



THE IMPLEMENTATION OF A EUROPEAN MASTERS IN LANGUAGE AND SPEECH

SOCRATES Project "European Masters in Language and Speech"

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ABSTRACT

The study of spoken language communication and the development of applications ask for students that are educated and trained in both speech sciences and natural language processing. The paper describes the model, structure, procedures and contents of a European Masters in Language and Speech that opens the possibility to realise this in a truly international way. The implementations at the eleven universities where the scheme will start in 1999-2000 are described and show a rich variety of curricula all matching the same qualifications.

Keywords: education, language and speech, masters, ESCA, EAEL

1. INTRODUCTION

Understanding speech communication requires knowledge of generation and perception of speech as a continuous acoustic signal, knowledge of language as symbolic information, and the interaction between both. The various representations of human language information have different characteristics, descriptions and theories and have traditionally been taught in different curricula such as Phonetics, Speech Technology, Electrical Engineering, General Linguistics, Computational Linguistics and Natural Language Processing (NLP). However, attempts to develop systems that utilise human speech as a means for interfacing to machines, revealed that success requires contributions from both Speech and NLP communities. Considering the growth of the language industry there is a rapidly increasing need for people that are able to work in a team consisting of specialists in speech, NLP, and computer science. These team members should be able to work together and therefore should be able to understand the major aspects of each other's specialisms. Most academic curricula in Speech and NLP do not make the connection between the two, even if both are taught in the same institute.

In 1997, a consortium of ten universities [Edinburgh, Sheffield, Essex, Aalborg, Utrecht, Saarbrücken, Lisbon, Patras, Athens, Lausanne/IDIAP] applied successfully under the Socrates programme for the development of a European Masters in Language and Speech. This Masters aims to improve the aforementioned situation by creating an advanced programme of studies that allows students to obtain qualifications that are needed for team working in the language industries.

After two years, a model for the organisation of the European Masters has been created and its contents have been defined. The features of its open structure will be described and the current implementations of the scheme will be presented. These show that the initiative has already stimulated new co-operation between departments and universities. It is hoped that this is a prelude of new ways of co-operation and new ways to improve the quality of education.

2. THE MODEL

2.1 A contents defined Masters

There is little homogeneity in the educational systems of European countries and the Masters degree is no exception to this situation. In many countries the Masters as such is not a degree and even in countries where it exists there is a great variety in implementation, even among universities. This makes it very hard to think of a *European Masters* as a legal degree.

Given the maze of educational systems and the enormous legal barriers it is fruitful to start with the European Masters visions and aims. The vision is that we believe that solutions in human language engineering require team workers that have at least basic knowledge and skills in speech *and* language. The Masters could be used as a definition of these basics. We actually do not care that much when and where this knowledge and skills have been obtained, as long as they are there once a student leaves the university. Interpreted in this way,

the European Masters would become a quality stamp rather than an official degree.

2.2 Role for ESCA and EACL

The European Speech Communication Association [ESCA] and the European chapter of the Association of Computational Linguistics [EACL] have endorsed the European Masters implementation. They will oversee the certification procedure for a student who fulfils all requirements for the European Masters. Although this certificate has no legal status, its value should show in its recognition by prospective employers. A role for professional organisations in the certification procedure is already in use in many other disciplines. The big advantage is that the certificate is independent from the educational systems in the various countries and independent of the legal degree the student will obtain according to those systems.

3. IMPLEMENTATION

The following ways of implementation of the Masters can be envisaged. The actual implementations (section 8) show examples of all of them:

- A traditional conversion Masters at one university. This may apply for the Anglo-Saxon universities. In this case the Masters is for instance organised as a one-year MSc course (such as the MPhil degree in Cambridge). The MSc degree and the certificate then coincide, and both will be awarded. In some countries it may be possible to organise the Masters by a consortium of national universities.
- A collection of courses within an undergraduate study. This may apply for those countries where a Masters is not an official degree, or where a Masters is not presented as a short postgraduate course but a degree related to a three or four year curriculum. At several universities the content of the Masters is already present although seldom within a single curriculum. A student can meet the requirements for the European Masters by the appropriate choice of option courses. There is no need that the courses are clustered in one year of studies: they may be presented anywhere during the whole four-year curriculum. The student will obtain the official national degree on the basis of the full curriculum and will get the European Masters certificate in addition.
- A collection of courses partly provided by the home university and partly through student exchange with a host university. This model can be a variant of both aforementioned models in

the case that the home university does not provide all the courses needed to fulfil the requirements. It is, for instance, conceivable that the home university only has courses in natural language processing and that the student has to obtain the speech courses elsewhere, or vice versa. Courses provided through the Internet may be developed for an international audience and hence reduce the need for actual exchange.

