THE FINITE STRING

C U R R E N T   B I B L I O G R A P H Y

Practical Natural Language Processing: The REL System as Prototype

Frederick B. Thompson, and Bozena Henisz Thompson
California Institute of Technology, Pasadena, California

REL (Rapidly Extensible Language) is a system for natural language communication with a computer for specialists. Each user of the system will have an idiosyncratic package reflecting the particular vocabulary and semantic processes of his specialty. The vocabulary of a package can be easily expanded by the user through use of the definition facilities of the language. Three base languages, each of which can be used in the creation of a number of specialized user packages, have been developed: REL English (with nomenclature and processing routines for statistical analysis), Animated Film language (for interactive graphics), REL Simulation Language (for designing, testing, and applying discrete simulation models). Other topics covered: Semantics and Data Structures (primitives, nets interpretive routines), Deduction, English for Computer (case grammar, verb semantics, quantification. Practical NL processing.

Artificial Intelligence--The Past Decade

B. Chandrasekaran
Department of Computer and Information Science, The Ohio State University, Columbus, Ohio

Topics considered: Language Processing, Some Aspects of Representation, Inference, and Planning, Automatic Programming, Game-Playing Programs, Some Learning Programs, Heuristic Search, Pattern Recognition and Scene Analysis, Cognitive Psychology and AI. Work of the following has been given particular attention: Winograd, Quillian, Simmons, Schank et al., Fikes et al. (STRIPS), Hewitt (PLANNER), Biermann, Winston, Evans (ANALOGY). 161 refs.

On Automatic Speech-Understanding Systems

Georgette Silva
System Development Corporation, Santa Monica, California

A Speech-understanding system must capture the meaning of the entire utterance, even if some parts of it cannot be clearly recognized; it must be a *meaning-extraction* system. Topics discussed: What knowledge must a speech-understanding system incorporate? How is the knowledge coordinated? What applications do we anticipate? The SDC-SRI system.

GENERAL

Artificial Intelligence

Earl B. Hunt

Contents: *Introduction.* The Scope of Artificial Intelligence. Programming, Program Structure, and Computability. *Pattern Recognition.* General Considerations in Pattern Recognition. Pattern Classification and Recognition Methods Based on Euclidean Description Spaces. Non-Euclidean Parallel Procedures: The Perceptron. Sequential Pattern Recognition. Grammatical Pattern Classification. Feature Extraction. *Theorem Proving and Problem Solving.* Computer Manipulable Representations in Problem Solving. Heuristic Problem-Solving Programs. Theorem Proving. *Comprehension.* Computer Perception. Question Answering. Comprehension of Natural Language. Review and Prospectus.

Abstracts from the 1974-1975 Rand Information Sciences Conference

G. F. Groner, Editor
The Rand Corporation, Santa Monica, California

Rand Paper P-5233/1, July 1975

The Rand Information Sciences Conference was initiated in Fall, 1973 to promote interaction among Information Sciences Department and Rand Computation Center staff members about their work in mathematics, computer science research, programming and analysis. Papers of interest include: Dan Relles, Statlib - A Statistical Computing Library; Peter Weiner, The Rand Text Editor; R. H. Anderson, J. J. Gillogly, Intelligent Terminal Research at Rand; Ivan E. Sutherland, Sorting and the Hidden Surface Algorithm; Peter H. Farquhar, Multi-Attribute Decision Analysis and Applications; R. Stockton Gaines, the Sad State of Debugging; David Drew, Evaluating the Impact of Federal Funds upon Universities; Ray Pyles, MODIA and DOSS - Software Engineering in a Research Environment.

GENERAL

The Credibility of Machine Intelligence

J. R. Ullmann
Division of Computer Sciences, National Physics Laboratory, Teddington, England

Nature 257: 547-549, October 16, 1976

Not all problem solving algorithms should be called intelligent. "Intelligence" denotes a very distinctive class of problem-solving processes: probably, in the brain, using highly parallel computation and distributed logic; in some cases, a sequential process that does not use stored programs. A programmed computer should not be deemed intelligent unless it is functionally similar to the brain in its use of previous experience.

Speech Input/Output System Employing a Minicompuer

H Fujisawa, and K. Shirai
Department of Electrical Engineering, Waseda University, Japan

The authors describe a speech input/output system which is designed for giving commands to robot WABOT-1. A problem concerning sentence recognition is also discussed together with the proposal of a concrete means for sentence recognition.

Speech Recognition by Machine: A Review

D. Raj Reddy
Department of Computer Science, Carnegie-Mellon University, Pittsburgh, Pennsylvania 15213

Topics covered: *I. Introduction:* the nature of the speech recognition problem, the uses of speech recognition; *II. Systems:* word recogntion systems connected speech recognition, speech understanding systems; *III. Signal Processing for Speech Recognition:* parametric analysis of speech, end-point detection, noise normalization; *IV. Task-Independent Knowledge:* phonemic labeling phonological rules, prosodics, word hypothesis, word verification; *V. Task-Dependent Knowledge:* vocabulary syntax, semantics, pragmatics and discourse analysis; *VI. System Organization:* control strategies in the presence of ambiguity and error, real-time input, knowledge acquisition; *VII. Conclusions.*

Color Their Prose Gray

M. E. Orth
Department of English, University of Wyoming, Laramie

Though surrounded by fascinating and challenging subjects, too many engineers and scientists write dull reports and papers. More attention to verbs can help alleviate dullness and can promote such qualities as vividness, directness, force, and interest. Passive verb forms can be changed to active; combinations of passive verbs with other lifeless verbs can be. reduced through subordination and elemination; and nominalized verbs can be used as true verbs. An improved approach to technical writing is suggested.

GENERAL

Proceedings of the ASIS 37th Annual Meeting, vol. 11

Conference held at Atlanta, Ga., 13-17 October 1974. The following topics were dealt with: information utility; data base management; processing for information retrieval; facilities and services; information use; user needs; bibliometric analysis of trends; semiotic implications; human information processing; education and research. Abstracts of some papers appear elsewhere on this fiche.

Some General Remarks About Pattern Recognition, Its Definition; Its Relation with Other Disciplines: A Literature Survey

C. J. D. M. Verhagen
Department of Applied Physics, Delft University of Technology, Netherlands

A survey is given of definitions and descriptions, taken from the literature, concerning the terms: pattern,. recognition, pattern recognition, classification, cognition, etc. Both very general and more specific definitions are quoted; no deep agreement on the meaning of these terms seems to exist. Relations between pattern recognition and other disciplines are discussed and graphicaaly indicated. Some tentative conclusions are given about possible future activities concerning the definition of general terms in the field.

GENERAL

Computational Linguistics or What's in a Name?

W. Martin
Institute of Applied Linguistics, University of Leuven, Belgium

A linguist can use a computer as a classifying, calculating, control, and simulation machine. *Senso largo*, all linguistic investigations which make use of a computer are called computational linguistics. It is only in the last two senses, however, and more especially in the last, that one can speak of computational or algorithmic linguistics as a possible autonomous discipline within the field of linguistics.

Explizite Beschreibung der Sprache und automatische Textenbearbeitung, I: Terminologisches Worterbuch. Explicit Description of Language and Automatic Text-Processing,   I: Terminological Dictionarv.

Matematicko-fyzikalni fakulta University Karrlovy Praha, 1975

The Terminological Dictionary contains terminology from algebraic linguistics and some terms from related disciplines, such as structural linguistics, logic, algebra, statistics, information theory, etc. A certain number of practical catch-words are also included, but any terms which are contested idiosyncratic, or otherwise problematical are generally omitted. The dictionary is primarily intended to meet the needs of research work, but it may also be of use to translators, students, etc. As a relatively new and quickly-developing one, the field faces the problems of establishing terminology and of determining the extent to which terms in various languages correspond to one another. On practical grounds the dictionary works from English terminology, by which entries are alphabetized; the equivalents in French, German, Russian, and Czech then follow.

GENERAL

Explizite Beschreibung der Sprache und automatische Textenbearbeitung, II: Bibliographie der linguistischen Gruppe des ZNM MPF KU Explicit Description of Language and the Automatic Processing of Texts, II: Bibliography of the Linguistics Group of the Center for Numerical Mathematics of the Mathematical-Physics Faculty of Charles University

Matematicko-fyzikalni fakulta University Karlovy Praha, 1975

The bibliography proper is subdivided into five general topics: formal description of language; empirical linguistic problems; surveys and reports; reviews; bibliographies, translations. It is preceded by a lengthy introduction to the so-called functional generative description of language as developed by the Prague group for nearly twenty years. This description is but one type of stratification description, i.e. it works with ordered planes which extend from meaning on the one hand to expression on the other. Functional generative grammar's specific nature makes it suited to automatization-related applications of linguistics, such as machine translation and information science (automatic abstracting, indexing etc. Although this work needs much further development, it is already of real use for purely intellectualized texts which are stylistically straightforward and contain relatively clearly-defined terminology. The system of levels in functional generative description is informally outlined, with special emphasis being laid on the semantic plane. (In German)

Cahiers de linguistique theorique et appliquee
Papers in Theoretical and Applied Linguistics

Contents:

Cahiers de linguistique theorique et appliquee
Studies in Theoretical and Applied Linguistics

Contents:

Cahiers de linguistique theorique et appliquee
Papers in Theoretical and Applied Linguistics

Cahiers de linguistique theorique et appliquee
Papers in theoretical and Applied Linguistics

Recent Computer Science Research in Language Processing

Allen Klinger
Department of Computer Science, University of California at Los Angeles

The machine translation problem has recently been replaced by much narrower goals and computer processing of language has become part of artificial intelligence (AI), speech recognition, and structural pattern recognition   The narrower goals involve making it possible for a computer user to employ a near natural-language mode for problem-solving, information retrieval, and other applications.   Natural computer responses have also been created and a special term   understand   has been used to describe the resulting computer/human dialogues.   The purpose of this paper is to survey these recent developments to make the AI literature accessible to researchers mainly interested in computation on written text or spoken language.

Directions in Artificial Intelligence: Natural Language Processing

Ralph Grishman, Ed.
Courant Institute of Mathematical Sciences, New York University

The report contains proceedings of a symposium on natural language processing held at the Courant Institute of Mathematical Sciences   New York University on December 6, 1974. The talks were concerned with the analysis of the structure among definitions in a dictionary, the automatic generation of semantic word classes by text analysis the design of semantic hierarchies, and transformational language analysis procedures and underlying structures for information retrieval.

