

Athens 2006 ISCA Workshop on Experimental Linguistics

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Abstract

This paper refers to the forthcoming ISCA (International Speech Communication Association) Workshop "Experimental Linguistics" in Athens, Greece, in 2006. The major objectives of the Workshop are (1) the development of experimental methodologies in linguistic research with new perspectives for the study of language, (2) the unification of linguistic knowledge in relation to linguistic theory based on experimental evidence, (3) the design of multifactor linguistic models and (4) the integration of interdisciplinary expertise in linguistic applications. Key knowledge areas ranging from cognition and neurophysiology to perception and psychology are organised in invited lectures as well as in oral and poster presentations along with interdisciplinary panel discussions.

Background

The present paper refers to the forthcoming workshop "Experimental Linguistics", which is an ISCA (International Speech Communication Association) interdisciplinary workshop, to be held in Athens, Greece, in 2006 (workshop details along with paper submission procedures will be announced later this year). The workshop is organised under the joint aegis of the University of Athens, Department of Linguistics, Greece, The Ohio State University, Department of Speech and Hearing Science, USA, and the University of Skövde, School of Humanities and Informatics, Sweden.

The scientific study of language is the backbone of a variety of established disciplines, among them theoretical linguistics, experimental phonetics, computational linguistics and language technology. Language is a complex code system, the study of which is related to a variety of knowledge areas ranging from cognition and neurophysiology to perception and psychology. The code system of language consists of functional categories in variable combinations and relations with multiple interactions, which determine the linguistic structure and the communicative function of language.

The study of language necessarily involves a variety of scientific fields associated with different aspects of linguistic knowledge. Thus, although language is commonly studied within the context of specific questions and targets of investigation, it is nevertheless a multifactor complex code with distinctive interactions between factors. Variability in any factor may have a serial effect on other factors which determine both the linguistic structure and the communicative function of language.

Theoretical linguistics is probably the most widespread discipline of linguistic inquiry. Specification of abstract linguistic categories and linguistic structures related to language functions in established theoretical frameworks leads to analytical methodologies and theoretical hypotheses, which define the type of linguistic knowledge. Experimental phonetics runs a course parallel to theoretical linguistics. Specification of discrete phonetic correlates of abstract phonetic categories and phonetic structures related to language functions in sophisticated laboratory environments leads to analytical methodologies and theoretical hypotheses, which define the type of phonetic knowledge. Computational linguistics focuses on data specification and data processing against the background of different theories and experimental methodologies in language applications. Language technology is also a language applications discipline with interdisciplinary anchoring in, among others, theoretical linguistics, experimental phonetics, computational linguistics and computer science.

In general, linguistic knowledge is related to a variety of established disciplines. This knowledge is, however, fragmented into different areas with different objectives, typically leading to tailor-cut specific theories and variable trial and error methodologies. Although much progress has been achieved in integrating interdisciplinary research and applications, much still lies ahead, especially with reference to the development and use of experimental methodologies with theoretical impact and the unification of linguistic knowledge.

Objectives and perspectives

The major objectives of the Workshop are (1) the development of experimental methodologies in linguistic research with new perspectives for the study of language, (2) the unification of linguistic knowledge in relation to linguistic theory based on experimental evidence, (3) the design of multifactor linguistic models and (4) the integration of interdisciplinary expertise in linguistic applications.

Knowledge is a fundamental condition of any science, be that theoretical, experimental or applied. How can we however define knowledge? And how much do we know about language? Assuming that knowledge is the ensemble of existing hypotheses in a scientific area, we may proceed with the very basic hypothesis about the nature of language and its typical characteristics. Language is the verbal means of communication mainly between speaker(s) or writer(s), i.e. senders, and hearer(s) or reader(s), i.e. receiver(s). Assuming further that written language is a conventional representation of spoken language, we will hypothesise about the latter.

The intent to communicate through language initialises in the sender abstract concepts which are coded and sent through air or compatible transmission means as physical signals. These signals reach the receiver, are decoded and interpreted, and the message (in an ideal case, the message intended by the sender) is perceived and a communicative act thus takes place. A communicative act may however be a complex process with variable interactions between sender and receiver. What is going on inside the sender's and receiver's heads respectively? And what is the relation between the physical signal and the perception of language? Assuming that the transfer of meanings is the basic function of language, where is meaning derived from? How much do we know about these questions and how can we increase our knowledge? Although intensive research has added to our knowledge regarding these questions, much is still required before we can successfully deal with basic aspects of these and similar questions.

