computational Linguistics, it will be presented in a somewhat unusual format. Instead of beginning at the beginning of the book, I shall start by discussing what seem to me to be the book's highlights for the computational linguist Only after that discussion shall I deal with the general plan of the book and with other specific parts of it

The book's ten chapters are intended to be capable of being read independently of one another, although most readers will want to peruse Chapter 1 ahead of any other in order to understand Salton's underlying theme for the book Of the ten chapters, those most immediately relevant to computational linguistics are undoubtedly the last two, plus Chapter 3. The last two are part of a section called "Dynamic Information Processing," in which Salton connects basic concepts in file organization and language processing with their potential applications in the dynamic library (about which more is said below) At the heart of computational linguistics, Chapter 9, "Language Processing," condenses into 49 pages a frank evaluative review of the state-of-the-art in this field Salton links the research in the field with its potential for applications to information systems by saying:

> A content analysis system going beyond the identification of individual terms . . . requires at least three parts: a *description* of an area of discourse in terms of basic entities, or concepts, of importance in this area, including also the main logical-semantic relationships that must be identifled between these entities; a *linguistic*

> *theory* based on appropriate characterizations of lexical items and on grammatical and semantic rules that would underlie the language analysis system; a *set of procedures* capable of generating for each acceptable input string a deep structure specifying the linguistic-semantic relations between entities obtained from the linguistic analysis, as well as the logical-semantic relations derived from the encyclopedia.

With the stage thus set, Salton presents a moderately detailed and highly readable overview of recent and current approaches to natural-language analysis, with an ample supply of examples The chapter's bibliography can serve as a list of the highlights in computational linguistics during 1963-1973 Not everyone will agree with Salton's somewhat pessimistic view of the usefulness of computational linguistics for information systems in the near future (i e , 10-20 years), but all will find this chapter a masterful presentation

In Chapters 3 and 10, Salton enlarges the horizons of computational linguistics beyond its most frequent area of concern, for whcih one might better use the narrower name of "algebraic linguistics", by discussing what I like to call "quantitative linguistics" --another part of computational linguistics, broadly considered Chapter 3, "Automatic Indexing and Abstracting", treats methods by which it is possible to assess programmmatically the probable usefulness of words and phrases as indicators of the content of documents. Such methods are primarily, but by no means exclusively, statistical, and the discussion includes syntax-analytic methods Salton takes pains to dispose of the standard criticism of automatic indexing as "imperfect", by arguing that

> The assertions concerning the inadequacy of automatic indexing are often bolstered by demonstrations designed to show that the results of certain specified automatic procedures will fail to pass any rational test carried out by independent human observers. And from such demonstrations one concludes that the quality obtained through automatic indexing methods is inferior to that of indexing by specialists.
>
> The trouble with these arguments is that a correct premise--that most automatic indexing products are imperfect--leads wrongly to the conclusion that the automatic product is necessarily inferior to one obtained intellectually by human experts.

He concludes that although "it is hazardous to extrapolate test results obtained in a laboratory environment to operational situations involving possibly hundreds of thousands of items", nevertheless, a number of different, independent tests--several of which he discusses-- have shown that "relatively simple automatic text analysis systems do not produce in a document retrieval environment search results inferior to" those of conventional manual indexing

As befits a final chapter, Chapter 10, entitled (like its superordinate) "Dynamic Information Processing", shows how the theories and techniques developed earlier in the book can be applied to the book's main theme, the dynamic library. As Salton puts it

> In this chapter the characteristics of on-line retrieval systems are taken up with emphasis on novel procedures not now implemented in operational situations in which suitable interactions between users and system may be particularly beneficial. Covered in particular are indexing methods adapted to particular (possibly changing) document collections, thesaurus construction and manipulations, search procedures based on the use of feedback information supplied by the customer population during the search operations, document space

> modification methods in which the document characterizations are changed in accordance with experiences accumulated in the course of operations, and collection growth and retirement procedures. Various methods are suggested for these tasks, and evaluation results are given whenever they are available.

Computational linguists may be especially interested in the treatments of how to construct indexing vocabularies and of how to construct, maintain, and manipulate thesauruses. Both of these treatments cover syntax-analytic, as well as quantitative, techniques But all readers will find much of interest in the chapter's combining the foregoing treatments with such ideas as the on-going modification of both queries and document index-term sets, to improve not only the retrieval of documents but also the management of the collection as a whole

Having dealt with the chapters that I suggest will be of primary interest to computational linguists, we can now examine the book as a whole Salton states that his overall purpose in the book is

> to bridge the gap between computer science and information science by introducing a new environment, called the dynamic library, and a set of dynamic information processing tasks to operate in that environment. The idea is to carry out most processing tasks, such as content analysis, classification, information search, and retrieval, interactively under user control, while simultaneously accommodating the file updating and maintenance procedures that are inherent in a changing data processing situation.

The key to achieving the goals of the dynamic library is the use of the "clustered file" concept Since this may not yet be a completely familiar concept, it deserves discussion here In

Salton's words

> . . . a *clustered file* organization is recommended in which documents carrying somewhat similar content descriptions are automatically grouped into clusters. Each cluster is identified by a representative cluster profile, or *centroid*, somewhat akin to the center of gravity of a set of mass points. A cluster centroid is simply a weighted set of terms derived from the document vectors (index-term sets) included in the corresponding cluster.
>
> A clustered file is then similar in concept to a normal classified library file except that the document classes are automatically generated and some overlap may exist between classes, that is, certain documents may be included in more than one class. Furthermore, in the case of the clustered file it is easy to rearrange the cluster composition by moving documents from one class to another if it should prove useful.
>
> A search in a clustered file is carried out in several steps: first, each query is compared with the index file of centroid vectors; then, for those centroids exhibiting a sufficiently high similarity with the query, the individual document vectors in the corresponding clusters are examined, and the document citations are ranked for output purposes in decreasing query-document order. . .
>
> It is clear that the "depth" of the search, as measured by the number of query-document comparisons, can be controlled in a clustered file because it is possible to search only the "best" cluster --the one exhibiting the highest query-centroid similarity--or the top two clusters, or the top ten, as may be required. Moreover, since all document vectors and citations belonging to a given cluster are stored adjacently in the same storage area, for example, on the same track or cylinder of a given disc assembly, only one access operation is needed for each document cluster, as opposed to one access for each document citation in an inverted file.
>
> A detailed comparison of inverted clustered file organizations shows that the clustered file is more economical of storage, leads

> to faster retrieval operations, and permits more flexible search strategies.

This important concept of the clustered file is discussed in detail in Chapter 8, "Automatic Document and Query Classification"

The use of clustered files makes it practical to "maintain the library system in a continuous state of flux"--i e , to make it a dynamic library--by facilitating query processing in which both query vectors and document vectors are continually subjected to small changes As its vector changes accumulate, a document's "classification", i e , its cluster, may change As document changes accumulate, a cluster's centroid may change.

The book as a whole, then is devoted to expounding the theme of the dynamic library and to explicating the necessary details Chapter 1, "Introducing the New Library", does just what its title says, and, as indicated earlier, most readers will want to peruse it to obtain a more detailed idea of what Salton means by the name "dynamic library". In this chapter he argues that libraries present data-processing requirements that are unique as a combination of very large size, high level of file activity, great variety of different operations to be performed, large volume of input and output operations, and need for real-time control He reviews attempts to solve library problems by mechanization and by cooperation, concluding that such efforts can offer no more than partial solutions. As a different approach, he proposes his concept of the dynamic library

In Chapter 2, "Mechanized Housekeeping", Salton provides an excellent overview of the present state of library automation in the areas of cataloging, serials control, and circulation control Chapter 4, "Storage and Retrieval Systems", continues this overview into the areas of reference service, current-awareness systems, and information centers and networks.

Chapter 5, "Library Systems Analysis", deals much too briefly, in my opinion, with systems analysis as such, but it does offer a very readable presentation of the ideas of bibliometrics and of operations-research techniques applied to libraries. In Chapter 6, "System Testing", the difficult problem of evaluating information systems is discussed, the chapter includes a concise treatment of cost-effectiveness and cost-benefit analysis.

