Preface

It has been estimated that the demand for translations is growing at a rate well beyond the present or foreseeable capacity of the translation profession. The application of computers to this task was first proposed over forty years ago. The idea had an immediate impact on the public, but interest fell away when no working systems appeared. In recent years, however, interest has grown markedly with the commercial development of crude but reasonably cost-effective computer-based aids for translators. It has focused attention again on the research in Machine Translation (MT) which had continued largely unnoticed. There is now a demand for basic introductions to the subject, from translators and other potential users of systems and from scientists in related fields of research.

The primary aim of this book is to serve the need felt by many teachers in further and higher education for a students' introduction to MT. It is anticipated that it could form the basis for courses attended by students of linguistics or computer science, perhaps as components of courses on computational linguistics or artificial intelligence. As a textbook it will probably be most suitable for students who have already attended seminars on linguistics or computer science, although we have provided two background chapters for those readers who feel they lack knowledge in either of these areas. Familiarity with computational linguistics or artificial intelligence is not assumed.

A second category of reader is the researcher in some related sphere of natural language processing who is looking for an introductory overview of the problems encountered and the methods and techniques applied in MT. There is growing regard by many active in artificial intelligence, cognitive science, information retrieval, computer science, and the 'language industries' in general for what research in MT has to offer. There is also increasing awareness among theoretical

linguists that programs for MT (and other areas of computational linguistics) may provide realistic 'testbeds' of their hypotheses about how language functions.

As a third category of reader, we may anticipate the interested layperson, someone whose curiosity has been aroused by the prospects of automating translation and who would like to find out more. We hope that there will be nothing too abstruse to deter such readers from reading the whole text, although some of the chapters in the second part may be somewhat demanding.

Our aim in this book is to introduce what may legitimately be regarded as the well-established core of methods and approaches in MT. It is concerned with the problems and difficulties of programming computers to translate, with what has been achieved and with what remains to be done; it is not concerned primarily with practical aspects of operating systems, although we have included chapters on the kinds of systems which are available and on how systems may be evaluated. It is not, however, in any sense a guide for translators and others who want a comparative survey of the capabilities and limitations of currently marketed systems or who want accounts of successful (or unsuccessful) implementations of systems in working environments. That would be quite a different book, although undoubtedly one which would be welcomed.

The book is in two parts. In the first part we describe the basic processes, problems and methods. Chapter 1 is a general introduction, with a brief history. Chapters 2 and 3 give the linguistic and computational backgrounds respectively, which might be omitted by those very familiar with these two areas. In Chapter 4 we introduce the basic strategies of system design. Chapters 5, 6 and 7 represent the core chapters, covering respectively the three basic translation processes of analysis, transfer and generation. Chapter 8 describes the ways in which systems operate in practice, and Chapter 9 outlines approaches to the evaluation of systems.

In the second part we describe in detail some actual systems, chosen to illustrate particular features. Here readers will find that the relatively clear-cut distinctions made in the first half do not always apply strictly when discussing individual systems. They will note that in almost every case these are systems in evolution; it is often impossible to give detailed descriptions of the current status of projects, and readers should also be aware that our accounts do not necessarily represent the views of project researchers now or in the past.

Chapter 10 is devoted to Systran, the best known ‘direct’ system and the most widely used mainframe MT system at the present time. Chapter 11 is on SUSY, an example of a standard ‘transfer’ design. Chapter 12 describes the archetypal sublanguage system Météo, in daily use since the mid 1970s. Chapter 13 covers Ariane, regarded as one of the most important research projects for many years. Chapter 14 is devoted to the well-known multilingual Eurotra project supported by the European Communities. Chapter 15 covers METAL, the most advanced commercial system, based on many years of research at the University of Texas. Chapter 16 describes the innovative Rosetta project, exploring a compositional isomorphic approach inspired by Montague grammar. Chapter 17 gives an account of the DLT project, notable for its use of Esperanto as an interlingua. The final chapter deals briefly with some other projects and systems including a knowledge-based system, the example-based approach, a statistics-based system, and systems

for monolinguals; it covers also controlled language and sublanguage systems and systems aimed at telephone speech translation; and it concludes with comments on possible future directions.

We have, of course, not intended to be comprehensive in our coverage of MT systems. There are two obvious omissions: readers will find no detailed descriptions of the numerous Japanese systems, nor accounts of the commercial systems now on the market. Their absence in this introductory text does not reflect any judgement whatever by the authors of the value or significance of the systems concerned. Indeed, we have both written elsewhere at length on these systems, and in this book references will be found for interested readers. Our criteria for including systems for detailed treatment were that systems should be good representatives of important MT approaches or techniques, should illustrate well developments which have been significant, and which are well documented for students and others to follow up, particularly English-language documentation. They are systems which, in our opinion, any future MT researchers ought to be familiar with.

During the writing of this book we have leaned on many colleagues in the field,
and especially at the Centre for Computational Linguistics at UMIST, where staff and students on the Computational Linguistics and Machine Translation courses have been a constant inspiration. The University of East Anglia is also to be thanked for granting study leave to WJH, without which this book might still only
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