Computers that Talk and Listen: Man–Machine Communication by Voice

James L Fla agan
Acoustics Research Department, Bell Laboratories, Murray Hill, N. J. 07974

Three modes of man-machine voice interaction: machine voice read-out of stored information, speaker verification, automatic ·recognition · of spoken commands.   Voice response. adaptive differential pulse-code modulation (ADPCM) formant synthesis, text synthesis.   Speaker verification: verification (cooperative individual having computer verify his claimed identity), identification of unknown individual via voice pattern.   *Speech Recognition:* the Holy Grail of the field: A three-mode experimental system for airlines information and ticketing is described.   Digital interfaces for man-machine communication: block addressed packet-switched· communication.   Current capabilities: for systems with designated speakers, vocabularies of several hundred individual words are tractable; for speaker independent systems, small vocabularies, such as spoken digits, are tractable.

Lip and Jaw Motor Control During Speech: Responses to Resistive Loading of the Jaw

J. Folkins, and J. H. Abbs
University of Washington, Seattle

Resistive loads were applied to the jaw during speech production.   Loads were initiated during the jaw closing movement associated with the production of bilabial stops, creating a situation in which bilabial closure would be disrupted if motor control were independent of peripheral feedback.   Three subjects were observed during control and experimental conditions.   In all utterances in which a load was appropriatedly introduced, closure of the lips was achieved and the bilabial stop was adequately produced.   To assess the nature of this control, displacement of the upper lip, lower lip, and jaw, in the inferior-superior dimension, were recorded along with EMG from medial pterygoid. anterior temporalis, masseter, and orbicularis oris superior muscles.   Based on observation of these variables, it appears that the muscles of the lips and jaws are capable of on-line compensatory motor reorganisation.

A New Time-Domain Analysis of Human Speech and Other Complex Waveforms

Janet MacIver Baker

Department of Computer Science, Carnegie-Mellon University, Pittsburgh PA

Three separate investigations are presented: 1) Cycle-based time-domain parameters were extracted from the speech waveforms of many hundreds of utterances, and were then analyzed by hand and by machine. 2) Based solely on time-domain phenomena found in 1) a segmentation program was written for continuous speech. 3) Examination of time-domain characteristics of 228 allophones of fricatives and stop consonants for 2 males and 1 female. Comparison of frequency-domain techniques with time-domain techniques. Applications to other complex waveforms.

PHONETICS-PHONOLOGY: RECOGNITION: SPEAKER IDENTIFICATION

Development of Analytical Methods for a Semi-Automatic Speaker Identification System

J. E. Paul, Jr., A S. Rabinowitz, J. P. Riganati, and J. M. Richardson

Segments of speech are extracted from two speech utterances and are computer-analyzed to yield a statistical measure indicating whether the utterances were said by the same or different speakers. The analytical studies involved the collection and processing of speech data from over 250 speakers from which was extracted over 35,000 phonetic-event tokens. A study of the discriminating power of individual phonetic events, along with a study of coarticulation effects on these events, was conducted. A unique set of 30 features was defined for each of the resultant 13 phonetic categories used by the SA IS in carrying out speaker identification. A weighted Euclidean distance measure was selected for measuring speaker similarity within a phonetic category and a desensitized Fisher discriminant was incorporated to combine these individual distance measures into an overall measure of similarity between the speakers of two spoken utterances. A set of likelihood tables, indexed by similarity measure and the phonetic events used, was derived to determine the probability that the utterances were uttered by the same individual.

Semi-automatic Speaker Identification System

P. K. Broderick
Aerospace Corporation, El Segundo, California

A system is described which analyzes speech samples to identify and extract speaker-dependent features and to perform a statistical/comparison of the features from different samples. The purpose is to enable law enforcement personnel to compare the recorded voice of a criminal (e.g., from a bomb threat recording) with recorded voice samples from suspects to identify the perpetrators of crimes. A minicomputer and associated peripherals accept analog speech signals for processing and statistical comparison. Specific phonetic events found to have a high degree of discriminating power are identified and labeled by the operator using an interactive graphic display terminal. In the comparison phase each selected event from the criminal sample is compared with a like event from a suspect sample. The points of comparison are well defined and yield quantitative results on a repeatable basis.

PHONETICS-PHONOLOGY: RECOGNITION: SPEAKER IDENTIFICATION

Automatic Speaker Recongition by Computer

E. Bunge
Philips Forschungslab, Hamburg GmbH, Germany

For security systems in banking and in law enforcement, the human voice is an essential aid for verifying a persons identity. The paper describes the principles of an automatically working speaker recognition system and outlines the basic difficulties and pitfalls. A promising approach is the combination of fast signal processing techniques and trainable pattern recognition procedures. Results of a comparative study are discussed.

A Programme for Synthesizing Hebrew Speech

Asher Laufer
University College, London, and the Hebrew University, Jerusalem

The program has two sets of inputs: 1) a linguistic description (essentially a phonemic transcription) of the utterance to be synthesized. 2) a phoneme table containing information about the category of phoneme, transition duration, average duration, average values of formant frequencies and their amplitudes which are the target values for the phonemes. After inputs are fed into the computer the program changes the basic data of the phonemes according to the allophone rules, which modify the target values of phonemes according to context. Parameter values are then calculated according to transition rules and intonation rules. The output of this program is a punched paper tape which is acceptable to the synthesizer (a computer-simulated parallel-formant synthesizer). Various intelligibility tests were carried out, the final test including sentences and a story. This last test scored an average of 97% words correctly recognized by 33 participants.

PHONETICS-PHONOLOGY: SYNTHESIS

Digital Techniques for Computer Voice Response

Lawrence R. Rabiner
Bell Laboratories, Murray Hill, N. J. 07974

Ronald W. Schafer
Georgia Institute of Technology, Atlanta, 30332

Digital waveform coding: Pulse-code modulation (PCM), Differential PCM, Adaptive DPCM, Analysis/Synthesis Techniques. Design Considerations: memory and speech coding, vocabulary preparation, message composition. A digital voice response system capable of handling interaction on 10 channels simultaneously is described and applications of the system are discussed: 1) computer-aided wiring of circuits, 2) directory assistance, 3) stock price quotation, 4) data set testing information system, 5) flight information, 6) speaker verification.

Synthesis of Speech from Unrestricted Text

Jonothan Allen
Research Laboratory of Electronics, Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology 02139

When we remove all limitations on the input, then what we require of a text-to-speech system is no less than a cognitive model for reading aloud. Text input is analyzed into an abstract linguistic specification from which a surface phonetic realization is generated. Word level synthesis is the first step. High frequency words can be recognized as a unit, less frequent words can be recognized as a sequence of familiar morphemes; a 12,000 item morpheme lexicon and a morphological analyzer does this. If this fails the system reverts to direct letter-to-sound synthesis rules. The next level of synthesis is the assignment of morphophonemic and lexical stress and the highest level concerns clause-level phenomena (suprasegmentals, prosodic features). At this highest level three functions, suggested by Halliday, are carried by the stress contour: 1) ideational, 2) interpersonal, 3) discourse.

A Model of Articulatory Dynamics and Control

Cecil H. Coker
Acoustics Research Department, Bell Laboratories, Murray Hill, NJ 07974

The system includes: 1) a physical model of the vocal system, with spatial constraints-very close to those of natural articulation; 2) a representation of the motional constraints of the articulators which, when moving from one stated shape to another interpolates realistic intermediate shapes; 3) a similar model of the movements of the excitation system, including subglottal pressure, vocal cord angle and tension; and 4) a controller for the mechanism which produces sequences of articulatory commands which cause this dynamic system to execute properly timed articulatory motions from input phonetic strings.

Linguistic Rules for Text-to-Speech Synthesis

Noriko Umeda
Bell Laboratories, Murray Hill, N. J. 07974

Prosody plays the role in speech of producing a spoken message meaningful to a particular circumstance, from otherwise unweighted abstract units called phonemes. In the process of message formation phonemes are given proper acoustic characterization according to the syntactic and semantic structure of the message, the location of stress and boundaries, and surrounding phonemes. This paper concerns work at Bell Laboratories on automatic text synthesis and summarizes the development of related prosody rules from natural speech data.

WRITING: RECOGNITION

Application of Fuzzy Set Theory to Syntactic Pattern Recognition of Handwritten Capitals

Walter J. M. Kikcert
Department of Electrical and Electronic Engineering, Queen Mary College, London University

Henk Koppelar
Department of Psychology, State University of Utrecht, The Netherlands

The recognizer works with a few idealized segments where the letter composition process is governed by a context free grammar. The recognition is performed sequentially: the pattern is scanned from segment to segment, and each segment is separately recognized as a member of the previously defined set of ideal letter segments. The recognition rules are divided according to the different places in the total pattern where a segment can occur (11 arbitrarily ordered rules). The fuzzy membership function represents the degree to which the actual pattern is a member of the fuzzy set "line" or "arc". The fuzzy set evaluation procedure uses only min and max operators.

Real-Time Recognition of Handwritten Numerals

S. Impedovc, B. Marangelli, and V. L. Plantamura
Institute of Physics, University of Bari, Italy

Experiments were set up to find a simple and inexpensive way to test many types of algorithms in real time, in particular, those which analyze nonstylized two-dimensional images bv contour description. In this case the processing of the contour may help, while it is being drawn, to avoid ambiguity arising in *a posteriori* analysis from the crossing points. Our equipment allowed a simple implementation of an algorithm that starting from the tangents to the contour points, discretizes their slopes and then identifies successions of slopes which are characteristics for each class of slopes.

A Bibliography in Character Recognition: Techniques for Describing Characters

R. Shillman, C. Cox, T. Kiklinski, J. Ventura, M. Eden, and B. Blesser
Cognitive Information Processing Group, Massachusetts Institute of Technology

I.   General References and Review Papers, 32 references
II.   Engineering Descriptions of Characters, 74
III. Psychological Descriptions of Characters, 89.
IV.   Insight Through the Study of Character Formation, 10
V.   Relevant Journals, 15

Algebraic Structurre for the Recognition of Korean Characters

Joo K. Lee, and Hoon Choo
Department of Electronic Engineering, Inha University, Korea

The algebraic structure of the basic Korean characters is analyzed in terms of the concave structure, line structure, and node relationships of character graphs. Characters are classified by degree of complexity. Equivalence relationships defined by rotational transformation group by Affine transformation of one element into another exist between the 10 vowels. Hence geometric properties, as well as topological properties, are important for recognition.