4. STRUCTURE AND CONTENTS

The European Masters will usually consist of a series of taught courses and a period of project work (traineeship). To give emphasis to the European character of the programme, a total of at least three months (whether on courses or project work) should be spent abroad. No requirements are set as to the total duration of the European Masters, but a year will be the absolute minimum.

4.1 Contents

The contents of the European Masters has been defined in the following topic areas:

- Theoretical Linguistics
- Natural Language Processing
- Phonetics and Phonology
- Cognitive Models for Speech and Language Processing
- Speech Signal Processing
- Statistical Pattern Classification
- Language Engineering Applications
- Programming Languages

The description of the contents of these areas are given in terms of a summary outline, a series of topics and sub-topics with references to example chapters in textbooks or papers. A full overview can be found at the website of the European Masters <http://www.cstr.ed.ac.uk/EuroMasters/>

4.2 Traineeship

The traineeship should preferably be teamwork in industry but it may be replaced by research work at the home university or at another university abroad. The organisation of the traineeship / research work of a student is the responsibility of the home university of the student. The summary of the thesis resulting from this part of studies should be compulsorily presented as a report (equivalent to 4 pages A4) to the international electronic student journal of language and speech WEB-SLS (run under the responsibility of ESCA, EACL and ELSNET, <http://web-sls.essex.ac.uk/web-sls/>).

4.3 Easter School

To strengthen the identification of a student with the European Masters, an Easter School is projected as a bridge towards teamwork in industry after the course period. The Easter School will be organised every year in April. All students following the European Masters are encouraged to attend this one-week Easter school preferably after most of the course requirements have been met. At the Easter School, active research topics will be presented as well as presentations from industry about the latest developments in LE applications.

It may be that some unofficial examination will be planned at the Easter School to get feedback on the level of the students. This examination will not have any consequences for the studies of the student.

5. APPLICATION

Any university (whether or not in the European Union) can apply for the European Masters. This brings the European Masters within reach of all universities and all students.

If a department wishes to participate in the European Masters, the following documents have to be provided with the application:

- A description of the coverage of the courses with respect to the prescribed contents of the Masters.
- Proposals detailing how a student can obtain missing contents elsewhere through courses that are accredited at other universities.
- A description of the way student exchanges will be realised [in most cases through the Socrates/Erasmus programme to avoid fee problems].
- The procedures that will be followed by the examination board of the department to award the student with the European Masters Certificate.

The Board of the European Masters will consider the application. A positive decision holds for four years. For the time being the Board consists of the project partners but in the longer run board members will be appointed by ESCA and EAEL.

6. CURRENT IMPLEMENTATIONS

The European Masters will start in the academic year 1999-2000 at the following eleven European Universities. These consist of a number of founding partners plus new partners that were attracted by the scheme and put forward an application. For

each of the universities a very short description of the type of implementation is given. Details can be found at the Masters web site.

6.1 Aalborg Universitet, Danmark

The European Masters is implemented as a path through the already existing Masters in Intelligent MultiMedia in which option modules are adapted to fulfil the European Masters qualifications. The entrance requirement is a Bachelors degree in Computer Science or Electrical Engineering. The course takes 1.5 years for completion, with the last semester devoted to thesis work.

6.2 University of Athens (Ethniko kai Kapodistriako Panepistimio Athinon), Greece

The European Masters will reside in the Department of Informatics. It consists of a series of courses at the undergraduate (BSc) and postgraduate (MSc) level. The latter involve MSc studies in Signal Processing and Computational Systems and in Cognitive Science (in co-operation with other departments and the Athens University of Economics and Business). The duration of BSc studies is four years while the MSc studies involve another two years. The European Masters can be realised as an appropriate trajectory of courses.