Nevertheless, we do have a considerable amount of scientific knowledge about language to consider and make some plausible assumptions. In order to be perceived, the intended message has to be produced and the outcome of this production is – in spoken communication – an acoustic signal. This signal is the end result

of motor commands from the brain to, and coordinated control of, the speech production mechanism. The acoustic signal is processed and decoded by the auditory system and the perceptual mechanism, which ultimately extract the intended meaning. Consequently, the mutual relation between acoustic signal and intended meaning may be considered the very basic functional anchoring of linguistic structure and language communication.

There are however several discrepancies between acoustic signal and intended meaning, the most characteristic of which are the continuous vs. discrete, as well as the one-to-many, relationships between the two. Thus, the acoustic signal is basically a continuous process whereas the intended meaning is a structural unit which consists of discrete functional categories. On the other hand, some variations of the acoustic signal, even large ones, may have no functional effect, whereas other variations, even small ones, may have critical effects on the transmission of intended meanings. Also, the same parameter of the acoustic signal may have different effects, whereas different acoustic parameters may have the same effect on intended meanings in different contexts.

A typical example of the case above is segmental categories where duration or aspiration parameters may independently or in combination determine variable distinctions such as in stop consonants, and may have critical effects on produced words and thus meanings in a variety of languages. Duration may determine several distinctions, such as lexical stress and other prosodic categories, which also have critical effects on produced meanings. Sentence types and intonation forms are also typical examples in which, independently or in combination with other linguistic markers, dissimilar intonation forms may define the same sentence type, and, inversely, different sentence types may be defined by similar intonation forms in different contexts.

In relation to the question above “where is meaning derived from?”, if we hypothesise that meaning is basically derived from the acoustic signal, we are consequently led to the question “how is meaning derived?”. Linguistic theories have historically posited a variety of functional linguistic units such as phonemes, morphemes, phrases and so forth, which the acoustic signal is presumably organised into. However, how much are these units determined by the acoustic signal and how much by psycholinguistic proc-

esses and knowledge of a particular language? For example, is the segmentation of the continuous acoustic signal into discrete words determined by acoustic effects or by knowledge of the language and the corresponding words? Alternatively, are some functional linguistic units determined by acoustic effects and others by knowledge of the language? Phonetic research on both production and perception aspects of these and similar questions is most indicative but further progress is definitely needed before we have basic psycholinguistic knowledge in these areas.

Each and every acoustic signal is a unique event whereas any produced meaning may be in principle infinitely reproduced by any speaker of a given language. Thus, no acoustic signal may be identically reproduced in strict physical terms by different or even the same speaker in general. In addition to linguistic meaning, the acoustic signal may however be related to a large variety of other functions such as paralinguistic and extra linguistic ones with reference to e.g. speaker's emotional state, age or gender. Consequently, relating the acoustic signal to intended meaning is a complex process, during which the acoustic signal is subjected to a variety of functional filterings in relation to distinctive linguistic categories and structures. In this respect, language is presumably organised in different levels of abstraction involving multiple interactions between the acoustic signal and intended meaning.

Linguistic theory studies, as a rule, language with reference to several linguistic components and key areas such as phonology, morphology and syntax in isolation rather than in interaction. Although isolation methodology has its own merits in linguistic analysis, linguistic communication functions as a whole, with multiple interactions between categories and structures of different components, which have, in addition, variable overlapping functions. In languages, for example, with inflectional morphology, case variability distinctions may have a series of functional effects not only on morphology proper but also on syntax, such as subject and object specifications, and ultimately on semantic interpretation of produced utterances.

Interaction analysis and integration perspectives between linguistic categories and linguistic structures in the study of language have generally not drawn particular attention, and thus little is known about the contribution of different components and linguistic categories

to linguistic communication. Although different components have historically been the object of intensive discussions, basic questions of the effects of morphology or syntax on the language communication process in the first place have only cursorily been addressed.