Finally, Chapter 7, "Storage Organization", provides an excellent summary of computer-file structures Any instructor who finds that his or her students tend to become overwhelmed by details when they read Knuth should offer them this chapter as a highly readable introduction to file-organization methods Attention is given to the special problems of library files, and the clustered-file concept is introduced. The chapter concludes with a look at some special-purpose file-organization techniques

Salton suggests that the book's chapters could be used for two semester-length courses, as follows, with "()" indicating optional chapters and "_" more advanced topics

For computer-oriented students	1,3,4,(5),7,8,(9),10
For information-science-oriented students	1,2,3,4,5,6,(9),10

My feeling is that each of these sequences is too long for a one-semester course, assuming a reasonable amount of additional reading assignments and exercises for the students My suggestions for courses and chapters are these

A course in "Language Processing for Informaton Storage and Retrieval"	1, 3, 9, 10, 8, (7)
A course in "Library Systems Analysis"	1, 5, 6, 2, 3, 4
As part of a course in "Library Automation'	1, 2, 4

Every reviewer finds a few nits to pick I wish Salton had not used the abbreviation "log" for "natural logarithm" instead of the now standard "ln", or at least that he had explicitly stated his usage A few of the tables contain minor numerical errors, none that I noticed affects the conclusions being drawn, and at least one ("18" instead of "22" in Table 1-2) when corrected strengthens the argument I wish Salton had dealt less curtly with systems analysis, but, after all, the book contains 537 well-filled pages as it stands

In conclusion, I think it likely that this book will come to be viewed as a master contribution to the professional and pedagogical literature in natural-language analysis, information science, and library science

C U R R E N T B I B L I O G R A P H Y

URGENT NOTICE The libraries of the University that have made it possible for AJCL to supply summaries of current articles are reducing their budget of periodical subscriptions Many journals are no longer available to us

```
* Members who subscribe to any journals other than the  *
*                                                       *
* standard few can help the Association by providing    *
*                                                       *
* occasional summaries  The Editor will explain what    *
*                                                       *
* is needed  The member who wishes to help should send  *
*                                                       *
* a list of available journals to AJCL, 5048 Lake Shore *
*                                                       *
* Road, Hamburg, New York 14075                         *
```

Authors of technical reports can help by sending their articles, or summaries of them, to AJCL for publication.

Many summaries are authors' abstracts, sometimes edited for clarity, brevity, or completeness

The bibliography is produced with programs designed by Martin Kay, using the equipment of the Xerox Palo Alto Research Center AJCL gratefully acknowledges their contribution

See frame 58 for a list of subject headings with frame numbers

SUBJECT HEADINGS

GENERAL 59
BIBLIOGRAPHY 62

PHONETICS-PHONOLOGY 62
RECOGNITION 65
SYNTHESIS 72

WRITING 75
RECOGNITION 76

LEXICOGRAPHY-LEXICOLOGY 77
STATISTICS 77
THESAURI 77

GRAMMAR 78
PARSER 79
CLASSES & CONSTRUCTIONS 80

SEMANTICS-DISCOURSE 80
THEORY 81
COMPREHENSION 81
MEMORY 82

LINGUISTICS 84
METHODS: MATHEMATICAL 84
COMPUTATION 85
INFERENCE 85
PROGRAMMING 87
INFORMATION STRUCTURES 88
PICTORIAL SYSTEMS 89

DOCUMENTATION 90

TRANSLATION 91

SOCIAL-BEHAVIORAL SCIENCE 92
PSYCHOLOGY 92

HUMANITIES 96

INSTRUCTION 97

The Hearsay-I Speech Understanding System: An Example of the Recognition Process

D. Raj Reddy
Department of Computer Science, Carnegie-Mellon University, Pittsburgh, PA 15213

Richard D. Fennell
Federal Judicial Center, Washington, D.C. 20005

Richard B. Neeley
Xerox Palo Alto Research Center, CA 94305

IEEE Transactions on Computers 25: 422-431, April 1976

In Hearsay-I diverse sources of knowledge can be represented as cooperating independent parallel processes which help in the decoding of the utterances using the hypothesize-and-test paradigm. The system is discussed by considering a specific example of its operation in the realm of voice chess. Topics: feature extraction and segmentation, the recognition process, speaker- and environment-dependent knowledge, syntactic and semantic knowledge.

Preliminary Results on the Performance of a System for the Automatic Recognition of Continuous Speech

L. R. Bahl, J. K. Baker, P. S. Cohen, N. R. Dixon, F. Jelinek, R. L. Mercer, and H. F. Silverman
Speech Processing Group, Computer Sciences Department, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598

Research Report RC 5654, 12p, September 30, 1975

The recognition system consists of the Acoustic Processor (front end) and the Decoder (back end), which uses statistical models of the various aspects of speech production and recognition. Two types of decoding algorithms have been used, a stack decoder and a Viterbi decoder. In one set of experiments the vocabulary consisted of the 11 digits - *zero, oh, one, two, ...nine.* Sentences consist of 7 digit sequences. After training on a set of 602 utterances, recognition on 100 test sentences yielded 89% and 82% correct for the stack and the Viterbi decoder respectively. Only one speaker was used. The second set of experiments involved the New Raleigh language, with a vocabulary size of 250. In this set the effect of training set size, number of iterations during training, variations in speaker model, and effects of different speakers were tested. Percentages of correct sentences were in the 80-85% range.

Speech Understanding Through Syntactic and Semantic Analysis

Donald E. Walker
Artificial Intelligence Center, Stanford Research Institute, Menlo Park CA 94025

IEEE Transactions on Computers 25: 432-439, April 1976

Summary of an early version (1972) of the SRI speech understanding system. Topics discussed: the nature of the problem of speech understanding (as opposed to speech recognition), syntactic and semantic analysis, acoustic processing, word verification.

Computer Power and Human Reason

Joseph Weizenbaum
Department of Computer Science, Massachusetts Institute of Technology, Cambridge

W.H. Freeman and Company, San Francisco, California, 1976 300 pp.,
HC $9.95
ISBN 0-7167-0464-1

Intoduction 1

1. On Tools 17

2. Where the Power of the Computer Comes From 39

3. How Computers Work 73

4. Science and the Compulsive Programmer 111

5. Theories and Models 132

6. Computer Models in Psychology 154

7. The Computer and Natural Language 182

8. Artificial Intelligence 202

9. Incomprehensible Programs 228

10. Against the Imperialism of Instrumental Reason 258

Natural Language Processing (A Bibliography with Abstracts)

David W. Grooms
National Technical Information Service, Springfield, VA

NTIS/PS-75/864/9GA, 204p, December 1975

Computer programming; information storage and retrieval, question-answering, man-computer communications, AI, syntactic analysis, computational linguistics. 199 abstracts.

PHONETICS-PHONOLOGY

Man Converses with Machine

S. A. Barchenko
USSR

Joint Publications Research Service, Arlington, Va.: NTIS JPRS-66417 Translation of Chelovek Razgovavivaet s Machinoi, Moscow: 77-83, 105-109, 123-134, 1974
PC $3.50/MF $2.25

Descriptions of electronic devices for speech analysis and conversion and for voice controlled systems and mechanisms.

Speech Research: Jan-Mar 75

Alvin M. Liberman
Haskins Laboratories, Inc., New Haven, Connecticut

Report SR 41 (1975), 235p, June 1975 NTIS AD-A013 325/6GA, PC $7.50/MF $2.25

Manuscripts cover the following topics: Preliminaries to a theory of action with reference to vision; two questions in dichotic listing; relationship of speech to language; rise time in nonlinguistic sounds and models of speech perception; phonetic coding of words in taxonomic classification task; on the front cavity resonance; synthetic speech comprehension; testing synthesis-by-rule with OVEBORD program Stress and the elastic syllable, VOT or first-formant transition detector; pitch in perception of voicing states in Thai; facial muscle activity in production of Swedish vowels; combined cinefluorographic-EMG study of the tongue during production of /s/; velar movement and its motor command; the stuttering larynx.