Automatic Signature Verification

N. M. Herbst, and C. N. Liu
IBM Thomas J. Watson Research Center, Yorktown Heights, New York 10598

The fine structure of the muscle forces exerted during a signature is very precise for most people and not subject to conscious control. The overall time for a signature as measured from start to finish is remarkably consistent as are the durations of the individual muscle forces. As the signature is a constant time phenomenon the magnitude of the forces is then related only to the size of the resultant trace. Based on this model, an automatic signature verification system is developed which uses the acceleration-time function as the principal measurement. The system is operational in the laboratory and an experiment involving 0 test subjects tested over a four week period indicated a false rejection rate of 2.87% and a forger acceptance rate of 2.06% with an average of 1.18 trials necessary for verification. Examples given.

An Experimental device for the Recognition of Handwritten Numerals

E. Backer, B. M. van der Boom, I J, Boxma, and J. C. Venniker
Laboratory for Information Theory, Department of Electrical Engineering, Delft University of Technology, Netherlands

Recognition of handwritten numerals, written without any constraints. The recognition procedure is based on the logical m-tuple method. The device first calculates set (triplet) of the three most likely categories of numerals with the aid of a general mask, based on all possible categories. This triplet is then processed with the aid of a second mask (the 'triplet mask'), which contains the tuples giving the best discrimination for the triplet in question. The hardware required for this application is comparatively inexpensive and gives 90% reliability.

WRITING: RECOGNITION

Optimisation Algorithms of Linguistic Deciphering

B. V. Sukhotin

It is natural to formulate the problems of language deciphering in terms of an optimisation algorithm. A definition of a language phenomenon that can be used to recognize this phenomenon in text comprises three components: a description of the set of admissible soltutions; a statement of the evaluation function; and an optimisation algorithm to find the extremum of this function. The author gives the deciphering definitions of vowels and consonants, of the subordinative relationship of words in a simple sentence, and of the morphological analysis of a text written without spaces between words. Algorithms for the recoding of a syllabic writing into a phonemic one and for transcribing a text in an unknown language into the alphabet of a known one are given.

Syntagmatic concordances and surface analysis
(Concordance syntagmatiques et analyse de surface)

P. Laurette

The paper describes two procedures for the establishment of syntagmatic concordances through pre-coding and automatic analysis for the nominal syntagm.

Statistical Analysis of Lexical Data Using Chi-Squared and Related Distributions

Barron Brainerd
University of Toronto

Quantitative data from literary sources often appear in the form of word-counts or counts of the occurrence of literary and/or grammatical structures. In their raw form such counts cannot always be assumed to have the properties (e.g. approximate normality, homoscedasticity) that make them directly analyzable in terms of statistical procedures involving the classical sampling distributions. There are, however, so called distribution-free procedures available for the rigorous treatment of such data. This paper discusses procedures involving the chi-square distribution. Topics include: significance tests, degrees of freedom, long-range variation in contiguous samples, independence tests, randomness of occurrence of events in a text, goodness-of-fit, dispersion. Examples are given.

Linguistic Subgrouping and Lexicostatistics

Isodore Dyen
Yale University

Towards an Algorithmic Methodology of Lemmatization

M. L. Hann
Department of European Studies and Modern Languages, University of Manchester Institute of Science and Technology, England

The article introduces some algorithmic techniques which enable a computer to determine those inflected word forms in a textual corpus which are lexically equivalent, and to generate automatically character-string transformations for reducing the raw source text to a series of lemmata. The methods proposed make no specific reference to the language of the source text and are applicable for the reduction of both grammatical and syntactic inflexions. The algorithms are exemplified in use on German text.

LEXICOGRAPHY-LEXICOLOGY: DIALECTOLOGY

Use of an Interactive Program in Analyzing Data for a Dialect Dictionary

Michael M. T. Henderson
Assistant Editor, Dictionary of American Regional English, University of Wisconsin, Madison.

DARE (Dictionary of American Regional English) uses written data and oral data obtained from 2752 informants in 1002 communities with a 1847 item questionnaire. The *words* are stored on paper where editors can get at them easily, while *numbers* are stored in the computer file. The data is available in tabular form and can be examined regionally by maps displayed on a CRT screen. The blank map has as many blank spaces in each state as there were questionnarires taken in that state. The distribution of a response can then be visually examined by having characters appear on the map which represent responses to the item being studied. If desired the computer can give a map of responses given by people fitting only certain classifications--male, old and female, black high-school graduate, etc. .

Automated Morphosyntactic Analysis of Medical English

M. G. Pacak
Division of Computer Research and Technology, National Institutes of Health, Bethesda, Maryland 20014

W. C. White
Centre Hospitalier Universitaire, Sherbrooke, Canada

The procedure for morphosyntactic analysis of medical diagnoses is based on the identification of terminal morphemes which convey information about part-of-speech class membership and, in some instances, also information about a semantic category to which the given word form may belong. The rules for the recognition of productive terminal suffixes and assignment of syntactic and or semantic values are represented by a tree-like right-to-left branching graph whose roots are the terminal characters of input words as they occur in the running text. The examination of characters proceeds from right-to-left to locate a set of defined preterminal characters which constitute a potential suffix. Advantage is taken of the fact that semantic values can be assigned to a set of highly productive Greek and Latin suffixes which occur frequently in medical languages. The program achieved an accuracy of 98.6% for 300 MEDLINE titles and 99.4% for medical diagnoses.

GRAMMAR: PARSER

Augmented Phrase Structure Grammars

George E. Heidorn
IBM Thomas J. Watson Research Center, Yorktown Heights, New York 10598

An augmented phrase structure grammar (APSG) consists of a collection of phrase structure rules which are augmented by arbitrary conditions and structure building actions. The data structure used by APSG is a form of semantic network, consisting of "records" which are collections of attribute-value pairs. *Records* represent entities, either physical or abstract, and such diverse things as vehicles, actions words and verb phrases. There are three kinds of *attributes: relations,* which have as their values pointers to other records; *properties,* which have as their values either numbers or character strings; and *indicators* which have bit string values and usually serve in a role similar to features in linguistic terminology. The decoding algorithm is basically a bottom-up, left-to-right, parallel-processing, syntax-directed compiler.

Case Systems for Natural Language

Bertram Bruce
Bolt, Beranek and Newman Inc., Cambridge, Massachusetts 02138

Deep cases bear a close relationship to the modifiers of a concept. In fact one could consider a deep case to be a special, or distinguishing, modifier. Several criteria for recognizing deep cases are considered here in the context of the problem of describing an event. Unfortunately none of the criteria serves as a completely adequate decision procedure. A notion based on the context-dependent "importance" of a relation appears as useful as any rule for selecting deep cases. Theoretical case systems by Fillmore, Celce, Grimes, Schank and Rumelhart, Lindsay and Norman, are discussed. Also: Simmons; Hendrix, Thompson and Slocum; the glaucoma model of Kulikowski and Weiss and its implementation in the CHRONOS system by Chokhani; Martin's work on automatic programming; Cohen, using procedural semantics; Brown, Bruce and Trigoboff (CHRONOS); Baranofsky (the SRI system); Nash-Webber (SPEECHLIS). 54 references.

From Remote Structures to Surface Structures Without the Cycle: A Computational Study

Donald L. Smith
Curriculum in Linguistics, University of Georgia, Athens 30601

A set of rules which account for roughly the same sentence types that Burt attempts to account for in her introduction to transformational syntax (1971) has been successfully developed and computer tested. In contrast to Burt's approach, this grammar does not utilize the transformational cycle; all conditions on the applicability of and the operation of the rules are made completely explicit. The rules are simply arranged on the basis of their functions: ranking, grafting (simplification), agreement, suffixing, and surface-structure transformations. The only transformations which reorder constituents are the surface-structural ones. The other transformations serve only to rank constituents or to alter trees. In formulating the transformations, the primary concern is what logical, stylistic, or psychological factors (such as perceptual strategy, short-term memory, etc.) might underlie them.

Data Base for Natural Language Information Processing. Normalization of Natural Language

S. Yoshida, T. Fujita, and H. Tsurumaru
Kyushu Institute of Technology, Fukuoka, Japan

Ordinary Japanese sentences can be decomposed into a set of simple sentential forms, which are called normal form sentences, and a set of connective relations between the normal form sentences. In general, a Japanese sentence is composed of one or more bunsetsu's (sentence units), each of which is composed of an independent word and zero or more annex words. Decomposition into the normal form is performed through the syntactic analysis related to the dependency relations among bunsetsu's in a sentence and the segmentation of words within each bunsetsu . (In Japanese)

SEMANTICS-DISCOURSE

A new journal: *Semantikos*

Ryszard Zuber, Managing Editor

Business and editorial correspondence should be addressed to Semantikos, 8 rue des Boulangers, 75005 Paris, France

The first issue, which appeared in June 1975, contains articles by Anscombe, Atlas, Ducrot, and Dahl. Articles will appear in English or in French.

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Indexical Symbolism: A Primitive Semiotic System

J. Gough, Jr., and M. Valach
Georgia Institute of Technology, Atlanta

The indexical symbolism in natural language is man's primitive information processing language. It is such by virtue of the egocentric processor oriented semiotic system in it and appears to be a linguistic parallel to man's directed sensorial system.

SEMANTICS-DISCOURSE: COMPREHENSION

Semantics, Preference and Inference

Yorick Wilks, and M. King
Institute for Semantic and Cognitive Studies, Castagnola, Switzerland

This paper gives full details of the program and the linguistic protocols for the system described in *Communications of the ACM* 18: 264-274, May 1975. (abstracted on AJCL microfiche 30, frame 52) and *Artificial Intelligence* 6:53-74, 1975 (AJCL M 30, F 49).

