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## PREFACE

This workshop is the fifth meeting of computational phonologists under the auspices of SIGPHON. Our goal is to bring together researchers working in different theoretical frameworks and to advance the understanding of the computational and formal issues of current approaches to phonology.

Finite-state methods have been used very successfully to model classical phonological descriptions based on rewrite rules. It was C. Douglas Johnson (1972) who apparently first realized that phonological derivations could be modeled as a finite-state transduction in which each rule represents a regular relation between the input and the output languages. This is also the fundamental insight of Koskenniemi's two-level morphology (1983).

Although the rhetoric of Optimality Theory suggests that OT is fundamentally different from old-fashioned "serial" approaches to phonological description, there are many similarities. Ellison (1994) was the first to provide a computational account of OT using finite-state automata. In later works, it has been widely assumed that GEN is a regular relation. Many of the constraints that have been proposed in the OT literature can be formalized as a simple finite-state automaton or as an input-output transducer as in the two-level model.

However desirable it might be from a computational point of view, it is by no means evident that OT can be reduced to yet another way of encoding regular relations, except by limiting the number of violations that need to be counted and by restricting the type of allowable constraints. The question of what will turn out to be the appropriate way to model OT computationally is very much open at this point. Three of the papers in this volume address this very issue.

One of the reasons why OT appears to go beyond the finite-state domain is that much of the "cutting-edge" OT work in phonology deals with phenomena such as reduplication that were not considered as central in the earlier times. In this domain the distinction between phonology and morphology becomes blurred. Two of the papers in this volume address this topic, from very different points of view.

We thank our dedicated reviewers who enabled us to bring together the papers for these proceedings. We hope that you enjoy the workshop!

The Program Committee

## PROGRAMME

- 9:00 : Welcome
- 9:05 : *Finite-State Non-Concatenative Morphotactics* (invited talk)  
Kenneth R. Beesley and Lauri Karttunen
- 10:05 : *Temiar Reduplication in One-Level Prosodic Morphology*  
Markus Walther
- 10:35 : Coffee
- 11:00 : *Easy and Hard Constraint Ranking in OT : Algorithms and Complexity*  
Jason Eisner
- 11:30 : *Multi-Syllable Phonotactic Modelling*  
Anja Belz
- 12:00 : Discussion of phonology/morphology papers from main conference
- 12:30 : Lunch
- 14:00 : *Approximation and Exactness in Finite State Optimality Theory* (invited talk)  
Dale Gerdemann and Gertjan van Noord
- 15:00 : *Taking Primitive Optimality Theory Beyond the Finite State*  
Daniel M. Albro
- 15:30 : Coffee
- 16:00 : *How to Design a Great Workbench Tool for Working Phonologists?* (panel)  
Lauri Karttunen (moderator), Dan Albro, Ken Beesley, Jason Eisner, Dale Gerdemann, Arvi Hurskainen
- 17:00 : General discussion, Final remarks

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## ORGANISERS AND PROGRAMME COMMITTEE

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## SHORT ABSTRACTS

### *Finite-State Non-Concatenative Morphotactics*

Kenneth R. Beesley and Lauri Karttunen

A new finite-state technique, "compile-replace", lets a regular expression compiler reapply and modify its own output, freeing morphotactic description to use any finite-state operation. This provides an elegant solution for classic examples of non-concatenative phenomena in Malay and Arabic.

### *Temiar Reduplication in One-Level Prosodic Morphology*

Markus Walther

This paper presents the first computational analysis of a difficult piece of prosodic morphology, aspectual reduplication in the Malaysian language Temiar, using the novel finite-state approach of One-Level Prosodic Morphology (Walther 1999b, 2000).

### *Easy and Hard Constraint Ranking in OT : Algorithms and Complexity*

Jason Eisner

A simple version of the automatic constraint ranking problem is easier than previously known (linear on the number of constraints). But slightly more realistic versions are as bad as  $\Sigma_2$ -complete. Even checking a ranking against data is up to  $\Delta_2$ -complete.

### *Approximation and Exactness in Finite State Optimality Theory*

Dale Gerdemann and Gertjan van Noord

Frank & Satta (1998) showed that OT with gradient constraints generally is not finite-state. We present an improvement of the approximation of Karttunen (1998). The new method is exact and compact for the syllabification analysis of Prince and Smolensky (1993).

### *Multi-Syllable Phonotactic Modelling*

Anja Belz

An approach to describing word-level phonotactics in terms of syllable classes. Such "multi-syllable" phonotactic models can be expressed in a formalism that facilitates automatic model construction and generalisation.

### *Taking Primitive Optimality Theory Beyond the Finite State*

Daniel M. Albro

Extends the Primitive Optimality Theory formalism (Eisner 1997) to handle reduplication. Each candidate set becomes a Multiple Context-Free Language. Constraints, however, remain finite-state. Efficient candidate filtering is possible via an extended Earley's algorithm.

### Panel Discussion: *How to Design a Great Workbench Tool for Working Phonologists?*

Moderator : Lauri Karttunen, co-author of the Xerox finite-state compiler

Dan Albro, author of the UCLA OTP tool

Kenneth R. Beesley, co-author of the Xerox finite-state compiler

Jason Eisner, author of the Primitive OT framework

Dale Gerdemann, co-author of the FSA Utilities toolbox

Arvi Hurskainen, author of tools for African languages