Recent Developments in Speech Research

O. Fujimura
Bell Laboratories, Murray Hill, New Jersey 07974

Manuscript for the Proceedings of the 8th International Congress on the Education of the Deaf, Tokyo, August 1975

Recent progress in speech research is reviewed with an emphasis on the efforts to relate linguistic units to speech events Topics discussed: Segmental aspects, Assimilation, Syllables as concatenative segments (instead of phonemes), Suprasegemental aspects. In the discussion of suprasegmentals experiments are reported in which English words were first recorded in a carrier sentence and then constituent syllables were clipped out and used to form new sentences. Various approximations to the target sentence were tested, simple concatenation, a version in which durations of syllables had been adjusted to match natural expansion or compression of syllables, another version in which the natural pitch contour (taken from an utterance of the target sentence) is stretched to match the durations as they were for the source syllables, and another version with natural pitch contour and duration-adjusted syllables.

Implementation of the Digital Phase Vocoder Using the Fast Fourier Transform

Michael R. Portnoff
Department of Electrical Engineering and Computer Science, Research Laboratory of Electronics, M.I.T., Cambridge, MA 02139

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 243-248 June 1976

A digital formulation of the phase vocoder, an analysis-synthesis system providing a parametric representation of a speech waveform by its short-time Fourier transform, is of interest both for data-rate reduction and for manipulating speech parameters. The system is designed to be an identity system in the absence of any parameter modifications. Computational efficiency is achieved by employing the fast Fourier transform algorithm to perform the bulk of the computation in both the analysis and synthesis procedures, thereby making the formulation attractive for implementation on a minicomputer.

Syllables as Concatenated Demisyllables and Affixes

O. Fujimura
Bell Laboratories, Murray Hill, New Jersey 07974

Paper Presented at the 91st meeting of the Acoustical Society of America, April 1976

By decomposing English syllables into phonetically and phonotactically well-motivated units it should be possible to create a complete inventory for segmental concatenation which will contain about 1,000 entries, and still reproduce natural allophonic variations. A syllable is shown to consist of a syllable core and syllable affix(es), the former being decomposed into the initital and final demisyllables. Consonantal features for each demi-syllabe include at most one specification of place of articulation (in terms of a few distinctive features), spirantization (for /sp/,/st/,/sk/, as opposed to /p/, /t/, /k/), tenseness, nasality etc.. The phonetic realization is governed by the vowel affinity principle as described elsewhere in terms of the temporal sequence of pertinent physical events. There is a phonetic constraint that a demisyllable is realized with not more than two phonetic consonantal segments. The final consonantal elements (such as /s/ in /taeks/) that follow a place-specified consonant (/k/ in this case) are treated as syllable affixes. These affixes are all apical, and they observe voicing assimilation with respect to the true consonant in the core.

Transition Networks for Pattern Recognition

Su Man Chou, and K. S. Fu
School of Electrical Engineering, Purdue University, Lafayette, Indiana

Report TR-EE75-39, 187p, December 1975, NTIS: AD-A020 727/4GA
PC $7.50/MF $2.25

Transition networks and Chomsky's hierarchy; modified Earley's algorithm for transition network grammars. Stochastic and error correcting versions of transition networks are proposed to solve the problem of noise and distortion in syntactic pattern recognition. This approach is illustrated by discussion of an experiment on *voice-chess* language. Inference in transition networks; inference on the probability assignment over the arcs of stochastic transition networks; examples of inference.

An Approach Towards a Synthesis-Based Speech Recognition System

R. B. Thosar
International Computers, Ltd., Poona, India

P. V. S. Rao
Tata Institute of Fundamental Research, Bombay, India

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 194-196 April 1976

The scheme uses information about interphoneme contextual effects contained in formant transitions and employs internal trial synthesis and feedback comparison as a means for recognition. The aim is to achieve minimal sensitivity to appreciable variability which occurs in the speech signal, even for utterances of a single speaker. While the approach is quite general, it has initially been tried out on vowel-stop-vowel utterances. Vowels are always identified correctly while recognition scores range from 66% to 78% for the consonants, except for /n/ at 47.9%.

Continuous Speech Recognition via Centisecond Acoustic States

Raimo Bakis
Computer Sciences Department, IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

IBM Research Report: RC 5971, 4p, April 5, 1976

Continuous speech was treated as if produced by a finite state machine making a transition every centisecond. The observable output from state transitions was considered to be a power spectrum - a probabilistic function of the target state of each transition. Using this model, observed sequences of power spectra from real speech were decoded as sequences of acoustic states by means of the Viterbi trellis algorithm. The finite-state machine used as a representation of the speech source was composed of machines representing words, combined according to a 'language model'. When trained to the voice of a particular speaker, the decoder recognized seven-digit telephone numbers correctly 96% of the time, with a better than 99% per-digit accuracy. Results of syllable and phoneme recognition tests are also given. The approach appears promising, with system training appearing to be the key problem.

A General Language-Operated Decision Implementation System (GLODIS): Its Application to Continuous-Speech Segmentation

N. Rex Dixon, and Harvey F. Silverman
Speech Processing Group, Department of Computer Sciences, IBM Thomas J. Watson Research Center, Yorktown Heights NY 10598

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 137-162 April 1976

GLODIS represents a flexible, operating-system approach to the generation and implementation of complex rules for decision making in pattern recognition, such as processing of EEG, EKG, seismic, sonar, radar, and, in this implementation, speech data. The user control of the system, written in GLODISL, is fed to a compiler stage which converts the user-oriented control data for the implementer, which applies the control data to the input data. The system is described in detail sufficient to permit replication. In the segmentation of 8.5 minutes on continuous text, containing 6175 individual phoneme-events, the system achieved 6.80% missed events, 10.50% extra events, 4.69% temporarily misplaced events. 88.6% of segments were assigned to the proper phoneme class, with the worst confusion existing between glides and vowels (which is predictable in a system using steady-state classification). GLODIS has been used as the acoustic-to-phonetic translator in a large experiment described in L.R. Bahl *et al.* IBRRB: RC-5654 (abstracted elsewhere on this fiche).

Computer Recognition of Interphonemic Transitions in Continuous Speech

David A. Brown
Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio School of Engineering

Report GSM/BE/75D-45, 90p. December 1975 NTIS: AD-AO19 842/4GA
PC $5.00/MF $2.25

The objective of this research was to determine the feasibility of recognizing five distinct speech units (interphonemic transitions) in the speech of one speaker. A computer program performed the recognition task based on formiant features in the transition regions of the speech data. A comparison of two sequential recognition models revealed that transitions in continuous speech can be more accurately modelled in terms of independent formant sequences than a simple sequence of sounds.

Modifications to Formant Tracking Algorithm of April 1974

Stephanie Seneff
Lincoln Laboratory, M.I.T., Cambridge, MA 02173

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 192-193 April 1976

An improved version of the algorithm described in McCandless (IETABA 22: 135, *AJCL* abstract on fiche 6: 55). The new algorithm, like the original one, applies continuity constraints and branches out from an anchor point in the middle of each vowel. The changes are that initial estimates for the formant frequencies at the anchor are determined more carefully, and that the option of choosing a new anchor point near the original one is allowed if the original one caused problems.

Prosodic Aids to Speech Recognition: VII. Experiments on Detecting and Locating Phrase Boundaries

Wayne A. Lea
Defense Systems Division, Sperry Univac, St. Paul, Minnesota

Report PX-11534, 52p, 14 November 1975 NTIS: AD-A019 047/0GA
PC $4.50/MF $2.25

Computer programs for detecting syntactic boundaries (BOUND3) and locating stressed syllables (STRESS) have been supplied to ARPA contractors and incorporated into speech recognition facilities. Experiments were conducted on various timing cues that correlate with phonological and syntactic phrase boundaries, showing that 91% of the phonological phrase boundaries that were perceived by listeners who heard spectrally inverted speech could be detected from lengthened vowels and sonorants in phrase-final positions. Also, 95% of these perceived boundaries were evidenced by long time intervals between syllables. The interstress interval also provided a good measure of rate of speech, that correlated with error rates in automatic phonetic classification schemes.

Evaluation of an Automatic Speaker-Verification System over Telephone Lines

A. E. Rosenberg
Acoustics Research Department, Bell Laboratories

Bell System Technical Journal 55: 723-744, July-August 1976

The system is based on an acoustic analysis of a fixed, sentence-long utterance resulting in a function of time or contour for each feature analyzed (such as pitch, intensity). In a test of the system 104 male and female speakers called in nominally once each working day, from their own phones, over a period of five months. In the initial call each 'customer' was asked to provide 5 recordings of the test utterance ("We were away a year ago"). Provision is made for updating the reference file. At the early stages the reject-customer rate is about 10%, while it approaches 4% on adapted customers. The accept-imposter rate shows a similar history. The greatest weakness of the system lies in the establishment of adequate initial reference files.