An Algorithm for Natural-to-Predicate Calculus Language Translation·

T.·D. Korel'skaya

For a subset of Russian, the language of geometry, an algorithm produces a predicate calculus formula expressing the same meaning as a given sentence. The algorithm is based on a system of formalised synonymic transformations which translate Russian syntactic structures into those of the predicate calculus. The dependencies connecting transformations in this system are disoussed, and, taking account of them, the process of applying transformations to a syntactic representation is arranged so that the end result—a predicate calculus formula—is obtained after a minimum of trials. (9 refs., in Russian)

SEMANTICS-DISCOURSE: MEMORY

A Framework for Representing Knowledge

Marvin Minsky
Massachusetts Institute of Technology

A frame can be thought of as a network of nodes and relations. The "top levels" of a frame are fixed, and represent things that are always true about the supposed situation. The lower levels have many *terminals*—"slots" that must be filled by specific instances or data. Each terminal can specify conditions its assignments must meet. Frames are linked together into *frame systems*. Topics discussed include: local and global theories of vision, parallelism, problem solving, is vision symbolic?, seeing a room, scene analysis, perspective and viewpoint transformations, imagery, frames and Piaget (the need for structures corresponding to "representations of representations"), words and meanings, discourse, active vs. passive, scenarios, memory, matching, advice and similarity networks, higher level organization of "similarity paths" in the memory, analogies and alternative descriptions, heuristic search, frames as paradigms (Kuhn), control structures, spatial imagery, global space frame system (GSF), embedding in GSF, evolution.

Spatial Networks as a Site for the Study of Language and Thought

Charlotte Linde
Hunter College, City University of New York

William Labov
University of Pennsylvania

When asked to describe their apartments, people (in NYC) generally give descriptions organized as an imaginary TOUR of the apartment--though a few people organize their description as a MAP. A TOUR is a speech act which provides a minimal set of paths by which each room could be entered. The path is presented as a series of units of the form *direction* (or *vector*) and *room.* Analysis of 72 layouts organized in this way reveals that : a) the imaginary tour always begins at the front room of the apartment, b) if the (imaginary) visitor comes to a one-room branch, he does not enter it, c) if he comes to a branch with rooms beyond the first room he always enters, d) when he reaches the end of a branch and there are other branches to be traversed he does not turn around and go back, instead he is moved back instantaneously to the fork point where the other branches originate. Phrase-structure rules are used for displaying these networks and for formally characterizing their structure.

Montague Grammar

Barbara H. Partee, Ed.
Department of Linguistics and Philosophy, University of Massachusetts, Amherst

Contents:

Lattice Grammars

Hyo Heng Kim, Masaharu Mizumoto, Junichi Toyoda, and. Kokichi Tanaka
Faculty of Engineering Sciences, Osaka University, Toyonaka, Japan 560

Formal grammars such as stochastic grammars, fuzzy grammars, weighted grammars, etc., are considered grammars in which a certain algebraic system is assigned to rewriting rules of formal grammars. In lattice grammars elements constructed by various parameters can be given as dimensions of lattices in membership space and the grade of words obtainable by these elements can be regarded as estimation specified by these parameters. The concept of L-fuzzy sets (Goguen 1967) is introduced into phrase-structural grammars to formulate lattice grammars wherein lattices are an algebraic system assigned to rewriting rules of formal grammars. Type-1 languages can be generated by type-2 lattice grammars. Chomsky and Greibach normal forms for type-2 lattice grammars are constructed.

On the Ambiguity Function of Context-Free Languages

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The number of distinct derivation trees of a word x under a CFG (context-free grammar) is denoted by $aG(x)$. The lower ambiguity function $aG(n)$ and the upper ambiguity function $AG(n)$ of the grammar G are respectively defined by the minimum value and the maximum value of $aG(x)$ such that $|g(x) = n$. Choosing an appropriate CFG G, the functions $aG(n)$ and $AG(n)$ can have the functional order of n to the k for any nonnegative integer k or the exponential order. The functional order of $AG(n)$ is in general undecidable However, it can be bounded by some range by utilizing the generating function of the grammar when the number of words in $L(G)$ whose length is equal to n, $N(L(G), n)$, is computable. The ambiguity function of a CFL (context-free language) L is said to have a functional order of $f(n)$ if the functional order of $AG(n)$ or any CFG G such that $L(G) = L$ is larger than or equal to $f(n)$ and, for at least one CFG G the functional order of $AG(n)$ is equal to $f(n)$. There exist CFLs whose ambiguity function has the functional order of n to the k for k = 0, 1, 2, . . . or the exponential order.

Do Quantifiers Branch?

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J. Hintikka (LIINBL 6: 153) claimed that some sentence types exhibit the logical properties of finite partially ordered (FPO) quantification. It is shown that the fragments of English considered by Hintikka offer no evidence that the formulas of FPO quantification theory are repoducible as the semantic structures of some English sentences. However, to say that standard logic is powerful enough for these fragments is not to say that standard logic itself is adequate. The question of how the logical properties of NL sentences can best be accounted for within linguistic theory therefore remains open.

LINGUISTICS: METHODS: MATHEMATICAL

Automata Theory (A Bibliography with Abstracts)

David W. Grooms
National Technical Information Service, Springfield VA

Research is cited on pushdown automata, tessellation automata, web automata and finite state automata. Studies on finite state machines, Turing machines, and sequential machines are included. Research on boolean functions, recursive functions, the moore model, and the mealey model as applied to automata theory is also covered. (Contains 159 abstracts)

On Non-numeric Architecture

C. Jack Lipovski, and Stanley Y. W. Su
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The main primitive operation in non-numeric processing is the search. But we must use standard von Neumann computers whose main primitive operation is addition. The main hardware problem in non-numeric processing: the entire data base cannot be put into primary memory so that the CPU can search it there. If the secondary memory had some searching capability only highly relevant information would have to be sent to primary memory. An alternative to the conventional approach is to search data with many processors acting in parallel. In designing a non-numeric machine one must consider the design of both software and hardware because: 1) The operations of the machine should be as close as possible to the operations of the end user. 2) The way the data is stored in the machine should be as close as possible to the way the user sees it. 3) but the user shouldn't have to be aware of how the machine stores the data in its storage structure. Other design considerations are discussed and project CASSM, a non-numeric processor we are building, is discussed.

Computer Communication Networks

R. L. Grimsdale, Ed.
Department of Electrical Engineering, University of Sussex, U.K.

F. F. Kuo, Ed.
Department of Electrical Engineering, University of Hawaii

Proceedings of the NATO Advanced Study Institute on Computer Communication Networks, Sussex, UK, September 9-15, 1973. Papers include: "The ARPA Network," F. E. Heart; "Performance Models and Measurements of the ARPA Computer Network," Leonard Kleinrock; "Topological Design Considerations in Computer Communication Networks," V. G. Cerf, D. D. Cowan, R. C. Mullin; "A new Mini-computer/Multiprocessor for the ARPA Network," F. E. Heart, S. M. Ornstein, W. R. Crowther, W. B. Barker, "A parallel Processing Approach to Computer Communication," Dan Cohen, Edward Taft; "Colloquies in Computer Networks," G. Le Moli, "Presentation and Major Design Aspects of the Cyclades Computer Network," Louis Pouzin.

Summary of MYCROFT: A System for Understanding Simple Picture Programs

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MYCROFT operates in the restricted world of simple programs for LOGO turtles. Input to MYCROFT consists of the user's programs and a *model* of the intended outcome. Model: conjunction of geometric predicates describing important properties of the intended picture. MYCROFT then analyzes the program, building both a Cartesian *annotation* (using an imperative semantics asssciated with each turtle primitive) of the picture that is actually drawn and a *plan* explaining the relationship between the program and the model. The system interprets the program's performance in terms of the model and produces a description of the discrepancies expressed as a list of violated model statements. The debugger repairs each violation, making the procedural description produce a graphical result that satisfies the set of predicates describing intent. The final output is an edited turtle program which satisfies the model

COMPUTATION: INFERENCE

A Logic for Semantic Networds

Robert Bechtel, and Stuart C. Shapiro
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NL understanddng systems require the use of nonstandard logic. We start with Belnap's four-valued logic: True, False, Both, None. Two non-standard connectives, AND-OR and THRESH, which are generalizations of the familiar symmetric binary connectives, are introduced. The classical quantifiers ALL and EXISTS, are retained and three new quantifiers are introduced: NONE states that there is no substitution which can validate the expression in its scope; ONE states that there is one and only one substitution which will make the expression within its scope valid; ALMOST-ALL (ALA) states that there maybe some substitution which invalidates the expression within its scope. A form of implication is defined and representations of constructions of the logic are developed for a semantic network.

The Relevance of Relevance

Stuart C. Shapiro, and Mitchell Wand
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Classical material implication is unsuitable for many AI and NL purposes becauses it leads to the deduction of theorems which are irrelevant in that they are semantically unrelated to the statements from which they are deduced (how useful is the knowledge that a false statement implies any statement?). A "fail-safe" heuristic is: "do not assert 'A implies B' unless the hypothesis A was actually used in the proof of B." A formal system embodying this heuristic is the system R of Relevant Implication of Anderson & Belnap (1975). Two examples are discussed. One involves the introduction of universes of discourse, and the other involves the deduction of new rules of inference.

COMPUTATION: PROGRAMMING

International Symposium on Theoretical Programming

Andrei Ershov, and Valery A. Nepomniaschy
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Proceedings of the Symposium on Theoretical Programming held in Novosibirsk, August 7 - 11, 1972. Papers include: "An axiomatic definition of the programming language PASCAL," C.A.R. Hoare; "Central technical issues in programming language design," J. Schwartz; "On universal classes of program schemas," B.A. Trachtenbrot; "Criteria for the algorithmic completeness of the systems of operations," V.A. Nepomniaschy; "Looking for an approach to a theory of models for parallel computation " A.S. Narinyani; "Configurable computers: a new class of general purpose machines," R.E. Miller, J. Cocke; "Towards automatical construction of parallel programs," V.E. Kotov; "A calculus for the mathematical theory of computation," R. Milner; "Some features of a language for a proof-checking programming system," G S. Tseytin.

