THE FIRST KFUPM WORKSHOP
ON
INFORMATION & COMPUTER SCIENCE

Department of Information and Computer Science
College of Computer Sciences & Engineering
KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DHAHRAN, SAUDI ARABIA

June 9, 1996

Workshop Proceedings

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PREFACE

In the Name of Allah, Most Gracious, Most Merciful.
The Information and Computer Science Department in the College of Computer Sciences and Engineering at King Fahd University of Petroleum and Minerals is organizing the First Workshop on Information and Computer Science (WICS 1) under the theme of "Machine Translation". This workshop will bring together the researchers in the area of "Machine Translation" from different parts of the world. The department is planning to organize a workshop every year under different themes.

The theme for this Workshop was carefully selected to cover an active area of research in the ICS Department as well as a very important computer application for the Kingdom of Saudi Arabia and the rest of the Arab world. The selected papers cover three major areas of "Machine Translation": Machine Translation and Arabic Language, Machine Translation Tools and Systems, and Machine Translation and Arabic Speech.

A total of 20 papers have been received and were reviewed by referees from the ICS Department. Only 13 papers were selected for presentation and publication in the Proceedings. These are presented by people from University of Edinburgh in UK, King Abdulaziz City of Science and Technology in Saudi Arabia, Kuwait University in Kuwait, La3i Universite de Rouen in France, Mansoura University in Egypt, King Saud University in Saudi Arabia, Universidad Politecnica de Madrid in Spain, Institute of Applied Information Science in Germany, King Fahd University of Petroleum & Minerals in Saudi Arabia, Insitut d'Electronique, Laboratoire Traitement du Signal in Algeria, CLIPS/I MAG in France, and King Abdulaziz University in Saudi Arabia.

Finally, in the name of the Executive Committee of WICS, I would like to forward my thanks to his Excellency the University Rector, Dr. Abdalaziz Al-Dukhayyil for his support for the Workshop. Also, I would like to thank Dr. Muhammad Benten, Dean of the College of Computer Sciences and Engineering for his continuous support for the Workshop. I am also pleased to sincerely thank two of my colleagues Dr. Mostafa Aref and Mr. Husni Al-Muhtaseb who worked long hours to make this workshop a successful event. Furthermore, I would like to thank Al-Juarisy Company for its support. Finally, I like to thank various University departments and specially the KFUPM press for their help.

Dr. Muhammed Saleh Al-Mulhem

Chairman of the Executive Committee and
Chairman of the Information and Computer Science Department

INTRODUCTION

These are the proceedings of the scientific papers for the First KFUPM Workshop on Information and Computer Science (WICS 1) which has been held at King Fahd University of petroleum and Minerals in Dhahran on June 9, 1996. The main theme of the Workshop has been "Machine Translation". The proceedings contain the selected scientific papers that have been accepted. A total of 20 papers have been received with 13 full papers finally being selected for presentation and publication in the Proceedings.

We hope that the view and exchange of contributions to the Workshop have enriched the Workshop deliberations and have availed the participants the opportunity to realized the new developments and advances in the field of Machine Translation. The standard of the research papers and their scientific value is of a high caliber reflecting the applied research approach of contributors to tackling technical problems in Machine Translation. The papers have been classified into three sessions:

- Session 1: Machine Translation and Arabic Language, consists of four papers from KACST, University of Edinburgh, Kuwait University and La3i Universite de Rouen.
- Session 2: Machine Translation Tools and Systems , consists of five papers from Mansoura University, King Saud University, Universidad Politecnica de Madrid, Institute of Applied Information Science and King Fahd University of Petroleum & Minerals.
- Session3: Machine Translation and Arabic Speech, consists of four papers from King Saud University, Insitut d'Electronique and CLIPS/I MAG.

We wish to take this opportunity to express my sincere thanks for members of the scientific committee and members of all other organization committees. Special thanks are due to Mr. Husni Al-Muhtaseb for his effort to keep the work of preparing for the workshop to the high standard.

Finally, I hope that we can manage to have another workshop or symposium with a theme related to Natural Language Processing in a different place next year. Also, we can manage to have the second KFUPM Workshop on Information and Computer Science (WICS 2) on a different theme next year.