Speaker Recognition Using Orthogonal Linear Prediction

Marvin Sambur
Bell Laboratories, Murray Hill, NJ 07974

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 283-289, August 1976

Recent experiments in speech synthesis have shown that, by an appropriate eigenvector analysis, a set of orthogonal parameters can be obtained that is essentially independent of all linguistic information across an analyzed utterance, but highly indicative of the identity of the speaker. The orthogonal parameters are formed by a linear transformation of the linear prediction parameters, and can achieve their recognition potential without the need of any time-normalization procedure. The speaker discrimination potential of the linear prediction orthogonal parameters was formally tested in both a speaker identification and a speaker verification experiment. The speech data for these experiments consisted of six repetitions of the same sentence spoken by 21 male speakers on six separate occasions. For both identification and verification, the recognition accuracy of the orthogonal parameters exceeded 99 percent for high-quality speech inputs. For telephone inputs, the accuracy exceeded 96 percent. In a separate text-independent speaker identification experiment, an accuracy of 94 percent was achieved for high-quality speech inputs.

Speech Recognition Experiments with Linear Prediction, Bandpass Filtering, and Dynamic Programming

George M. White, and Richard B. Neely
Palo Alto Research Center, Xerox Corporation, CA 94304

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 183-188 April 1976

Preprocessing by linear predictive analysis and by bandpass filtering are found to produce similar recognition scores. The classifier uses either linear time stretching or dynamic programming to achieve time alignment. Dynamic programming is of major importance for recognition of polysyllabic words. The speech is compressed into a quasi-phoneme character string or preserved uncompressed. Best results are obtained with uncompressed data, using nonlinear time registration for multisyllabic words.

Some Preliminary Experiments in the Recognition of Connected digits

Lawrence R. Rabiner, and Marvin R. Sambur
Bell Laboratories, Murray Hill, NJ 07974

IEEE Transactions of Acoustics, Speech, and Signal Processing 24: 170-182 April 1976

The first part of the recognition system segments the string into individual digits while the second part recognizes the individual segments. Segmentation is based on a voiced-unvoiced analysis of the digit string, as well as information about the location and amplitude of minima in the energy contour of the utterance. The digit recognition strategy is similar to the algorithm used by Sambur and Rabiner (BSTJAN 54: 81) for isolated digits, but with several important modifications due to the impreciseness with which the exact digit boundaries can be located. In evaluating the accurancy of the system high-quality sound recordings obtained from a soundproof booth were segmented with 99% accuracy and the recognition accuracy was about 91% across ten speakers (5 male, 5 female). With recordings made in a noisy computer room the segmentation accuracy remained close to 99% and the recognition accuracy was about 87% across another group of 10 speakers (5 male, 5 female).

Utterance Classification Confidence in Automatic Speech Recognition

Ralph Kimball, and Michael H. Rothkopf
Palo Alto Research Center, Xerox Corporation, CA 94304

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 188-189 April 1976

A confidence measure for utterance classification using Hamming distance: Given an unknown string *U* and known strings *T1 . . . Tk*, we wish to choose the known string *Tm* most similar to *U*. The Hamming distance *Hm* between *Tm* and *U* is the total number of character differences between the respective strings. The Hamming ratio, between the two best Hamming distance scores obtained in matching utterance templates with an unknown utterance, is an indication of the degree of competition among alternative classifications. If the Hamming ratio falls below a specific threshold, the classification cannot be taken seriously and it is necessary to invoke a more costly, but more powerful, classifier.

A Comparison of Several Speech Spectra Classification Methods

Harvey F. Silverman, and N. Rex Dixon
Speech Processing Group, Computer Sciences Department, IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 289-295 August 1975

Four methods of classifying speech-spectra are discussed: 1) maximum direction cosine method, 2) minimum distance with no mean correction, 3) minimum distance with linear mean correction, 4) minimum distance with full correction. These were tested with 80, 40, 20, and 10-point spectral representation. Measures of accuracy and stability were derived through the use of an automatic performance evaluation system. Over 3000 hand-labeled spectra were used. Of those evaluated, a linearly mean-corrected minimum distance measure, on a 40 point spectral representation with a square (or cube) norm was consistently superior to the other methods.

A Pattern Recognition Approach to Voiced-Unvoiced-Silence Classification with Applications to Speech Recognition

Bishnu S. Atal, and Lawrence R. Rabiner
Bell Laboratories, Murray Hill, NJ 07974

IEEE Transactions on Acoustics, Speech, and Signal Processing 24: 201-212 June 1976

The linking of voiced-unvoiced decision to pitch analysis not only results in unnecessary complexity, but makes it difficult to classify short speech segments which are less than a few pitch periods in duration. By using measurements of the zero-crossing rate, the speech energy, correlation between adjacent speech samples, the first predictor coefficient from a 12-pole linear predictive coding (LPC) analysis, and the energy in the prediction error it is possible to use a pattern recognition approach to deciding whether a segment is voiced speech unvoiced speech, or silence. The speech segment is assigned to a particular class based on a minimum-distance rule obtained under the assumption that the measured parameters are distributed according to the multidimensional Gaussian probability density function. The means and covariances for the Gaussian distribution are determined from manually classified speech data including a training set. A simple nonlinear smoothing algorithm is described to provide a smooth 3-level contour of an utterance for use in speech recognition applications.

Residual Energy of Linear Prediction Applied to Vowel and Speaker Recognition

Hisashi Wakita
Speech Communications Research Laboratory, Inc., Santa Barbara, CA 93109

IEEE Transactions of Acoustics, Speech, and Signal Processing 24: 270-271 June 1976

Abstract--Recognition of steady-state vowels based on the residual energy of linear prediction was ascertained to be useful for a recognition system in which the reference data are taken from the intended speaker. Sharp speaker selectivity based on a threshold criterion suggests that the use of the residual signal energy may also be useful for speaker identification, especially for speaker screening in a large population.

Speech Synthesis by Programmable Digital Filter

Donald B. Warmuth
Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio School of Engineering

Report GE/EE/75-41, 78p, December 1975 NTIS: AD-A019 842/4GA
PC $5.00/MF $2.25

Input from teletype, output is recognizable speech. The technique is based on modeling the accoustical conseqüences of the various configurations of the vocal tract and was tested by listening to output and by use of the Speech Analysis System of the Aerospace Medical Research Laboratory, which consists of an analyzer and associated equipment necessary to produce a real-time hardcopy representation of the frequency characteristics of the speech input. The analyzer is called a COC filter with a design based on the hydro-mechancial operation of the inner ear.

A Model of Articulatory Dynamics and Control

Cecil H. Coker
Acoustics Research Department, Bell Laboratories, Murray Hill, NJ 07974

Proceedings of the IEEE 64: 452-460, April 1976

The system includes: 1) a physical model of the vocal system, with spatial constraints very close to those of natural articulation; 2) a representation of the motional constraints of the articulators which, when moving from one stated shape to another, interpolates realistic intermediate shapes; 3) a similar model for the movements of the excitation system, including subglottal pressure, vocal cord angle and tension; and 4) a controller for this mechanism which produces from input phonetic strings sequences of articulatory commands which cause this dynamic system to execute properly timed articulatory motions.

Automatic Generation of Voiceless Excitation in a Vocal Cord-Vocal Tract Speech Synthesizer

James L. Flanagan, and Kenzo Ishizaka
Acoustics Research Department, Bell Laboratories, Murray Hill, NJ 07974

IEEE Transactions of Acoustics, Speech, and Signal Processing 24: 163-170, April 1976

The speech synthesis technique incorporates acoustic models for sound propagation in a tube with yielding walls, turbulent noise generation at locations of constricted volume flow in the vocal tract, and the self-oscillatory properties of the vocal cord source. With the freedom from the traditional assumption of linear separability of sound source and resonant system allowed by this formulation, new opportunities accrue for building realistic physiological characteristics into the synthesizer which represent information that need not be overtly supplied to control the synthesizer. The system is used to synthesize test syllables from controls which are stylized models of articulation and connected speech from controls automatically derived from printed text. The synthesis technique demonstrates the feasibility of generating all speech sounds (voiced unvoiced, nasal) from a common set of physiologically based control parameters (subglottal lung pressure, vocal cord tension, vocal cord neutral area, area of nasal coupling, cross sectional area of the vocal tract along its length).

