A MODEL OF THE PERCEPTIVE PHONETICS, ATTENDED BY THE HUMAN MEMORY

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The ifluence of the perceptive phonetics for systems with AI is actualized,in model describing: 1)HUMAN MEMORY (sensor and imagine-bringing instantaneous memory;short-term memory - direct,operative,buffer;long-term memory,super long-term and meta memory) 2)PERCEPTIVE PHONETICS (The zone perceptive basis of the natural language has been reserved in the long-term human memory like standarts and principles of these standarts,with the segmental and supersegmental common and complicated language units and their features).

Recent developments in perceptual phonetics - part of the study of human perception of speech are associated with advances in the fields of psycho-linguistics,knwoledge engineering and applied AI,pattern recognition,etc.

We assume a zonal organization of templates in long-term memory (LTM) with the following structure :
- there are some primary (atomic?) phonetic units expressed by some domain of the space of values of certain parameters (each of them corresponding to a single measurable physical characteristics)the rest of the units being compound and corresponding to composite systems of domains of the parameters;
- to compound tenplates there correspond parameters of two types (type A and tape B). The units of type A are compound units for which the set of characteristics is the same for any two opposite units and these are distinguished only by the integral value of the compound parameters,e.g. the compound characteristics of accented and unaccented syllable: they both have the same set of parameters,such as duration of the vocal part, duration of the consonant part,intensity of the syllabic peak,frequency of the basic tone,etc.;they have non-intersecting regions of values of tho compond parameters (so that syllables with or without accent could be told appart).The units of type B are distinguished from opposite units by the existence of a parameter which is absent in the representation of the counterpart (any phoneme is an example of this type of unit);
- thus in contrast to units of type A the identification of units of type B may be based on a specific set of characteristics and not on an integral compound characteristics (as happens in case of units of type A).Based on experimental data,a hypothesis is put forward in 2 that the compound parameters of units of type B can themselves be composed by units of type A.In particular,distinct differential characteristics of the phonemes,occuring in different units,can be established by summing up the values of its components ;
- the templates in LTM of the phonetic units which correspond to sound images in EIM can be represented as zones of identical perception (ZIP).These ZIPs correspond to regi ons in the space of parameter values in which any two realizations are id entified.So any change of the values of the parameters within the limits of the region leads to perceptually indistinguishable realizations. Such a view on the functioning of the templates is founded on ignoring in the perceptual basis of the language of the variations which are small.On the other hand identical reaction to phisical features that are "near" enough is phisiologically natural.In this respect it resembles the law of "all or nothing" ;
- an immediate neighbourhood of a ZIP is the zone of similarity to the template (ZST).The ZIPs of disctinct phonetic units do not intersect,moreover they have non-interecting closures in the topology,generated by the notion on nearness,while the ZST may well have non-empty common parts and this is one of the explanations for ambiguous perception ;
- for units that do not have a corresponding sound images the existence of a zone of identical reactions can also be conjectured as well as of zones of similarity ;
- the categorical character of speech sounds' perception is rejected,i.e. we do not need the notion of different speech sounds being comprehended in two completely different ways:"categorial" and "non-categorial";
- the boundaries of the zones (in particular of ZST) are quite unstable.This could explain the process of chage of the phonetical background of a language.The unstability of the boundaries have been established by experiments and it seems to be a result of different extralinguistic factors.A very substantial shift in the boundaries can be observed when a specific psychological attitude is adopted during the experiment - a fact that leads sometines to assimilative or contrastive perceptual illusions,and for this matter should be taken into account when determining templates' boundaries by phonetic experiments.

