Report of the EAGLES Workshop on Implemented Formalisms at DFKI, Saarbrücken

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editors

March 1-3, 1993

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Part 1

Introduction

From the 1st through the 3rd of March 1993, the Working Group on Linguistic Formalisms of the EAGLES initiative held a workshop in Saarbrücken on implemented grammar formalisms.

Starting with some notes on the Working Group, we will describe objectives, organization, and results of the workshop. We also summarize some relevant general findings as they emerged from the final discussion.

The systems demonstrated are described in a detailed synopsis. In order to facilitate comparison a standardized questionnaire was used for the individual descriptions. The questionnaires were filled out by the developers. Since there might always be relevant pieces of information that do not fit well in such a questionnaire, the developers could also provide a short prose description. Most developers took advantage of this opportunity and attached a brief summary of their system.

1.1 The Working Group

The Working Group on Linguistic Formalisms of the EAGLES initiative brings together experts on the design and implementation of linguistic formalisms from academia and industry in order to :

- come to a consensus on the basic features and properties for NLP formalisms and indicate likely and needed future features;
- promote consensus with respect to the definition of de facto standards for grammar formalisms;
- exchange information about each other's projects and, as far as compatible with IPR, know-how and results, thus increasing the awareness of possible synergies;
- where appropriate, concretize potential synergies by promoting cooperative actions, thus furthering the definition of de-facto standards in the field;
- disseminate information about its activities, participate in and organize events aimed at make these activities better known (round-tables, workshops, conferences);

- coordinate and cooperate with national and international initiatives; and
- suggest actions needed for the creation of formal and computational prerequisites for the development of multilingual, reusable, grammatical resources.

The group is hosted by the DFKI in Saarbrücken.
The members of the WG are:

H. Ulrich Block - Siemens AG, Munich,
Ewan Klein - University of Edinburgh,
Jeremy Peckham - Logica Cambridge,
Steve Pulman - SRI Cambridge,
Christian Rohrer - University of Stuttgart,
Hans Uszkoreit - DFKI Saarbrücken (chair).

Many additional industrial and academic research institutions are represented by specialists in the three Subgroups of the Working Group:

Linguistic Adequacy,
Computability and Implementation,
Industrial Requirements.

1.2 Objectives of the Workshop

The main objective of the workshop was to obtain an urgently needed overview of existing software systems, including their development platforms, that implement state-of-the-art grammar formalisms. It is not possible to derive such an overview by surveying the literature. In their publications, the developers of such formalisms usually focus on certain selected aspects of their systems that constitute novel scientific approaches. The state of the implementation of a system and its robustness, performance and overall usability can never be judged from the literature.

Another motivation was the broadly-felt necessity to exchange experience gathered in implementing constraint-based grammar formalisms among the relevant developers.

Therefore the focus of this workshop was not on the linguistic, philosophical and semantic foundations of advanced typed feature-unification formalisms. The meeting concentrated on existing implementations.

One goal of the workshop was to obtain an overview of what is feasible and usable today. This overview served as the starting point for the Working Group's activities during the survey phase. It is an important part of the ongoing survey of existing implemented linguistic formalisms. It will also provide a good basis for characterizing the state of the art in this area.

To participants working in the area of formalism development, the workshop offered a unique opportunity to learn those facts about other researchers' formalisms that cannot be found in the literature.

1.3 Organization

At the workshop we made sure that the mutual review did not turn into a contest. The evaluation and assessment of NLP systems has not yet reached a state that permits an objective comparison of systems. The theoretical premises on which the systems were developed and the goals of their developers differ so much that it would be impossible to agree on a reasonable single ranking scheme. On the other hand, a comparison of implementations along several dimensions was undertaken because it is urgently needed by everyone working in this area. Such comparative knowledge is also very important for the further work of EAGLES. In order to arrive at such a synopsis, detailed questionnaires were designed and handed out to all participants. We had a return rate in excess of 100%, due to the fact that some participants copied the questionnaire to describe additional systems not shown at the workshop. These description are not considered in the current report on implemented formalisms but they have been included in the working material of the group.