Digital Analysis of Laryngeal Control in Speech Production

J. L. Flanagan, L. R. Rabiner, D. Christopher, and D. E. Bock
Acoustics Research Department, Bell Laboartories, Murray Hill, NJ 07974

T. Shipp
Veterans Administration Hospital, Speech Research Laboratory, San Francisco, CA 94121

Journal of the Acoustical Society of America 60: 446-455, August 1976

Physiological measurements are made directly on human talkers to determine several dynamic laryngeal functions. The functions are control variables in a speech synthesizer which utilizes acoustic models of the vocal cords and vocal tract. They are the time variation of vocal-cored (glottal) opening (Ag); the electromyographic (EMG) potentials of three laryngeal muscles--posterior crico arytenoid (PCA), interarytenoid (IA), and cricothyroid (CT); the subglottal air pressure (Ps); the speech output sound pressure waveform (P); and timing pulses from a digital clock. Preliminary data for ten utterances by a man are digitized by a multiplexed A/D converter and the results are stored in disk file for analysis. The results show how voice periodicity can be manifested differently at the glottal and sound-output levels. A typical instance is vocal-cord vibration throughout the occluded phase of a voiced stop consonant. The EMG functions are analyzed by computing short-time energy. The results are correlated with voicing onset/offset and with voice pitch. PCA energy is shown to be correlated with voicing offset, and anticipatory to it by about 20-30 msec. IA energy is shown to be correlated with voicing onset, and anticipatory to it by about 40-50 msec. CT energy is found to be nearly directly correlated with the frequency contour for voice pitch. Direct utilization of these physiological parameters for speech synthesis is suggested.

Speech Resynthesis from Phoneme-Related Parameters

Joseph P. Olive, and N. Spickenagel
Bell Laboratories, Murray Hill, NJ 07974

Journal of the Acoustical Society of America 59: 993-996, April 1976

In work on speech analysis and resynthesis predictor (LPC) derived functions are used to describe the spectrum of the acoustic signal; small changes in the values of these parameters do not affect the speech quality. If the boundaries of the steady-state portion of the phonemes are found, the steady-state portions, as well as the transitions between the phonemes, can be represented by straight lines. This method allows for the description of the acoustic signal with two sets of points per phoneme. Numerous sentences have been encoded by this method, and the resulting sentences do not sound differently from the sentences from which the data were derived. Such a scheme could be used for a rule-synthesis scheme, as well as for segmentation of speech in speech recognition schemes.

Computers Learn to Talk

Sergei Ivanov
USSR

Foreign Technology Division, Wright-Patterson AFB, Report: FTD-1D(RS) I-2306-75, Edited translation from Rabochaya Gazeta 208: 4, Sept. 75, by Gale Weisenbarger, NTIS: AD-A017 927/5GA
PC $3.50/MF $2.25

Communication with computers in printed form. From the International Conference on Artificial Intelligence held in Tbilsi.

Kana to Kanji-and-Kana Conversion System

Y. Matsushita, H. Yamazaki, and F. Sato
Oki Electric Industry Co., Ltd.

Information Processing in Japan 14: 87-92, 1974

Problems in the processing of Japanese language information are indicated and a system is discussed for converting Kana to Kanji-and-Kana.

The Design and Construction of a System to Transliterate Tai by Computer

U. Warotamakikkhadit, and N. Kanchanawan
Ramkhamhaeng University, Thailand

D. Londe
System Development Corporation

6th Australian Computer Conference Proceedings: 833-839, Australian Computer Society, Inc., 1974

The system accepts Thai words as input and produces as output a Romanized transliteration. The components of the system are an IBM 1800 computer, and Thai and Roman character printing Shinko teletype, a string processing language and an interpreter for this language.

Optical Character Recognition (A Bibliography with Abstracts)

George W. Reimherr
National Technical Information Service, Springfield, VA

NTIS:PS-75/892/0GA, 120p, December 1975
PC $25.00/MF $25.00

Design, performance, and applications of optical character recognition devices and techniques for alphanumeric symbols, automatic recognition of handwritten characters. 115 abstracts.

Word Inventory and Frequency Analysis of French Conversations

ERIC: ED100190, 175 p, 1975
MF $0.75/HC $9.00

This word frequency list was extracted from a corpus of fifty half-hour conversations recorded in Paris during the academic year 1967-68. The speakers, who did not know that they were being recorded, were all well-educated professionals and all speakers of the most standard dialect of French. The list is made up of all phonetically discrete words recorded, without any attempt to separate homonyms.

Automated Compiling of Thesauri and Concept Systems for Dictionaries and Technical Glossaries

(Automatisierte Herstellung von Thesauren und Begriffsystemen fur Worterbucher und Fachterminologien)

F. H. Lang
Osterreichische Gesellschaft fur Dokumentation und Information

Nachrichtungen Dokumentation 24: 231-238, 1973

GENTHES supports the construction of a thesaurus and its use and is based on a relational system which corresponds to ISO/DIS 2788 (UNESCO) and DIN 1463, differing, however, in adding generically related and contiguous terms pertaining to a part-whole system. The characteristics that determine narrower terms against their broader terms are introduced as new relations, and many types of associations are made available for experiment. The programmed generation of dependent relations ensures avoidance of formal errors and logical contradictions. The program can operate interactively or in batch. Program functions: input, logical and formal input checking, generations of relations, display, delete, print--on line printer and storage on disk.

Comparative Study of the Syntactic Characteristics of Formal-Informal Discussion and Administrative Correspondence

Public Service Commission of Canada, 418p, 1974
ERIC: ED102874,
MF$0.76/HC$20.94

The study provides descriptive, comparative, quantitative, and statistical information on the syntactic characteristics of two English registers: 1) formal and informal discussion and 2) administrative correspondence. In chapters 1 and 2 the background and purpose of the study are discussed. ,The composition of the major spoken and written corpus, the analytical data of which formed the basis of the study, is described in chapter 3. Chapter 4 outlines the multilevel analytical model adopted and its characteristic features.

On Relational Constraints on Grammars

David E. Johnson
Mathematical Sciences Department, IBM Thomas J. Watson Research Center. Yorktown Heights, New York 10598

IBM Reaearch Report: RC 5868, 50p, February 18, 1976

Within the framework of Relational Grammar the following universal principle of natural language is proposed and defended:

> *The Continuous Segment Principle:* No rule R of a natural language can apply to a *non*-continuous segment of the Relational Hierarchy (RH) (S < DO < IO <OO), i.e., if R applies to noun phrases holding grammatical relations U and W on the RH (U < W), then, for all V on the RH such that U < V < W, R can apply to noun phrases holding V. [S: subject, DO: direct object, IO: indirect object, OO: oblique object]

Evidence from a wide variety of languages supporting this generalization is discussed.

Size, Index, and Context-Sensitivity of Controlled Partition Grammars

Eva-Maria M. Wotschke
IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

Detlef Wotschke, and Peter J. Downey
The Pennsylvania State University, University Park, PA 16802

IBM Research Report: RC 5867, 35 p, November 13, 1975

General Controlled Partition Grammars (CPGs) generate exactly all context-sensitive languages. CPGs have two parameters: *size* and *index*. The partition index of CPGs can be bounded by two, while CPGs with partition index one generate exactly the class of context-free languages. The size (of the partition sets) of CPGs can be bounded by two, while CPGs of size one generate a class of languages properly contained in the class of context-sensitive languages. If one can eliminate recursive productions of the form a is rewitten as B in a CPG then deterministic and nondeterministic lba's are equivalent.

GRAMMAR: PARSER

Morphological and syntactic analyses of the Portuguese language in an automatic translation project

Analises morfologica e sintatica da lingua portuguesa num projeto de traducao automatica

Paltonio Daun Fraga
Department of Computer Science, Institute of Mathematics,
Statistics, and Computer Science, University of Campinas,
SP 13100, Brazil

Mimeographed, July 1976

The finite-state system ATEF and the tree transducer CETA developed by Vauquois, Chauche, et al. at Grenoble have been installed at Campinas. Morphological analyis is in operation. An elementary portion of the syntax has been completed, and work on adjectival and nominal groups is in progress.