Dr. Mostafa Aref

Chairman of the Scientific Committee

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8:30 am Opening: His Excellency the University Rector, Dr. Abdulaziz Al-Dukhayyil

9:00 am Keynote Speaker: M. G. Khayat, King Abdul Aziz University
Understanding Natural Arabic

9:45 am Coffee Break

10:00 am - 11:30 am   Session 1: Machine Translation & Arabic Language
Chairman: M. A. El-Affendi

1. Formal Linguistic Tools for Machine Translation Programs
Mohamad El-Hannach, Electronic & Comp. R. Institute, KACST, Saudi Arabia

2. Using Classification for Mapping Semantic Representation into Arabic Lexical Items
Saad Al-Jabri & Chris Mellish, The University of Edinburgh, UK

3. Sentential Count Rules For Arabic Language
Fawaz Al-Anzi, Kuwait University, Kuwait

4. Segmentation and Description of Arabic Handwritten Words by Multiagent Approach
Midel, C. Olivier, Y. Lecourrtier & M. Cheriet, La3i Universite de Rouen, France

11:30 am - 1:15 pm   Prayer and Lunch Break

1:15 pm - 3:00 pm   Session 2: Machine Translation Tools & Systems
Chairman: Saad Al-Jabri

5. A Proposed Algorithm for English-Arabic Machine Translation System
A. El-Desouki, A. Abd-Elgawwad & M. Saleh, Mansoura University, Egypt

6. An Adaptive Object-Oriented Client-Server Model For Natural Language Processing Systems
M. A. El-Affendi, King Saud University, Saudi Arabia

7. Sintagmatic Analysis for Spanish Processing
Arriaga M. El-Alami, & M. Escorial, Universidad Politecnica de Madrid, Spain

8. Aramed: Extension and Integration of Arabic Lingware Components in a Unification-based MT System for the Field of Medical Terminology and Classification
C. Pease & A. Boushaba, Institute of Applied Information Science, Germany

9. Khabeer: As A Machine Translation Tool
Al-Muhtaseb & M. Aref, King Fahd University of Petroleum & Minerals, Saudi Arabia

3:00 pm - 3:30 pm   Prayer and Coffee Break

3:30 pm - 5:30 pm   Session 3: Machine Translation & Arabic Speech
Chairman: Mostafa Aref

10. On the Pragmatics of Arabic Speech Synthesis and Analysis
M. A. El-Affendi, King Saud University, Saudi Arabia

11. Knowledge Based Approach for Arabic Back Consonant Recognition in Continuous Speech
M. Debyeche & J. Paul, Insitut d'Electronique, Laboratoire Traitement du Signal, Algeria

12. Using Phonetic and Phonologic Matrices of Arabic to Design DRT Materials and Implying Rules
B. Boudraa, M. Boudraa & B. Guerin, Institut d'electronique, Algeria

13. Experiments of Automatic Speech Recognition of Standard Arabic
Sid-Ahmed Selouani & Jean Caelen, CLIPS/I MAG, France

KEYNOTE SPEECH ABSTRACT

UNDERSTANDING NATURAL ARABIC

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ABSTRACT

Natural Language understanding serves as the basis block upon which natural language applications such as translation, natural language interfaces, and speech processing, can be built.

As Arabic is highly derivational, understanding Arabic requires the treatment of the language constituents at all levels: morphology, syntax, case-endings, and linguistic semantics. Many research efforts have concentrated on morphology analysis (vs. Synthesis). Fewer research efforts at the other levels exist and do not fully cover the topics they address.

Many problems remain unresolved. Exact determination of the correct linguistic element is not yet possible. At the simplest level, determining whether a word is a verb, noun, or particle can be an issue. The problem becomes more complicated as we move to syntax, and on to semantic. As a linguistic construct may have a number of interpretations, determination of the correct interpretation poses another problem. For example, a morphological derivation pattern may have a number of interpretations, one of which is the correct one in a particular context. In some cases, heuristic can be used to partially help to resolve the issue. In other cases, the processing is deterministic and the problem is nullified. However, in order to fully solve the problem, the interdependencies between all levels (morphology, syntax, linguistic and non-linguistic semantics) must be exploited. In fact, this could lead to infinite recursion. Resolving these interdependencies can be used to measure and compare the success of different approaches to the problem. Representation of linguistic semantics poses another problem. This problem extends from the morphological level to the different styles of Arabic rhetoric.

In order to address these problems, one must build the basic elements independently, each of which must handle all possibilities. These elements can then be integrated with one element being the igniting process after which these elements react with each other to produce the correct results.