Seventeen systems were invited: fourteen from European research sites, three from the USA. This imbalance not only reflects the focus of the EAGLES WG but demonstrates the growing role that European sites play in today's formalisms research. At the workshop fourteen systems were exhibited. Two sites turned down the invitation because their new systems were not yet in a state to be demonstrated; one American researcher was unable to attend because of a scheduling conflict.

All systems were first presented in brief talks. On the second day, six review teams, each of three researchers, were formed. Although in theory every participant could see every system, reviewers often focussed on the systems they were to report on. The results of this review were reported in a plenary session. After each report the developers of the respective systems received time for rebuttal. Most of the questions from the audience concerned implementation details. The discussion was very concrete and stayed on a high technical level. Although the review did not follow measurable evaluation criteria, the findings and subjective comments were generally accepted by the developers.

1.4 Results and Findings

For the discipline of computational linguistics as a whole, the workshop has resulted in this synopsis of relevant implemented formalisms. All participating developers have provided a standardized characterization of their system by filling out a very detailed questionnaire.

In a final session all participants contributed to a discussion of general developments and urgent problems. This discussion was very important for further WG activities.

The following summary lists the most relevant findings of the workshop.

Clear progress: All of the systems showed strong advantages over the formalisms that were used a decade ago.

European Role: European research in the area no longer trails behind the corresponding American research.

Lack of Industrial Strength: None of the systems has, as yet, the desired performance behaviour for broad industrial application: some could be used in limited applications, others have potential in this direction. The most pressing problem for research on formalisms is the need for adequate performance models.

Convergence: There are strong tendencies towards convergence: e.g., most formalisms are based on typed feature logics, most new systems use multiple inheritance hierarchies, and so on.

Connections to constraint logic programming: There is a close relationship with ongoing developments in programming language design, especially in CLP, that needs to be explored further.

It was pointed out that the systems demonstrated represented quite a spectrum of compromises between sophistication in linguistic description on the one hand and efficiency in processing on the other. The range of such decisions was noted and discussed.

In the subsequent discussion the concern was raised that improvements in the actual formalisms such as powerful type systems and additional data types have not brought the systems any closer to exploitation in industrial strength systems and, moreover, that efficient processing models might even have become less likely through such development. The strong move towards low-level processing methods and statistical approaches would indicate the dissatisfaction with the pure feature logic based approach.

Proponents of the current formalism research replied that the real challenge lies in combining the sophisticated high-level description approaches with powerful low-level processing methods. Low level processing methods and statistical approaches to grammar development alone have not been able so far to arrive at comprehensive, reusable grammatical resources. They also pointed at the attempts to come up with strategies for effectively controlling linguistic processing based on constraint-based grammars.

Another point of discussion was the utilization of results from constraint logic programming. A number of demonstrated systems were actually described in CLP terms as special instances of the Höhfeld/Smolka model. The question was raised whether one should not leave the search for more efficient processing models to the much larger community of CLP researchers. It was replied that the linguistic descriptions for NLP offer such a strongly structured and challenging domain to CLP that it would be in the mutual interest of both communities to work together. The CLP community was represented at the meeting by such eminent scientists as Hassan Aït-Kaci, Luis Damas, Andreas Podelski, and Gert Smolka. It was decided that the connections between CLP and NLP should be strengthened. The upcoming workshop of the Computability and Implementation Subgroup will focus on relevant developments in CLP and on the exchange between the two communities.

Several participants proposed to hold a follow-up meeting in a year's time. In the discussion it became clear that such an event would most likely not have the same status with respect to EAGLES work, but that the EAGLES working group might serve as co-sponsor. Some very concrete suggestions concerning the organization of the next meeting were made. They were discussed and taken to the records.

Summing up it became obvious that the workshop not only delivered important empirical input for the program of the EAGLES Formalisms Working Group, it also provided the participants with a better overview of the state of the art and served as a forum for discussing new trends, burning issues and further collaboration.

Hans Uszkoreit

Part 2

Systems Exhbited