6.3 Universitat Politècnica de Catalunya (UPC), Barcelona

The UPC implementation is a joint effort of the speech processing group of the Department of Signal Theory and Communications, and the NLP group from the Department of Informatic Systems and Languages. Courses in theoretical linguistics are taken from the *Universitat Pompeu Fabra*, in phonetics and phonology from the *Universitat Autònoma de Barcelona*, and a course in human language processing comes from the *Universitat de Barcelona*. A truly inter-university programme! The programme takes one year.

6.4 Rheinische Friedrich-Wilhelms Universität, Bonn, Germany

Students working towards the *Magister Artium* in Communication Research and Phonetics will be able to complete the European Masters with little extra workload. The study is a combination of the subjects Phonetics and Computational Linguistics as offered at the Institut für Kommunikationsforschung. Total duration of studies is 4.5 years (9 terms) of which the latter is devoted to thesis work. The European Masters study defines a series of over 15 courses that should have been followed during this period.

6.5 Masarykova Univerzita, Brno, Czech Republic

A co-operation between the Masaryk University (MU) and the Brno University of Technology (BUT) forms the basis for the European Masters implementation. Twelve courses given by lecturers from the Faculty of Informatics (MU) and of the Faculty of Electrical Engineering and Computer Science (BUT) underlie the programme within the framework of *Magistr* studies. Two courses were newly developed to meet the European Masters criteria. The international component is emphasised by the presence of Hynek Hermansky from OGI in the local examination board.

6.6 Friedrich-Alexander Universität, Erlangen, Germany

The Erlangen implementation of the European Masters is built in the context of the completion of an MA in *Linguistischer Informatik* or after a BA in *Linguistischer Informatik*. Fourteen courses form the requirements and come from the chairs in Computational Linguistics, Pattern Recognition, and from the philology studies. Topics in speech perception and word recognition should be taken elsewhere.

6.7 Panepistimio Patras, Greece

The European Masters at the University of Patras can be realised mainly at the postgraduate level within the framework of a Doctorate in Electrical and Computer Engineering. Nine courses have been identified which partially fulfil the European Masters requirements. For the remaining contents in NLP, Phonetics and Phonology, Theoretical Linguistics and Cognitive Science, there are external possibilities in Athens, in the Department of Philology in Patras (under development), and through exchange with other Socrates partners.

6.8 Ecole Polytechnique Fédérale de Lausanne, Université de Lausanne, Université de Genève, IDIAP Martigny, Switzerland

The Swiss implementation is a joint effort of three universities around the lake of Geneva and the research institute IDIAP in Martigny. The European Masters is implemented as a full one-year postgraduate study in a 'pre-doctoral' school. It is especially designed for foreign students. A series of ten courses, chosen from the three participating universities constitutes the European Masters. An implementation within the 4.5 year undergraduate studies at EPFL is planned as well.

6.9 Universität des Saarlandes, Saarbrücken, Germany

As in Bonn, the total duration of studies in Saarbrücken is 4.5 years, with existing degrees in Computational Linguistics (*Diplom*) and in Phonetics and Phonology (*Magister Artium*). A series of 24 courses taken from both programmes constitute the European Masters study. An arrangement with Bonn University has been made to meet requirements in the area of speech signal processing.

6.10 University of Sheffield, United Kingdom

The European Masters will be realised within existing masters degrees in Software Engineering, Computer Sciences, and Artificial Intelligence, which each take four years for completion. Twelve courses have been identified which should have been followed during the Masters studies.

6.11 Universiteit Utrecht, The Netherlands

At Utrecht University students can obtain an MA (*doctorandus*) degree in Phonetics or General Linguistics, which each take the last three out of four years of studies. The European Masters has been implemented as a choice of 24 courses out of the total offer of courses in Phonetics, General and Computational Linguistics.

Besides these eleven universities that start the European Masters in September 1999, it is likely that the universities of Edinburgh, Stuttgart and Leuven will follow in 2000.

7. CONCLUSION

The European Masters model that has been described is flexible and open. Its implementation at eleven universities throughout Europe has already resulted in a number of new cooperations between departments and universities. For the near future, involvement (through traineeships) of industry will be sought. It is expected that the European Masters scheme will be an adequate answer to the current training needs of human language technology.

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