In the vein of the functional anchoring between acoustic signal and produced meaning, isolation methodology, despite theoretical simplicity and practical merits, may lead to serious inadequacies in the study of language and linguistic theory. Thus, although semantics, for example, is related to all linguistic categories and structures and to the variability of the acoustic signal, it is most usually studied with reference to selective functional variability in the lexicon and syntax. On the other hand, although phonetics studies the functional variability of the acoustic signal, it most usually concentrates on the phonetic correlates of phonetic categories and phonetic structures with no attempt to integrate phonetic functioning in general linguistic theory. Similarly, linguistic theory does not usually involve production and perception mechanisms, for which phonetics has an established expertise and sophisticated experimental methodologies.

Produced meanings are not however defined unless the situational context is specified, and thus, the pragmatics of linguistic communication in relation to the acoustic signal is another dimension of the link and interactions between acoustic signal and produced meanings. The unification of linguistic knowledge and the overall integration of theoretical linguistics and experimental phonetics seems the most realistic and promising enterprise in the study of language and the development of linguistic theory.

Coming back to the major objectives of the Workshop, the use of experimental methodologies in linguistic research, similar to the ones already established in phonetic research, may be a promising start on the road towards new methodologies for and new perspectives on the study of language. Standard scientific criteria may thus be applied on linguistic analysis and development of linguistic theory, based on solid premises provided by experimental evidence. Promotion and unification of linguistic knowledge will provide an interactive background to the forms and functions of different components which will pave the way to the design of multifactor linguistic models to be applied in a variety of language applications with interdisciplinary dimensions.

Organisation

The Workshop is organized into invited speaker lectures, original research presented in oral and poster presentations, and interdisciplinary panel discussions. Both oral and poster papers will undergo standard peer review from independent reviewers of the International Scientific Committee and a post-workshop volume is planned with representative papers of key knowledge areas, in addition to the published proceedings which is common practice for ISCA Workshops.

In accordance with the objectives and perspectives of the Workshop, key knowledge areas and language applications are shown in Table 1.

Table 1. Key linguistic areas and language applications of the Athens 2006 ISCA Workshop on Experimental linguistics.

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1. Theory of language
 2. Cognitive linguistics
 3. Neurolinguistics
 4. Speech production
 5. Speech acoustics
 6. Phonology
 7. Morphology
 8. Syntax
 9. Prosody
 10. Speech perception
 11. Psycholinguistics
 12. Pragmatics
 13. Semantics
 14. Discourse linguistics
 15. Computational linguistics
 16. Language technology
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Key linguistic areas and language applications are organized into linguistic domains, rather than theoretical premises and analysis methodologies, in order to allow for interdisciplinary approaches and interaction perspectives. The way we see and study language with reference to general linguistic theory, and the relation and interaction between phonetic production and produced meaning, are paid special attention. Extensive discussions of the theoretical assumptions of key linguistic areas as related to models and experimental methodol-

ogyies will be carried out. Plenty of room will also be provided for discussion of the nature of linguistic training and the requirements for linguistic education in a variety of scientific contexts in both theory and practice.

Outlook

Language has been studied throughout human history with various, sometimes overlapping, perspectives and objectives, and with various applications in mind. The pursuit of linguistic knowledge has been the driving force behind the study of language as one of the most defining characteristics of human beings. Language has been the primary means of communication in human societies and there have been several applications critical to the development of human societies as we know them.

Among these applications, three have marked the route of human societies. First, early insights in basic forms and functions of phonetic systems led to the development of writing systems and the acquisition of reading and writing skills as part of educational systems, probably the most fundamental language application. Second, basic knowledge of voice characteristics and voice signal transmission led to the development of telephone systems and distant voice communication. Third, the growth of information technology and the advent of the Internet paved the way for a variety of language applications. Thus, in our days, linguistic research and language technology set common goals and joint efforts into multifunctional language applications. However, the main precondition for the achievement of these goals and the fruition of these efforts is that solid theoretical knowledge meets basic scientific criteria and reflects linguistic reality.

As every era sets its conditions, our era sets additional requirements and alternative methodologies for the study of language. A new generation of linguists is to be educated and equipped with a rich arsenal of experimental methodologies and new perspectives in linguistic research, and the present Workshop is organised in order to discuss and set the groundwork for this in an interdisciplinary context.