Breaking the Complexity Barrier Again

Terry Winograd
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Large programs such as the SHI DLU system, are so complex that they are almost impossible to handle. In order to deal with programs an order of magnitude larger than current programs we need an interactive programming system which can function as a moderately stupid, but very patient, assistant which combines the powers of a compiler, and interpreter, and editor, a debugging system, a documentation system, and a problem solver. The user should be able to intermix writing a program, editing it, running pieces of it, asking questions about it, stating new information increasing the store of abstract concepts for describing it, and debugging, all without switching between systems, writing and loading files, etc. The system should be based on an explicit modeling of the programming world, as SHRDLU is based on a model of the BLOCKS world. This project is so complex that it presents us with the paradox of fighting complexity with complexity. The article is followed by transcripts of discussion.

The Utility of Natural Language Systems

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Natural languages and computer languages are suited to quite different kinds of applications. Formal languages are best where the user knows exactly what the system can do, how to use it, and instructs it to his own ends. Natural language systems are more appropriate where the user is uncertain about the contents and use of the system and/or uncertain about the problem domain. A NL interface would allow the user to start work on a problem in spite of these uncertainties and it would provide facilities for learning about the system and the problem domain. Such system should contain knowledge about the problem domain, the requests appropriate in it, and the linguistic strategies used to specify them. It should be able to use this knowledge and information about the context and the user's intentions to understand the sentence, including being able to complete and understand partially specified requests, fuzzy words, and perhaps ambiguous requests.

On the Formal Documentation of Programs

Martin Mikelsons, and Irving Wladawsky
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Programs can be formally documented through two interlinked models: 1) the program model, which contains the semantic properties of the different tokens in the programming language, and 2) the application model, which contains the properties of a set of application concepts meaningful to the users. Application and programming knowledge are represented in a semantic network of nodes and directed arcs. The program model consists of the basic concepts of the programming language organized as a tree, roughly corresponding to the abstract of the language. The application model follows the organization of the program and program model. Without the application model, the only link between the nodes in the program and program model and the application would be a meaningful label, i.e. "Invoice" for a document in the program corresponding to the equivalent business document. The application model contains whatever additional information we wish to associate with the concept "Invoice" as used in this program. The system is being implemented for accounting programs written in BDL; examples of networks are given.

COMPUTATION: PROGRAMMING

The Realization of the Anglo-Russian Multiaspect Automatic Dictionary with Grammatical Servicing on a Third-Generation Computer

S. A. Yakhontov

Some ideas about the practical realization of a MT system on a type 'R'AD' computer are described. Specifically, the set of programs and the structure of the ARMAD dictionary needed for morphological analysis of NL texts. The set of programs is written in assembly language. It makes extensive use of the facilities of Disk Operating System for computers of the third generation. (In Russian)

Programming Languages, Natural Languages, and Mathematics

Peter Naur
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Several of the social aspects of mathematics and natural language show a meaningful analogy with similar aspects of programming languages. It therefore makes sense to extrapolate the analogy to other aspects. On this basis the following conclusions may be drawn: the split between the more academic, pure computer science oriented study of programming languages and the world of practical programming will persist indefinitely; the era of influential programming language construction is past, Fortran and Cobol will retain their dominance; the existing programming languages will develop slowly, with only weak interaction among them; the areas of widest influence from scholarly studies on programming at large will be program literature and style, the most important medium of influence being textbooks at the fairly elementary level; greater interest in empirical studies of programming may be expected to develop in the future.

COMPUTATION· PROGRAMMING LANGUAGES

The List Processing Language SLPL – An Informal Outline

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SLPL was designed as an extension of ALGOL 60 concepts to provide a more versatile language to be used by undergraduates, primarily in conjunction with courses in list processing, AI, and compiling techniques. SLPL combines the security of compile-time mode compatibility with the flexibility of run-time mode checking. The degree of the flexibility/security trade-off is under the control of the user. SLPL is designed to encourage structured programming; list structures and a number of predefined operators and system primitives to process these structures are provided. The main concepts of the language are outlined and a sample program is given in the appendix.

Some Steps Towards a Better Pascal

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Gideon Yuval
Computing Science Department, The Hebrew University of Jerusalem, Israel

A change is *compatible* if it is close enough to the original PASCAL that the transformation to the new syntax (or semantics) is a trivial, automatable project. Compatible changes are suggested concerning: program readability: constant declarations, automatic indentation to facilitate readability of the listing; variable dimensions: array allocation, function types and infix operators, FOR statements; in-line code; 3 more functions of the WRITELN type; compiler directives; cross reference listing. These features can easily be added to the ETH implementation for the CDC 6000 series.

COMPUTATION: PROGRAMMING: LANGUAGES

Cognitive Psychology and Programming Language Design

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Programming language designers must become familiar with the ideas and techniques of cognitive psychology. This will help in the development of the next generation of programming languages and will facilitate more widespread computer literacy.

Use and Maintenance of a Data Dictionary

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The Health Insurance Study (HIS) is a complex multi-yeared longitudinal study of the role of health insurance in the utilization of health care services. Because of the nature and size of the data base it is important that a systematized archive be maintained which presents an everview of the data contained in the data files. The Data Element Dictionary is central to this archive, providing a formal reference point for the proper usage, meaning and manipulation of the data elements. The DED consists of two physical files: a data description file, a statistics file. By including a statistics file as part of the logical DED, the concept of a "dynamic" dictionary is introduced; one which is defined partly at the time new data elements are defined and partly upon inspection of the data. The contents of the DED can be classified under two categories: one providing the researcher/data element interface and the other the program/data interface. To meet these needs the dictionary entry for each data element contains: context information, statistical information, attribute information.

COMPUTATION INFORMATION STRUCTURES

System Organizations for Speech Understanding: Implications of Network and Multiprocessor Computer Architectures

Lee D. Erman, Richard D. Fennell, Victor R. Lesser, and D. Raj Reddy
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The structure of the Hearsay system is based on a set of cooperating, independent processes using the hypothesize-and-test paradigm. The system is implemented as a small number of parallel coroutines (modules), each realized as a separate job in the PDP-10 time-sharing system, thus the time-sharing monitor is the primary scheduler for the modules. The acoustic, syntax, and semantic modules are each linked to ROVER (*Recognition OVERlord*), which handles the interface between them. Futher exploitation of parallelism in speech understanding is being investigated by implementing a parallel decomposition of Hearsay on C mmp, a closely coupled network of PDP-11's which communicate through a shared memory. Finally, the problem of resource sharing in a large loosely coupled computer network (the ARPA net) is discussed.

Learning Structural Descriptions from Examples

Patrick Henry Winston
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A semantic network is used to build representations of simple three-dimensional objects and scenes of such objects. Scenes can be matched by examining the networks describing the two scenes; the *skeleton* describes those parts of the compared networks that correspond while *comparison notes* (C-NOTE) are attached to the skeleton and describe the nature of the correspondence. The program can learn to recognize simple configurations by exploiting the *near miss*. Examples are given in a carefully constructed training sequence so that the machine can learn about an object by exploiting the similarity between a valid example and one which is *almost* a valid example. Some of the concepts built up so far: house, tent, arch, table. The program also has the capacity to recognize symmetry along three axes by generating a copy of the scene description and converting LEFT-OF pointers to RIGHT-OF pointers, and vice versa, (or ABOVE BELOW IN FRONT OF/BEHIND) and then comparing the original description against the modified copy. If the match is exact, then the scene is symmetric along the tested axis. Evan's analogy program is also discussed.

The Psychology of Computer Vision

* These chapters nave been absracted elsewhere on the fiche.

A Multidimensional Approach to Syntactic Pattern Recognition

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A syntactic method for representing the primitive parts of a pattern as nodes of a type of directed graph is described. A linear representation of the digraph can then be presented to a regular unordered tree automaton for classification. Regular unordered tree automata can be simulated by deterministic pushdown automata, so this procedure can be implemented easily. Regular u-tree automata and the corresponding generative systems, regular u-grammars, are formally defined. Several results are shown which are applicable to all syntactic pattern recognition schemes involving the use of primitives.

COMPUTATION. PICTORIAL SYSTEMS

Recent Progress to Formal Approach of Pattern Recognition and Scene Analysis

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PR techniques and programs may currently be considered as a bag of tricks, justified by their experimental results. Formalization and theory have been lagging. Propositions are made for a formal PR language, similar to the language of logic, which could be used to describe precisely the PR algorithms. Interpretations of the terms of this language have to be made in other languages: natural, machine or programming languages. A PR function should be constructive, i.e. find its interpretation in an algorithm or program. A training set is far from enough to define such a function. Properties of the experimental domain should guide the PR specialist. They are examined and discussed, in an effort to find some unity in the PR techniques.

Library Automation and Information Science in Ethiopia

C. Darch
University of Dar es Salaam, Tanzania

The role of information science and its techniques, in particular, the position of computerized libraries and information systems, in Ethiopia is surveyed. The library system of the National University of Ethiopia, which is the only library and information network outside the government which is large enough to either need or consider computer applications, is outlined.

DOCUMENTATION: CLASSIFICATION

The Use of Title and Cited Titles as Document Representation For Automatic Classification

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U.S.A.*

The use of title and cited title words as document representation offers a method intermediate between the use of title and abstract of a document and that of citation identities, retaining some advantages of both. Compared with title and abstract it leads to more compact and uniform document representation with a high concentration of indicative words, gives more consistent coupling strengths to profiles with results agreeing with that employing citations, and offers a more consistent ability for inter-group diferentiation when the groups are close to each other. Compared with the use of citations, it gives results with less specificity and operationally requires an extra step to input and analyse the full citation titles. However, the group profiles derived from title and cited titles are words and can be used to classify documents that have descriptive abstracts but no or few citations

A Vector Space Model for Automatic Indexing

G. Salton, A. Wong, and C. S. Yang

The best indexing (property) space is one where each entity lies as far away from the others as possible; in these circumstances the value of an indexing system may be expressible as a function of the density of the object space; in particular, retrieval performance may correlate inversely with space density. Good discriminator terms must be those with uneven occurrence frequency distributions which cause the space to spread out when assigned by decreasing the similarity between the individual documents. Terms of medium frequency should be used for content identification directly, without further transformation. Terms with very high document frequency should be transformed into entities of lower frequency--perhaps by using them as components of indexing phrases. Terms with very low frequency should be transformed into entities of higher frequency--perhaps by grouping them into common term (thesaurus) classes.

