

ECS - MT using LFG

ECS Inc. (the ECS stands for Executive Communication Systems), of Provo, develop advanced linguistic tools and applications, including a machine translation system for the language pairs English to Chinese, English to Japanese, English to Korean and Korean to English.

I was received at their offices at 455 North University Avenue, Provo, by ECS's president, Larry M. Gibson, and by Dr One-Soon Her, Director for Asian Languages. I mentioned that their approach, which is based on Lexical-Functional Grammar (LFG), was well-known in theory, thanks to papers at computational linguistics conferences etc., but I was interested to learn how the company had come into being, and what were the principal applications so far.

ECS was formed in 1984 from a group who had been working at Weidner Communications on software for natural language processing and automatic translation. ECS's first major task involved porting down the Weidner Japanese to English translation system from the FORTRAN in which it was originally written to C computing language, which made this system more accessible and turned it into a best-seller among machine translation systems.

ECS then developed a new approach to machine translation utilising Lexical-Functional Grammar as it developed an English to Chinese system. Later it added an English to Japanese system, a bidirectional English-French prototype, and a bidirectional translation system between English and Korean.

More recent work has been on Chinese to English, Japanese to English and bidirectional English-Arabic prototype systems.

One of the biggest projects which ECS undertook was the development of its Hangul (=Korean)-English Support System (HESS) as part of the Automated Command and Control Information Management System (TACCIMS) for use by United Nations forces in South Korea. The control system was developed by TRW, a major United States defence contracting conglomerate.

The bidirectional HESS translation system is used by monolingual speakers of either English or Korean in the Combined Forces Command. Ambiguities in source documents are resolved by the author in an interactive pre-edit mode before the document goes forward for automatic translation. If a bilingual post-editor is available, the interactive pre-edit can be dispensed with and the system run in a completely automatic mode. The system was developed and supplied on schedule, something which greatly impressed its military users. Currently the systems are

being "beefed up" to make them more versatile.

The ECS system, based as it is on the theory of Lexical-Functional Grammar, uses an indirect translation, or transfer approach, where analysis and generation are independent of each other and where therefore a transfer component is needed for each language direction. The first company to use Lexical-Functional Grammar in this way, ECS has created a development environment where linguists can formally describe linguistic structures and translation mechanisms in a friendly higher-level linguistic language, which has the advantage of tight maintainable systems with great power and versatility. The translation engine itself is language-independent, completely driven by run-time parameters, control tables and user-modifiable information in words in the dictionary. Artificial intelligence techniques are used to reduce lexical and structural ambiguity during analysis. The end user can specify various levels of participation for the resolution of remaining ambiguities during the translation process: as mentioned above in connection with HESS, these levels range from fully automatic to fully interactive processing.

In the summer of 1990 ECS announced the release of its Toolkits for creating natural language processing systems and machine translation systems.

The idea is that the ECS Machine Translation Toolkit can be used to develop commercial systems for machine translation. One of ECS's customers, the University of Bergen in Norway, has acquired the MT Toolkit to develop a bidirectional English-Norwegian translation system.

The machine translation applications use their own ECS Toolkit linguistic technology. The Toolkits include a morphological rule compiler and analyser, and rule and lexical entry compiler, a parser, a dictionary maintenance utility, and language-independent formalism and implementation. Morphological analysers have been developed for English, French, Spanish, Korean, Japanese and Turkish, and syntactic dictionaries for English, French, Spanish, Korean and Japanese.

Prototype work is also continuing at ECS on English to Arabic, English to French, Arabic to English, Chinese to English, French to English and Japanese to English.