Some Frills for Modal Tic-Tac-Toe: Semantics of Predicate Complement Constructions

Aravind K. Joshi
Department of Computer and Information Science, The Moore School of Electrical Engineering, Department of Linguistics, University of Pennsylvania, Philadelphia

Ralph M. Weischedel
Department of Computer and Information Science, University of California, Irvine

IEEE Transactions on Computers 25: 374-389, April 1976

A system for testing the semantic properties (presuppositions and entailments) of predicate complement constructions. Implementation of these constructtons has been explored in some detail in the context of the tic-tac-toe game-playing setting of Isard and Longuet-Higgens (1973) and Davis and Isard (1972) which was devised to explore the semantics of modal verbs (*might, can, will,* etc.) and hypotheticals (*if you had . . .*). The program has two phases. The first phase is merely playing a game of two-dimensional, 3 by 3, tic-tac-toe using a simple numerical approach. In phase two the system processes NL commentary on the game played in phase one. The current parser is top-down, L-R, but in future work the systems will built around an ATN.

SEMANTICS-DISCOURSE

Case Systems for Natural Language

Bertram C. Bruce
Bolt Beranek and Newman, Inc., Cambridge, MA 02138

Report BBN 3010, 72p,
$3.50, April 1975

Because (1) it is difficult to specify semantic-free selection rules for the cases, and (2) related phenomena based on prepositions or word order appear in apparently case-less languages, many have argued that studies of cases should focus on meaning--i.e. "deep cases." Deep cases can be considered to be a special or distinguishing modifier of a concept. Several criteria for recognizing deep cases are considered here in the context of the problem of describing an event. Unfortunately, none of the criteria serves as a completely adequate decision procedure. A notion based on the context-dependent "importance" of a relation appears as useful as any rule for selecting deep cases. A representative sample of proposed case systems is examined.

Belief Systems and Language Understanding

Bertram C. Bruce
Bolt Beranek and Newman, Inc., Cambridge, Mass. 02138

Report BBN 2973, 56p.
$2.50, January 1975

In order to recognize intention in behavior (speech or other) one must have a model of the beliefs of others and know how actions fit together into larger units and are determined by intentions and beliefs. A theory of personal causation is developed using primitives of various sorts. These permit accounts of the social dimension of an action. Patterns of behavior, called "social action paradigms" (SAP's), are then defined in terms of social actions. The SAP's provide a structure for episodes analogous to the structure a grammar provides for sentences.

Partitioned Networks for the Mathematical Modeling of Natural Language Semantics

Gary G. Hendrix
Department of Computer Sciences, University of Texas, Austin

Technical Report NL-28, December 1975

The models are based on set theory, but are encoded as partitioned semantic networks which facilitate computation by cross-indexing semantically related data. A special network partitioning mechanism is introduced to delimit the scopes of quantified variables, distinguish hypothetical situations from reality encode the multiple alternative worlds considered in planning, share subnetworks among multiple hypotheses during parsing, and focus attention on selected portions of memory. Processes are defined in the network by "process automata," structures capable of encoding discrete, continuous and parallel change at multiple levels of detail.

Conceptual Graphs for a Data Base Interface

John F. Sowa
IBM Systems Research Institute, 219 E. 42nd Street, N. Y. 10017

IBM Journal of Research and Development 20: 336-356, July 1976

A data base system that supports natural language queries is not really natural if it requires the user to know how the data are represented. The formalism of *conceptual graphs* can describe data according to the user's view and access data according to the system's view. The graphs can represent functional dependencies in the data base and support inferences and computations that are not explicit in the initial query. A *conceptual graph* is a finite, connected, undirected, bipartite graph with nodes of one type called *concepts* (tagged with *sort labels*) and nodes of another type called *conceptual relations*, each of which has a certain number of *links*, which may be attached to concepts. Four basic formation rules (copy, detach, restrict, join), derived formation rules, values and quantifiers, conceptual schemas, Boolean connectives.

On Natural Language Based Computer Systems

S. R. Petrick
IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

IBM Journal of Research and Development 20: 314-325, July 1976

This article is substantially the same as "On natural Language Based Query Systems" (IBM Research Report 5571) abstracted on *AJCL* Microfiche 50: 66.

The SQAP Data Base for Natural Language Information

Jacob Palme
Research Institute of National Defense, Stockholm, Sweden

National Technical Information Service: PB-243 783/8GA, July 1975
PC $4.75/MF $2.25, 79p.

The Swedish Question Answering Project (SQAP) data base consists of a network of nodes corresponding to objects, properties, and events in the real world. Deduction can be performed. The data base is described, with particularly full treatment being given to the representation of NL noun phrases and to the representation of deduction rules in the data base in the form of data base patterns. Essentially the same contribution was published as AJCL microfiche 24.

REQUEST: A Natural Language Question-Answering System

W. J. Plath
IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

IBM Journal of Research and Development 20: 326-335, July 1976

REQUEST is an experimental Restricted English QUESTion-answering system that can analyze and answer a variety of English questions with respect to a small *Fortune*-500-type data base. To address the somewhat conflicting requirements of understandability for the machine and maximum naturalness for the user, REQUEST uses a language processing approach featuring: 1) the use of restricted English (drawn initially from the world of business statistics); 2) a two-phase organization in which input queries are treated as high-level-language expressions that are to be compiled into executable code; the first phase is parsing and the second is a translation of the resulting structural description into object language code; 3) linguistic analysis based on transformational grammar containing more than 100 transformational rules and which can presently handle wh- and yes-no questions, relative clauses, genitives, negatives, locatives, and time expressions. An appendix gives examples of current linguistic coverage.

Semantic Modeling for Deductive Question Answering

Robert T. Chien
Coordinated Science Labpratory, University of Illinois at Urbana-Champaign 61801

Fred Stahl
Department of Electrical Engineering, Columbia University, NY 10027

Steven J. Weissman
Coordinated Science Laboratory, University of Illinois at Urbana-Champaign 61801

IEEE Transactions on Computers 25: 358-366, April 1976

A model for the driver's world is implemented in Micro-Planner. As the input is being accepted, antecedent theorems may be invoked in order to add information to the data base. After the data have been entered any question will be transformed into a goal or a series of goals. In attempting to satisfy these goals, theorems representing traffic laws and facts concerning the driver's are applied. Where information is lacking, specialist routines are invoked to determine the most likely default conditions. If recourse to a specialist fails (the goals are still not satisfied), then the user may be asked to supply additional information and the system again attempts to satisfy its goals. All information is expressed in relation to time frames.

Semantic Directed Translation of Context Free Languages

H. William Buttelmann
Computer and Information Science Research Center,
Ohio State University, Columbus

Report OSU-CISRC-TR-75-6, September 1974
NTIS: PB-242 854/8GA
PC $3.75/MF $2.25

The phrase is the meaning bearing unit. Its meaning is a function of its syntactic structure and the meanings of its contituents. This is the basis of a formal definition for the semantics of a context free language. From a general definition of translation of CFLs the article moves to a form of translation which proceeds by translating on the phrase trees of the languages and is specified by a finite set of tree-replacement rules. Finally a procedure is presented which, given a CFG and phrase-structure semantics for a target language, will (usually) produce the finite set of tree-replacement rules for the translation, if the translation exists. The procedure may be viewed as a computer program which is a translator generator, and which produces another program that is a translator. Essentially the same contribution was published as AJCL microfiche 7.

One Approach to the Problem of Syntactic Analysis

V. V. Shevchenko

Cybernetics 10: 588-596, January 1976

Recursive-type parametric grammars (RTPG) incorporate an apparatus for controlling descending syntactic analysis in a sentence-generation device. A RTPG depends on 3 parameters, one is the array of generation rules, while the other two are the set of binary relations which are treated as carriers of information regarding history and possible continuation of the sentence and a mapping that links every generation rule with certain binary relations from this set. Constraints can be imposed on the parameters such that the subclasses of RTPGs thus isolated will describe a fairly broad set of formal languages, in particular, programming languages, such that their elements are grammars oriented toward noninspective analysis.