A Theory of Indexing

Gerard Salton
Cornell University

Five types of significance measure are discussed and evaluated: discrimination values, inverse document frequencies, signal-noise values, variance-based measures, and information values. Good and bad index terms are characterized by objective measures, leading to the conclusion that the best index terms are those with medium document frequency and skewed frequency distributions. A discrimination value model is introduced which makes it possible to construct effective indexing vocabularies by using phrase and thesaurus transformations to modify poor discriminators--those whose document frequency is too high or too low--into better discriminators, and hence more useful index terms. Test results are included which illustrate the effectiveness of the theory. 56 pp., 32 refs.

The Computation of Discrimination Values

Robert G. Crawford
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Two algorithms for computing the discrimination values are given. The more efficient one is:

0. Given: A file of document vectors $d1$, $d2$,....., dN. An inverted file listing for each term those documents in which it occurs. c, the centroid of the document space. SUMSQC [a property of the centroid]

1. For each document $j = 1, ..., N$ DO

    1.1 Compute SUMSQDj

    1.2 Compute DOTPRODj

    1.3 Update QSUM (QSUM = QSUM + COS (c, dj))

2. For each term $i = 1,..., M$ DO

    2.1 Qi = QSUM

    2.2 For each document j *in which term i occurs* DO

    2.21 Qi = Qi - COS (c, dj) + COS (c to the i, dj to the i)

    2.3 compute discrimination value for term i. Di = 100* $(Qi$ - QSUM)QSUM

Automatic Indexing Using Term Discrimination and Term Precision Measurements

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Edmonton, Canada

A term discrimination model and a term precision system are described and experimental evidence is cited showing that a combination of both theories produces better retrieval performance than either one alone. In the discrimination model the full indexing vocabulary is retained while the terms whose frequency characteristics are nonoptimal are transformed into indexing units with better assignment frequencies. This model does not account for the linguistic or semantic aspects of the texts being processed. The term precision method remedies this situation somewhat by utilizing customer opinions concerning the relevance or nonrelevance of certain documents to the queries submitted to the system. A precision weight attached to each query term is used as a partial indication of the lingistic characterization of the terms.

Automatic Indexing System for German-Language Documents

I B. Arzumanova, L A. Khoklova, and B. R. Pevzner

The core of the system is a German to descriptor dictionary in electrical engineering and an algorithm for morphological analysis of compound words, which splits these words into their semantic components. (6 refs., in Russian)

Natural Language Access to a Large Data Base

David L. Waltz
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The report describes the first year's accomplishments toward a natural language system which answers questions about a data base of naval aircraft maintenance and flight data. The system is designed to: Allow a user to ask questions in natural English; provide answers to questions requiring averaging, statistical analysis, comparison of sets of data, and other complex functions as well as answers to simpler questions about specific data base records; provide aid in evaluating and predicting the causes of failures and of the need for excessive amount of maintenance work.

The Importance of User Education and Training in a multi-data Online Information Network

J. Egeland
State University of New York, Albany

The SUNY Biomedical Communication Network provides online access to three different data bases to 32 member institutions across a 10-state area. Through a single terminal located in their library, users may search the MEDLARS, ERIC, and Psychological Abstracts data bases. As part of this service to member institutions, SUNY also provides training sessions in the use of the system. This paper focuses on the importance of user awareness of the differences in the indexing policies and vocabulary structures for each of the files. More attention should be directed to the development of this type of training for users of multi-data base online systems. The need for cooperation between data base vendors and producers in this regard is noted.

Automatic Abstracting by Applying Graphical Techniques to Semantic Networks

S. L. Taylor
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A method is presented for processing semantic networks using graphical techniques in order to produce a reduced semantic network while retaining the important concepts or topics of the original semantic network. The processing method is considered as part of an abstracting system composed of three parts: a parser that constructs a semantic network from discourse, a reduction that executes the processing method, and a generator that generates discourse from the reduced network. The processing method consists of two phases. The first phase processes the semantic network as a directed graph using graph clustering techniques. The second phase then analyses the largest cluster found using signal flow graph analysis.

DOCUMENTATION. ABSTRACTING

Methods of Automatic Abstracting (USA, 1958-1974)

V. P. Leonov

The current methods of abstracting in the USA are discussed: statistical, logico-mathematical, and linguistic. The linguistic is especially promising. General views are given on the quality and outlook for machine abstracting. (24 refs, in Russian)

Chinese-English Translation System

William S-Y Wang, Stephen W. Chan, and Philip Robyn
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Research was focussed on integrating the QUINCE system modules into a completely sequenced system of programs during execution of the translation process. Interface modules for the front end of the system were written to enable all machine coded texts to be normalized before input to the actual analysis process. All texts entering the system are designated by a decimal reference so that each sentence or subpart of a sentence could be cross-referenced for retrieval and additional analysis. Programs for interfacing the sentence dictionary with the text normalization programs were completely designed but not implemented (funding problems prevented this). The complete text of a physics monograph was fully coded, revised for errors and machine processed into a normal form into data suitable for direct input into the QUINCE system. Appendices include: Grammar Code Description; Grammar Rules; Programs, Texts and Data on File. 94 pp.

TRANSLATION

Search. Material for the Anglo-Russian Multiaspect Automatic Dictionary

L. L. El'nitskii

Presents three dictionary entries describing two of the meanings of the English verb/search/ and a noun derived from one of them. Among other things, the entries contain an exhaustive formal definition of the primary lexical meaning of the verb as well as some rules for idiomatic translation of the words described. (In Russian)

Signal 1 and Signal 2.   Materials for the Anglo-Russian Multiaspect Automatic Dictionary

T. V. Pivovarova

Machine Translation and Applied Linguistics 17: 94-9, 1974

Dictionary entries for two meanings of /signal/ as used in radio and electronics. The first meaning is characterized by a wide range of lexical functions while the second ·one is an example of a common value of the lexical function Magn. (In Russian).

TRANSLATION

Require.   Materials for the Anglo-Russian Multiaspect Automatic Dictionary

T. G. Potemkina

Machine Translation and Applied Linguistics 17: 86-93, 1974

A dictionary entry is given for one of the meanings of the English word /require/. Each section of the entry is supplied with a commentary. The following sections are of particular interest: the rules relating syntactic structure to semantic representation; the syntactic zone, where two, modifications of the syntactic pattern of the word in question are described; sections dealing with the transformations of Russian and English structures incorporating this lexical unit. (In Russian).

Pronoun IT in the Anglo-Russian Multiaspect Automatic Dictionary

A S. Chekhov

The paper contains lexical entries of the English-Russian Multiaspect Automatic Dictionary which describe the pronoun IT and some commentaries thereto. (In Russian)

TRANSLATION

The Anglo-Russian Multiaspect Automatic Dictionary (ARMAD)

Z. M. Shalyapina

The Anglo-Russian Multiaspect Automatic Dictionary (ARMAD) is described with respect to the MT system in which it is used. ARMAD treats NL texts at three levels of representation: morphological, syntactical, and semantic. Each of these is discussed at some length. (In Russian)

Braille Programs

P. Coleman
Warwick, University, Coventry, England

Computer Weekly 19, 459: 6, 21 August 1975

Programs for Braille translation are needed. Some of the possible programming and language techniques are discussed.

SOCIAL-BEHAVIORAL SCIENCE

Documentation in Social Science Experiments

Michel M. Rogson
The Rand Corporation, Santa Monica, California

Rand Paper P-5494-1, January 1976

Systematic and well documented data accrual processes are essential. In a large experiment a maximal set of documentation causes the volume of this documentation to approximate that of the data collected. This documentation should be organized by a glossary of key terms, a dictionary that defines all data elements, and codebooks that describe the data elements and transactions affecting them. All access to the data would be effected through the central dictionary. If a suitable dictionary scanning tool is prepared, access to the data base documentation could also effected through the dictionary. Given this structure of documentation organization, the researcher's view of the data base organization and its physical representation are independent of each other. This independence permits the implementation of standardized access and update methods that need not depend on the data base content or organization at any point in time.

A Representation of Systems of Concepts by Relational Structures

Klaus Witz
University of Illinois, Urbana

John Earls
Department of Anthropology, University of Michigan

Conceptual-semantic systems can be represented by *relational structures* which permit the use of mathematical structures such as homomorphisms, products, and partial orderings in the analysis of conceptual structures. A relational formalism is sketched out briefly and applied to: 1) Thai ideas about the relationship between a person and the territory he controls, 2) Homomorphism in the conceptual structure underlying metaphysics of a fragment of the Tewa origin myth, 3) Analysis of the concept of authority based on transcripts of discussions with a single informant in a small Illinois town.

Social Structure, Social Classifications, and the Logic of Analogy

Francois Lorrain
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When considering kinship of myth, some anthropologists--especially Levi-Strauss--have stated analogy relations of the type "A is to B as C is to D." Phonologists of the structuralist school often stated such analogy relations among phonemes. If certain natural axioms, stated below, govern these analogy relations, then the system described by these relations exhibits strict structural properties: it consists of various criss-crossing series of parallel lines or cycles. These structures are investigated in: a) componential analysis, classificatory kinship, elementary structures of kinship (section systems) and the relationship nomenclatures associated with them), b) structural time-invariance, c) egocentric and sociocentric representations of a network of social relationships.

A Spreading-Activation Theory of Semantic Processing

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Quillian's theory of semantic memory search and semantic preparation or priming is the basis for a spreading activation theory of human semantic processing which can be applied to a wide range of recent-experimental results. A number of additional assumptions are proposed for Quillian's theory in order to apply it to recent experiments: production experiments by Loftus, Juola and Atkinson's multiple category experiments, Conrad's sentence-verification experiments, and several categorization experiments on the effect of semantic relatedness and typicality by Holyoak and Class, Rips, Shoben, and Smith, and Rosch. A critique of the Smith, Shoben model for categorization judgements, in which concepts are represented as bundles of semantic features, is offered. A revised version of the Smith et al. model can be seen as a special case of a more general procedure specifiable in our theory.

Set-Theoretic and Network Models Reconsidered: A Comment on Hollan's "Features and Semantic Memory"

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Edward E. Smith
Stanford University

Edward J. Shoben
University of Illinois

The choice of a network or set-theoretic representation correlates with two substantive differences among models of semantic memory. First, in explaining certain reaction time effects network models emphasize retrieval processes, while set-theoretic models often emphasize comparison processes. Second, set-theoretic models posit more semantic analysis during sentence verification than do network models. Hollan's recent demonstration of an isomorphism between set-theoretic and network representations cannot resolve these important issues.