PAS-II: An Interactive Task-Free Version of an Automatic Protocol Analysis System

Donald A. Waterman
Rand Corporation, Santa Monica CA 90406

Allen Newell
Department of Computer Science, Carnegie-Mellon University, Pittsburgh PA

IEEE Transactions on Computers 25: 402-413, April 1976

PAS-II is a task-free, interactive modular data analysis system for inferring the information processes used by a human being from his verbal behavior while solving a problem. The input to the system is the transcribed text of verbalization of a subject solving a problem and the output is a problem behavior graph (PBG) which describes the subject's search through a posited problem space. The program is structured on three levels. At the *mode* level there are *run* modes, which hold the data being processed, *rule* modes, which contain task-specific processing rules, and *auxiliary* modes, which contain task-independent rules. A *stage* consists of a run mode plus (a) rule mode(s). The system has six *processors* (consecutive stages in a control cycle): Topic processor; Linguistic processor; Semantic processor; Group processor; PBG processor; and a Trace processor which enables the user to write a production system model of the subject and compare the trace obtained by running the production system model with the PBG obtained by the protocol analysis.

Special Issue on Automated Theorem Proving.

IEEE Transactions on Computer 25, August 1976

Contents

INTRODUCTION

Tutorial on Resolution, L. J. Hensch 769

PAPERS

Experimental Results

Problems and Experiments for and with Automated Theorem-Proving Programs,J. D. McCharen, R.A. Overbeek, and L. A. Wos 773

Resolution, Refinements, and Search Strategies: A Comparative Study, G. A. Wilson and J. Minker 782

Strategies and New Methods

Refutations by Matings, P. B. Andrews 801

A Problem-Oriented Search Procedure forTheorem Proving, D. H. Fishman 807

Semantic Resolution for Horn Sets, L. J. Henschen 816

A Search Technique for Clause Interconnectivity Graphs, S. Sickel 823

An Evaluation of an Implementation of Qualified Hyperresolution, S. K. Winker . . . 235

Applications

The Use of Higher Order Logic in Program Verification, G. W Ernst and R. J. Hookway 844

Methods for Automated Theorem Proving in Nonclassical Logics, C. G. Morgan . . . 852

Automatic Programming Through Natural Language Dialogue, A Survey

G. E. Heidorn
IBM Thomas J. Watson Research Center, Yorktown Heights, New York 10598

IBM Journal of Research and Development 20: 302-313, July 1976

Four projects are reviewed: one at the Informations Sciences Institute (ISI) of the University of Southern California, Project MAC at MIT, a project at IBM, and the now discontinued work at the Naval Postraduate School (NPGS) at Monterey. Each of these systems is intended to be a knowledge-based system that can "understand" a user's statement of a problem or a procedure in his own terms and convert it into a computer program. IBM and MIT are concerned with business applications, while ISI is attempting to develop a domain independent system. The ISI system is intended to *generate* programs "from scratch," whereas the IBM system is intended initially to *customize* parameterized programs. The MIT system is intended to do both. The three current projects are implemented in LISP, but each is developing a higher level language embedded in LISP. All four systems use some form of semantic network representation for the knowledge base and some form of procedural specification for NL processing.

Clisp: Conversational Lisp

Warren Teitelman
Xerox Palo Alto Research Center, CA 94304

IEEE Transactions on Computers 25: 354-357, April 1976

Clisp is an attempt to make Lisp programs easier to read and write by extending the syntax of Lisp to include infix operators, IF-THEN statements, FOR-DO-WHILE statements, and similar Algol-like constructs, without changing the structure or representation of the language. Clisp is implemented through Lisp's error handling machinery, rather than by modifying the interpreter. When an expression is encountered whose evaluation causes an error, the expression is scanned for possible Clisp constructs, which are then converted to the equivalent Lisp expressions. Thus, users can freely intermix Lisp and Clisp without having to distinguish which is which. Emphasis in the design and development of Clisp has been on the system aspects of such a facility, with the goal of producing a useful tool, not just another language. To this end, Clisp includes interactive error correction and many "do-what-I-mean" features.

D-Script: A Computational Theory of Descriptions

Robert C. Moore
Artificial Intelligence Laboratory, MIT, Cambridge, MA 02139

IEEE Transactions on Computers 25: 366-373, April 1976

D-Script is a language for representing knowledge in AI programs and contains the following types of expressions 1) constants 2) variables 3) forms, and 4) lists. All functions, predicates and operators evaluate their arguments with evaluation rules largely adapted from LISP Types of D-Script statements: simple predication, logical connectives (OR, AND, NOT IMPLIES) descriptions of three types, existential (SOME) universal (EVERY), and definite (THE) A description is a form whose first element is SOME, EVERY or THE. whose second element is a list containing a variable, and whose third element is an expression whose value is a statement. D-Script is capable of handling statements involving opaque contexts, time contexts, and knowledge about knowledge; it contains the lambda calculus and is Turing universal.

The Architecture of Coherent Information System: A General Problem Solving System

Chitoor V. Srinivasan
Department of Computer Science, Rutgers University, New Brunswick, NJ 08903

IEEE Transactions of Computers 25: 390-402, April 1976

The meta-descriptional system (MDS) is used to generate intelligent information systems in different domains of discourse. MDS is specialized to a specific domain by accepting definitions of description schemas and descriptions of knowledge concerning *facts*, *objects*, *processes* and *problem solving* in the domain. The contributions of the proposed (and partially implemented) architecture are: 1) the capacity to use large data bases, 2) a highly flexible descriptive mechanism to model a domain, 3) definition of the descriptive language itself in terms of the models the system can build in a domain.

Unified Theory of Image Processing

Azriel Rosenfeld
Computer Science Center, University of Maryland, College Park

NTIS: AD-A018 154/5GA, 27p 31 October 1975
PC$4.00/MF$2.25

The 10 year project had two purposes: 1) formulation of a general approach to image processing, 2) investigation of the formal theory of computation on pictures. 39 technical reports came from the project; they are listed, along with abstracts.

Scene Analysis: A Survey

Carl Weiman
Courant Institute of Mathematical Sciences, New York University

Report NSO-9, 67 p, December 1975
NTIS: AD-A020 700/1GA,
PC $4.50/MF $2.25

This survey traces the development of scene analysis by computer from its origins in digitized picture processing and pattern recognition. Discussion of diverse approaches is unified by geometric concepts related to projection. A concluding overview contains suggestions for new approaches based on projective geometry and neurophysiological models. The bibliography, available as a deck of Hollerith cards, is organized according to topic and document accessibility.

Collective Index to the Journal of the American Society for Information Science, Volumes 1-25

Prepared by Aspen Systems Corporation

American Society for Information Science, 282 pages, 1976
$42.00 ASIS members, $51.00 ASIS affiliates, $60.00 list price

Cumulative Index to the Annual Review of Information Science and Technology, Volume 1-10

American Society for Information Science, 244 pages, 1976
$22.00 ASIS members, $24.75 ASIS affiliates, $27.50 list price

Complete index to the *Annual Review of Information Science and Technology* for the years 1966-1975.

Computer-Readable Bibliographic Data Bases - A Directory and Data Sourcebook

American Scoiety for Infrmation Science, 814 pages, 1976
$54.40 ASIS members, $61.20 ASIS affiliates, $69.00 list price

Volume contains information and data on 301 bibliographic and bibliographic-related data bases produced in U.S. and Europe.

TRANSLATION

On Machine Translation from Japanese into English for a Technical Field

K. Shudo
Fukuoka University

Information Processing Japan 14: 44-50, 1974

Japanese to English translation for the field of transistor circuits.

Feasibility Study for Design of a Biocybernetic Communication System

Lawrence R. Pinneo, Patricia Johnson, Jennine Herron, and Charles S. Rebert
Stanford Research Institute, Menlo Park, California

NTIS: AD-A017 405/2GA, 158p, August 1975
PC $6.75/MF $2.25

The purpose of this three-year research program was to test the feasibility of designing a close-coupled, two-way communication link between man and computer using biological information from muscles of the vocal apparatus and the electrical acitivity of the brain during overt and covert (verbal thinking) speech. The research plan was predicated on existing evidence that verbal ideas or thoughts are subvocally represented in the muscles of the vocal apparatus. If the patterns of this muscle acitivity are at all similar to those involved in normal overt speech, a reasonable assumption is that the electrical activity of the brain during verbal thinking may be similar to that during overt speech. The results are reported in two parts. Part I concerns the off-line and on-line analysis of the EEG coincident with overt and covert speech as it might be used in biocybernetic communication, and Part II concerns the hemispheric laterality difference.