Features and Semantic Memory: Set Theoretic or Network Models?

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Smith, Shoben, and Rips (1974) propose a set-theoretic model (sets of semantic features) of semantic memory. Their set-theoretic model can, without loss of explicatory power, be formulated as a network model and therefore the distinction between set-theoretic and network models is vacuous. The network model is preferable because: 1) it can call on the extensive literature of graph theory, 2) graph theoretical models can easily be implemented as computer programs.

SOCIAL-BEHAVIORAL SCIENCE PSYCHOLOGY

The Measurement of Meaning in Psychoanalysis by Computer Analysis of Verbal Contexts

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Twenty-five hours of abbreviated transcripts out of 363 on tape of the analysis of one patient were analyzed: 10 hours showing significant "analytic work" by the patient, 10 hours of· "resistance" to analytic work, and 5 "middle" hours. A computer searched the texts of the patient's portion of. the 25 hours for words from the Harvard III Psychosociological Dictionary (Stone et al., 1966). For 20 of the 83 categories from the dictionary there were highly significant linear relationships between the measure of analytic work and the percentages of the categories in each hour. Further analysis used 4 methods for defining contexts of word usage: 1) Are particular words more highly correlated with either the denotative or the connotative category to which the Dictionary assigns them? 2) A listing of words with which a particular word is correlated--done only with words selected on the basis of their high correlation with one of the dictionary categories. 3) Factor analysis of a correlation matrix of 47 words using a Principal Components solution with a varimax rotation of 10 factors. 4) In which one takes words from a given factor, finds an hour in which they all occur, and then lists the words with the line number of the text where they were found. The evaluation of the results of this procedure depends on clinical judgement.

A Quantitative Study of a Psychoanalysis

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Research Center for Mental Health, New York University, New York City

Data from 363 tape-recorded psychoanalytic sessions with one patient were analyzed. P-technique Factor Analysis of a correlation matrix of 53 analyst-coded variables yielded 6 factors (Resistance I, Family-Genetic, Sexuality, Dreams, Anxiety, Interaction-Resistance II) and produced estimates of the amount of each factor in each hour. These scores were plotted against time. A measure of "analytic work" vs. "resistance to analytic work" was derived by combining the resistance factors into one factor R and the other four into another factor C. $C - R$ measures the amount of analytic work done by the patient. Twenty-five hours were selected for analysis using the Harvard III Psychosociological Dictionary. "High work" hours were significantly different from "resistance" hours in terms of the 83 categories of the dictionary. Finally, analysts were asked to rate 8 of the 25 hours for predominance of analytic work or resistance. This measure confirmed the results of the factor analysis and the content analysis.

SOCIAL-BEHAVIORAL SCIENCE: PSYCHOLOGY

Cognitive Structures in Human Story Comprehension and Memory

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Simple narrative stories contain setting, main character, problem to be solved, plot sequence, and resolution. A process model for the comprehension of these stories assumes that stories are encoded in a hierarchical organizational framework which represents the abstract structural relationships of the plot. Four experiments on text comprehension were run. In Experiment I subject's recall of a story was found to be a function of the amount of inherent plot structure in the story. Experiment II extended the results of I and found that repeating story structure across two passages produced proactive intereference. Experiment IV tested a model of the use of inferences in comprehension. False recognition rates for implicit inferences from a story depended on the plausibility of the inferences and their role as organizing and integrating devices for other information in the story.

Computer Simulation of Two-Person Interactions

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Using roles as determinants of action makes possible the elimination of complicated goal-directed decision making and consideration of belief structures. Four data elements: 1) Description of the roles of the two people. 2) Description of responses they make to each other, 3) Description of the situation, 4) Description of any necessary universal constants. These descriptions are made as ratings on various axes. Two functions: 1) Response generator using 1-4 (above) to produce the next description of a response, 2) A learning function modifies roles as a function of 1-4. An optional third function would interpret the response descriptions into English dialogue. The program DYAD is based on Leary's personality theory (1957) which has 16 categories of interpersonal response arranged on 2 axes, dominance-submission, attack-affection. Each person's role is represented as a probability distribution over the 16 categories. The response generator is based on a principle of reciprocal interactions which is simulated as a transition matrix and the learning function is based on a model of positive and negative reinforcement. Experiments with the model are described.

SOCIAL-BEHAVIORAL SCIENCE. PSYCHOLOGY

Representing Logical and Semantic Structure of Knowledge Acquired from Discourse

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The model: 1) Semantic structures: propositions are represented as networks of concepts. 2) Logical structures: networks of propositions are connected by various labeled logical, causal, and algebraic relations. 3) Detailed consideration is given to the algebraic (and metric) properties of noncase (classification, attributive, degree, temporal, locative, quantification) relations and certain relations having specified algebraic properties (e.g. transitivity, symmetry, reflexivity) which may be used to connect propositions containing these noncase relations are defined. The result is a mechanism for representing comparative relations, and relations of relative time and location, tense and aspect. 4) A stochastic element is included to deal with imprecision and linguistic "hedges." 5) Distinction is made between "symbolic" and "non-symbolic" objects and "cognitive and "noncognitive" actions, both of which involve symbolic content. To assess acquired knowledge, a procedure is presented for coding a subject's verbal reconstruction of knowledge acquired from a presented text (or other input) against the logical and semantic structure from which the text was derived. Experimental data are presented.

In Search of Buber's Ghosts: A Calculus for Interpersonal Phenomenology

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A Boolean analysis of the following three independently developed methods for the study of interpersonal phenomenology reveals that they are isomorphic to one another: Interpersonal Perception Method (Laing, Phillipson, and Lee, 1966), Interpersonal Perception Technique (Drewery, 1969,), Family Relationship Test (Scott, Ashworth, Casson 1970). Their shared structure makes it possible to develop a single lucid and rigorous language for the full interpretation of each. This language removes the need for intuitive derivations of terms, reduces semantic confusion, clarifies relations among terms, provides a basis for new applications, and reduces scoring effort by over 95 percent. Possible applications: the study of process and outcome in marital therapy, the phenomenology of different ethnic groups, the study of communication and attribution in the families of schizophrenics.

The Psychological Unreality of Semantic Representations

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Both generative and interpretive semantics assert the necessity for rules of eliminative definition. However, there is no convincing evidence for the psychological reality of such rules. Intuitive arguments are given against the reality of eliminative definition (consider the eliminative definitions of *the* and *a* for a start) and experimental evidence concerning reaction time to attain a correct evaluation of sentences containing various types of negatives suggests that such a level is unreal. If our arguments are sound, then it appears practically mandatory to assume that *meaning postulates* (similar in thrust, but not in detail, to Kintsch, 1974) mediate whatever entailment relations between sentences turn upon their lexical content.

System Developments in the ACT Language: Towards Machine Independence

J. R. Millenson
McGill University, Montreal, Quebec, Canada

ACT (the Automated Contingency Translator) is a list processing state oriented sequence control language for on line control and data acquistion of psychological experiments. Since 1967 ACT software has been progressively expanded and the machine base extended from the PDP 8 family to the PDP9, NOVA, and the PDP11. The most recent variant of this language, ACTN, removes previous arbitrary restrictions on state network complexity, expands the conversational repertoire, and adds a subset of compatible BASIC to ACT, thereby giving the package greatly increased computational powers and data storage facilities.

SOCIAL-BEHAVIORAL SCIENCE PSYCHOLOGY

Hierarchical Man: A Comparison of Three Cybernetic Systems

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The cybernetic view of man holds that man's behavior and experience can be accounted for by feedback-control processes which are hierarchically organized. The ideas of Koestler, Laszlo, and Powers are examined. Despite differences in detail they articulate remarkably consistent theories of the nature of man.

An Information Processing Constraints Approach to the Conjunction of Macroeconomic and Macropolitical Theory

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Human information processing is a fundamental and critically important resource for political life. It is moreover a constrained resource. Using this fact, connection can be established between ideas employed in political science and concepts in macroeconomic theory. A concept of "interest rates" can be derived from information processing constraints. These "interest rates" are analogous to the "arousal level" construct of motivational psychology. A generalized Keynesian "general equilibrium" model can be derived largely from macropolitical considerations. In the space defined by activity in the system (a generalization of GNP) and interest rate one has a governance of production" curve G (a generalization of the Keynesian LMc curve) and an "assimilating production" curve A. The positions of G and A in the space are determined by: 1) the "well directedness" of intellectual structures with respect to either governance or assimilation, 2) the "risk-readiness" of society with respect to failures of governance or assimilation, and 3) the character of the environment in terms of the type of problems generated for governance and for assimilation.

HUMANITIES

Situation and Prospects of Computer-Aided Literary Research in Spanish

Leopoldo Saez-Godoz
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There has been relatively little computer-aided work done on Spanish. And there is little in the way of analysis or explanation of the theoretical basis of the work (mostly concordances) which has been done. In order to facilitate more work in the field, an information center on the use of computers in Spanish has been founded at the Institute for Communication Research and Phonetics at the University of Bonn.

Trends in Computer Applications to Literature

R. L. Widmann
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Too many humanities students remain ignorant of computer methodologies. Perhaps graduate students should be allowed to offer competence in a computer.language instead of the more traditional French, German, or Russian. Other topics discussed: concordances, historical lexicology, stylistics, content analysis, MT.

HUMANITIES

Directory of Scholars Active

Areas of work: Education, General, Language and Literature, Music, Philosophy, Social Science, Visual Arts

Annual Bibliography for 1974 and Supplement to Proceding Years

Stephen V. F. Waite
Kiewit, Computation Center, Darmouth College

Topics covered and number of references per topic: General-42, Archaeology-84 History-245. Language and Literature-265, Music-37, Visual Arts-69.

HUMANITIES

The Humanist in the Computer Lab

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The most substantial accomplishments to date have been the rationalized lists of words (dictionaries, indexes and concordances) for which the computer's capacity to sort rapidly without fatigue or error makes it an ideal servant. A new brand of humanistic scholar now evolving--highly trained in the humanities and at the same time in those aspects of computer science genuinely relevant to his studies--will contribute to the creation of new programming languages specially designed for this work. assist in the training of others who follow and help to guide computer-assisted instruction beyond the mechanistic mode in which it currently operates.