Information Processing in Humans. Volume 1: 1964-1973, Volume 2: 1974-November 1975

Elizabeth A. Harrison
National Technical Information Service, Springfield, VA

Vol 1: NTIS/PS-75/857/3GA, Vol. 2: NTIS/PS-75/858/1GA, December 1975
PC$25.00 per volume

Selected abstracts on reports which cover psychophysiology, memory, visual evoked responses, psychoacoustics, neuroses, decision making and learning as related to information processing in humans. Vol. 1: 209 abstracts, Vol. 2: 89 abstracts.

Studies in Interactive Communication: Limited Vocabulary Natural Language Dialogue

Michael J. Kelly
Department of Psychology, The Johns Hopkins University, Baltimore, MD 21218

Doctoral Thesis, 82p NTIS: AD-A019 198/1GA, August 1975
PC $5.00/MF $2.25

Two-person teams communicated through a computer-controlled teletypewriter system to cooperatively solve real-world problems. They were permitted to use only words on predetermined lists of 300 words, or 500 words, or as a control condition with no vocabulary restrictions. Dependent measures were taken on four classes of variables: 1) time to solve the problem, 2) several measures of overt behavior, 3) several measures of verbal output, 4) measures of errors made by subjects using two restricted vocabularies. The main effect of vocabulary size was significant for only 3 of the 21 dependent measures and only 4 of the 105 interactions involving vocabulary size were statistically significant. These results suggest that NL dialogues with computers can proceed well under fairly strict vocabulary restrictions.

Experimental Determination of Design Requirements for a Program Explanation System

Ashok Malhotra, and Peter B. Sheridan
IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

IBM Research Reports: RC 5831, 56 p, January 29, 1976

The development of design requirements for interactive, computer-based systems to support human task performance was investigated by interconnecting two consoles logged into a time-sharing system. A subject is seated at one of the consoles and is asked to use the system, making believe it existed, to solve a set of representative problems. The subject's commands or requests for information appear on the other console where they are examined by the experimenter who creates responses to them that are analogous to those that would be given by the system, albeit with a slower response time. The experiments were conducted to determine the requirements for a system that would contain knowledge about programs and would be capable of explaining their intentions and behavior to a user who wished to use them modify them and interface them with other software. The system would be capable of answering questions and responding to commands phrased in English. It is essential that a practical system be able to respond intelligently to questions it cannot analyze syntactically. Experimental protocols are given and analyzed. An outline of the response generation strategy that would be required for such a system is given.

The Structure and Recall of Narrative Prose

Donald R. Gentner
Center for Human Information Processing, University of California at San Diego

NTIS: AD-A017 093/6GA, 21p, October 1975
PC$3.50/MF$2.25

Subjects listened to repeated presentations of a tape recording of two pages from a history book, with verbal recalls collected after each presentation. The elements of the passage were organized according to a serial structure based on order in the passage and a story grammar structure based on causal relations. While the serial structure at first influenced which elements of the passage were remembered, as the subjects remembered more of the passage, the story grammar structure became the dominant influence over the elements remembered on subsequent recalls.

A Method for Studying Natural Language Dialogue

John C. Thomas
Behavioral Sciences Group, Computer Sciences Department,
IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10598

IBM Research Report: RC 5882, 59p, February 27, 1976

To study application-specific dialogues a 'user' (subject) interacts via typed messages with a second person who is simulating a computerized NL interface. The dialogues are all concerned with order-handling and invoicing; however, they are collected in three different situations. The user is variously attempting to describe, understand, or diagnose an order-handling and invoicing system. It seems clear that a NL interface must be able to deal with at least some metacomments about the interaction. Second, the way in which various expressions (e.g. conditionals) are used is heavily dependent upon pragmatics of the dialogue, not just the semantics. Third, users of different backgrounds will interact quite differently with a NL interface - so differently that the interface should probably be able to discriminate professionals from nonprofessionals and take appropriate action.

Writing and Following Procedural, Descriptive, and Restricted Syntax Language Instructions

John D. Gould
IBM Thomas J. Watson Research Center, Yorktown Heights, New York 10598

Clayton Lewise
Psychology Department, University of Michigan, Ann Arbor

Curtis A. Becker
Psychology Department, University of Oregon, Eugene

IBM Research Report: RC 5943, 22p, April 9, 1976

Two exploratory experiments compared the way people (with no experience in the use of computing systems) write and carry out natural language procedures, NL descriptions, and instructions expressed in an artificial restricted syntax language. The results suggest that there is no single "natural" way that people write simple plans and instructions. Speed and accuracy of writing were about the same for all three approaches, although the linguistic characteristics differed greatly from approach to approach. While subjects were tolerant of ambiguity both in writing and in carrying out instructions, they often voluntarily employed restricted-syntax notation in their writing after being exposed to the notation. Subject's accuracy in following detailed instructions was no greater than that in writing those instructions.

Cybernetic Theory of Cognition and Learning

Gordon Pask
Systems Research Ltd., 2 Richmond Hill, Richmond, Surrey, U.K.;
Brunel University and the Open University (I.E.T.)

Journal of Cybernetics 5: 1-90, January-March 1975

A theory of conversational interaction and one embodiement of that theory--CASTE (Course Assembly System and Tutorial Environment)--is presented. A conversation involves individuals who participate in process of problem solving, learning, and understanding with respect to a set of topics. All psychological observations are observations

of conversations, albeit with very restricted domains. The stable organization of conversations is characterized as a set of procedures (program-like entities) that are executed in particular processors such as brains or computing machines. Thus a conversation involving 2 human beings is conceived as a set of procedures executed in parallel in physically distinct processors. One characterization of the

individual is the M Individual, or mechanically characterized individual--a physically distinct individual. The P Individual is defined as follows: 1) a concept is a procedure for reproducing a relation, 2) a memory is a procedure for reproducing a concept, 3) a P Individual is a procedure for reproducing a class of memories. A P Individual, as a procedure, is run or executed in some M Individual, but there is not necessarily a 1-to-1 correspondence between P Individuals and M Individuals. Thus a conversation is a P Individual distributively run in 2 (or more) M Individuals.

HUMANITIES: ANALYSIS

Cognitive Networks and Literary Semantics

William Benzon
Department of English, State University of New York, Buffalo, 14226

Modern Language Notes 91: 952-981, 1976

Drawing on the servomechanism theory of William T. Powers (*Behavior: The Control of Perception*) and the cognitive network theory of David Hays (*Cognitive Structures*, New Haven: HRAF Press, forthcoming) a fragment of the Elizabethan worldview is modeled as a network and paths are described in the network which serves as the semantic base for Shakespeare's sonnet *Th'Expense of Spirit*. The opening line and a half of the poem is an extended pun--"Th' expense of spirit in a waste of shame/ Is lust in action." The lexical nodes for *spirit*, *expense*, *shame*, and *lust* are each linked to two different nodes in the semantic network. One set of nodes is defined in relation to the sensorimotor system (which is external to the network) and the other is recursively defined over episodes in the network. This pun extends through the rest of the poem. Further analysis shows that the single string of lexemes which is at the base of the poem's language is in fact being simultaneously mapped into four isomorphic episodic fragments. The highest level pattern into which the lexemes are mapped is the *Fortunate Fall*--one of the central themes of medieval and Renaissance Christian thought.

Processes in Acquiring Knowledge

Allan Collins
Bolt Beranek and Newman, Inc. Cambridge, Mass.

Semi-annual technical report no. 1, 15 September 75-30 March 76: BBN-3231 NTIS AD-A020 270/5GA
PC $4.50/MF $2.25

The objective of this paper is to develop a theory of Socratic tutoring in the form of pattern-action (or production) rules for a computer program These pattern action rules are being programmed on a computer system for tutoring causal knowledge and reasoning. The production rules were derived from analysis of a variety of tutorial dialogues. The analysis accounts for the specific teaching strategies used by the tutors in the dialogues within a content-independent formalism. The paper includes twenty-three production rules derived from the data analyzed.