Association for Literary and Linguistic Computing: Bulletin, Vol. 4, No. 1, 1976

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HUMANITIES: ANALYSIS

Poetry Generation and Analysis

James Joyce
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University of California, Berkeley*

The following topics and investigators are considered: *Poetry Generation.* Marc Adrian's work
on concrete poetry, R. Caskins' generation of haiku, P. Kilgannon's use of computer generated
poems as a basis for his own poems L. T. Milic. *Concordances:* the WYLBUR editor, the
Cornell Concordance series, Shinagel's Swift concordance, Ingram and Swaim's Milton
concordance, Spevack's Shakespeare concordance, Misek's concordance to *Paradise. Lost.*
Stylistic Analysis: the EYEBALL programs of Ross and Rasche, Green on formulas and
syntax in Old English poetry. *Prosody:* Dilligan on quantative verse in Hopkins and Bridge's
translation Book VI of the Aeneid. *Literary Influence:* Raben and Smith on Milton and
Shelley. *Statistical Analysis:* Sainte Marie et al. on Moliere. *Mathematical and Statistical
Modeling:* Edward Kahn's modelling of narrative structure in *The Faerie Queene,* Joyce's
work on periodicity of pauses in poetry and prose. *Textual Bibliography.*

The Use of Function Word Frequencies as Indicators of Style

Fred J. Damerau
IBM Thomas J. Watson Research Center, Yorktown Heights, New York

Style is presumed to be independent of content. The evaluation is based on the observation that words not context'dependent would occur in a Poisson distribution; context independence indicates that the usage of a word is not dependent on content. 60,000 word samples were taken from *Slaughterhouse Five, For Whom the Bell Tolls, Tropic of Cancer,* and 2 separate samples from *Vanity Fair.* Words which may have an ordinary looking Poisson distribution for one author are widely divergent from such distribution for another author. For some authors many words are Poisson distributed, for others few are. Analysis of the two *VF* samples indicates significant differences between them. It thus appears that the usage of function words is not context'independent and therefore doesn't constitute a useful measure of style. An appendix gives a list of all words which occurred at least 5 times per 10,000 words in any sample. They are coded for the significance measure. modified mean. for each word in each sample.

A Shakespeare Dictionary (SHAD): Some Preliminaries for a Semantic Description

H. Joachim Neuhaus, and Marvin Spevack
Department of English, Westfalische Wilhelms-Universitat, Muenster, Germany

From lemmatization to final semantic description: A list of lemmata maybe taken as a skeleton dictionary. Lemmatization produces some nternal structuring of entries: paradigmatic (differently inflected word forms of a lemma); variational; syntagmatic (contexts of token occurrence). Semantics: An adequate dictionary semantics is possible only when there is a shift away from the lemma as the focus of semantic analysis and description towards an analysis of the function of a token in particular contexts. Topics discussed: defective distributions (ex: *un-* words); variational phenomena (ex: *-eth* and *-es* in 3rd person singular); underlying systems (ex: *-ish* suffix in forming adjectives; *child, childish*).

The Algorithm and Some Results of a Statistical Investigation of Rhythm on the 'Minsk-32' Computer

V. S. Baevskii, and L. Ya. Osipova

The representation of alternating verse rhythm in based upon a gradual numerical evaluation of degrees of intensity of syllables. The procedure includes the computation of a number of statistical characteristics. The algorithm of verse analysis was realized on the 'Minsk-32' computer. The results of a computer experiment on the study of trochaic tetrameter of Russian poets of the middle of the 20th century are given.

HUMANITIES. ANALYSIS

Literary Statistics. VI. On the Future of Lieterary Statistics

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Discusses the future of literary statistics as a fully-fledged branch of applied statistics with its own special methodologies and a considered rationale for their use. The controversy centered around the philosophy of science issues concerned with the nature of inference and the application of significance tests is discussed.

Carlyle and the Machine: A Quantitative Analysis of Syntax in Prose Style

R. L. Oakman
University of South Carolina, Columbia

A large selection of Carlyle's prose is analyzed with linguistic and quantitative methods of syntactic analysis and a computerized parsing procedure.   Two objectives. what are the stylistically significant elements of Carlyle's syntax and is large scale automatic syntactic analysis a profitable technique for use in describing prose style?

INSTRUCTION

Using Computers in a Natural Language Mode for Elementary Education .

Alan L. Tharp, and Woodrow E. Robbins
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The fact retrieval system (about history and geography) was designed for NL interactive use with fourth grade students.   The parser uses an augmented transition network.   The storage and retrieval system inspects output from the parser and enters information into the system if the input was a declarative sentence and retrieves the desired information if the input was a question.   The original system has been modified to include: 1) An interactive program facilitating the addition of new words to the dictionary so that the teacher and more advanced students would be able to do this.   2) The parser was modified to convert input strings into a deep case structure rather than a deep structure.   3) An assembler language module was constructed to act as an interface permitting data and dictionary items to be individually accessed directly from disk during execution.   4) Information about synonym, antonym and implication relations was added to. the dictionary.   5) The capacity to decay the reliability of a fact with time (some things are true forever, other things are not).

Interactive Computer Simulations for Teacher Education

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A part of laboratory experiences for teacher education students includes interactive computer simulations of various classroom situations. Such simulations can be used to help teacher education students reach a high awareness level and can also be used to study individual teacher behavior. Simulations discussed here have focused upon teaching strategies and questioning behaviors.

INSTRUCTION

MODELR--Model Building and Model Modification for Instruction

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An integrated set of three computer programs that enable the implementation and student investigation of computer models of behavioral phenomena is described. These models are intended as tools for aiding in the instruction of undergraduate social science courses in research methods. Each program provides for natural language interaction with one of three classes of users: A 'Modeler', who implements a model of some behavioral phenomenon; an 'Instructor', who tailors models for his course of instruction, and a 'Student Experimenter', who applies an experimental design to the model and receives synthetic data in return. None of these users need have any prior computer expertise nor do they depend on external documentation on how to use the programs.

Interpretative Systems in Instruction

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Computers in education should not only be used for organizing instruction, but they should be available to support user's problem solving. This is achieved by programs explaining themselves. In case of operations of an interpretative system such as APL this can be performed by the proposed teaching strategy. (3 refs., in German)

INSTRUCTION

Model-Building and Computer Simulation for Non-Programming Users

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Learning involves building internal (mental) models of reality, testing these models against reality, and correcting (debugging) the models when errors are found. The computer implementation of this notion assumes no user knowledge of computer programming. The computer is programmed to perform several information processing operations appropriate for a certain class of models, e.g. queueing models. The user builds a model by specifying the sequence in which the operations are to be performed. The program then runs a simulation of the model. Because the user has not written a computer program, any errors revealed by the simulation can be attributed to the logic of the model. The user debugs the model by changing the sequence of operations. Two sample model building programs, Q and EAT, are described.

Exploring New Worlds

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"New Worlds" is the title of one Physics Computer Development Project proposal. It aims at developing breakthrough subjects, graphic communications, and intelligent NL interaction. Collectively, these elements become literal play worlds wherein subject knowledge can be represented, manipulated, and made into new conceptual experiences. Teaching and concept testing in higher education can look to Piaget-like approaches. The strategies for doing this are based on firm successes with several existing educational programs. The paper looks at the microstructure and macrostructure of one particular New World approach.

INSTRUCTION

Teaching Computational Linguistics: A Continuation of the Discussion

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In designing courses in computational linguistics for arts students, in particular, an optional postgraduate course in CL within the overall framework of an M.A. course in General Linguistics, it is both feasible and valuable to base such courses on a strong foundation of practical computing, providing that sufficient attention is paid to teaching students to program well and that students are encouraged to discriminate between problems suitable for computer solution and problems more aptly tackled by other means.

The Use of a Computer in Devising A Beginners' Latin Course

C. W. E. Peckett

Association for Literary and Linguistic Computing Bulletin 3: 158-60, 1975

There was a need to devise a one-year course of forty lessons for beginners at university level. It was clear that emphasis should be placed on the ability to translate, furthermore, the Direct Method could not be used. Target texts were chosen and analyzed by computer to ascertain the vocabulary and grammar. Texts were pre-edited to enable word forms to be identified. The computer produced several lists, for example of all the word forms of all the words and frequency of use, verbs used in various forms of the subjunctive. Analysis revealed facts about Virgil's style which may be of interest to both linguists and classicists. Details regarding the method of translation are given, all words being considered in the order in which they come in the sentence--the order in which the Romans heard and understood them.

INSTRUCTION

Computers and Mathematics Instruction

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Computers and Mathematics with Applications.1: 121-32, January 1975

1) It is important that every educated person understand some of the principles on which computers operate. 2) There is an important relationship between mathematics education and computers, both in the sense that the mathematics curriculum can contribute significantly towards teaching students about computers, as well as in the sense that computers have a role to play in mathematics education. The latter point is shown by several examples which are discussed in detail. It is also argued that high school mathematics teachers can obtain the required knowledge to use computers effectively in their teaching by taking two one-semester courses as part of an in service training program.

Schemas: The Brain's Representation of Domains of Interaction

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The brains of humans and animals contain a large number of different subsystems - schemas corresponding to different domains of interaction in which the animal might find itself. At any given time, these schemas are at different levels of activation - and it is the most active schemas which between themselves constitute the current representation of the animal's environment. These schemas must comprise three types of routines: (1) *inputmatching* routines that sample environmenta stimuli as well as the activity of other schemas to determine whether in fact activation of that schema appears appropriate; (ii) *action* routines which can control movement or activate other schemas, in a way that is appropriate for interaction with the domain of interaction which the schema represents; and (iii) *competition and cooperation* routines which serve to increase the activation of other schemas consistent with the given schema, while depressing the activity of schemas which are mutually exclusive.

The Fundamental Theses of Neuro- and Psychocybernetics (Neurocybernetics)

C. Balaceanu, and G. Dona

Neurological sciences, cybernetics and general system theory achieved enough progress in the last decade to permit the establishment of a satisfactory theory of the functioning of the nervous system. An axiomatic-like theoretical skeleton for neurocybernetics and psychocybernetics is proposed in the form of eight theses which can be considered as the essential aspects of the formal framework needed for the actual interpretation and the future development of our knowledge in the field of brain research.