Under units of primary perception we understand templates for such segments and supra-segments of the speech flow that are operative in establishing the "sounding of an utterance.In experiments with uncommon combinations of consonants the stimili have been comprehended with big distortion.This fact shows that the units of primary perception are not the phonemes,i.e. in theperception of unusual combinations of consonants comparison is carried out not with the templates of some phonemes,but with templates of their combinations.If in the set of templates in the perceptual basis of the human mind there is no suitable tamplate (exactly fitting) the sound image is mapped to all the nearest such templates (in the topology) and to all combinations of them until a suitable combination is found and a satisfactory similarity is established.Of course,another possible explanation is that phonemic templates are indeed the templates of primary units and un the perception of a soundimg word a simultaneous correction is taking place.But data from 2 and 5 supports the view that this is not the case and that the units of primary perception are not the phonemes,but certain their compounds,in particular - the syllables.One more reason for this is the fact that in experiments with perception of syllables the reaction time

for single phonemes is much greater than the reaction time for syllables themselves. Thus one is bound to insist that the real formative units are the syllables.

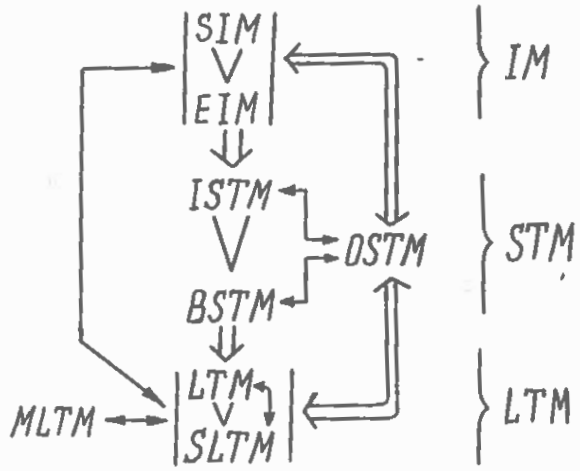
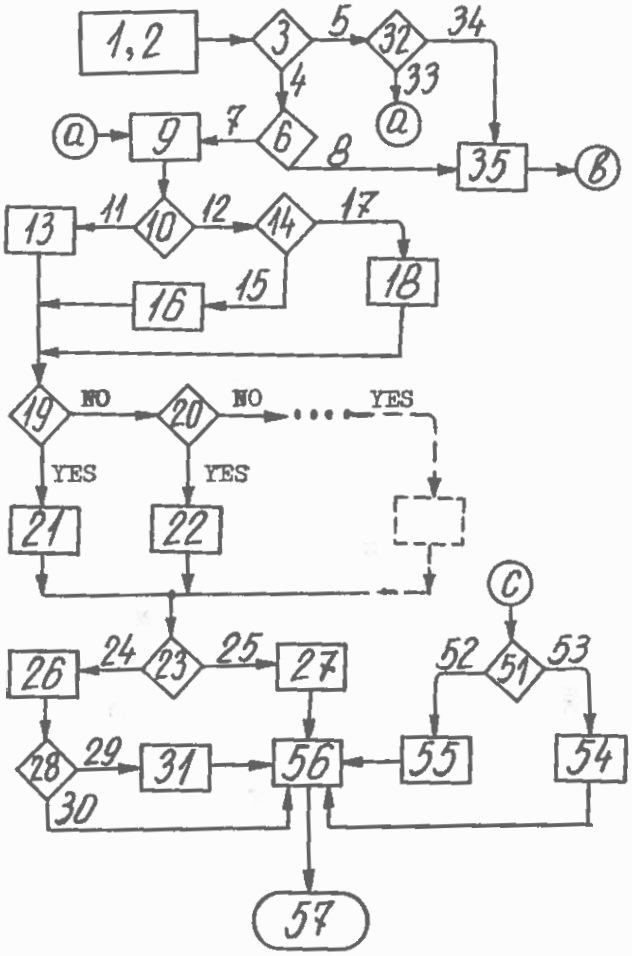


Fig.1. Internal structure of human memory(HM) (Instantaneous memory: SIM - sensory instantaneous memory; EIM - eidetical instantaneous memory. Short-term memory: OSTM - operative short-term memory; ISTM - immediate short-term memory; BSTM - buffer short-term memory. Long-term memory: LTM - long-term memory; SLTM - super long-term memory; MLTM - meta long-term memory. ⟹, ⟹ - information flow, ⟷ - control and feed back).



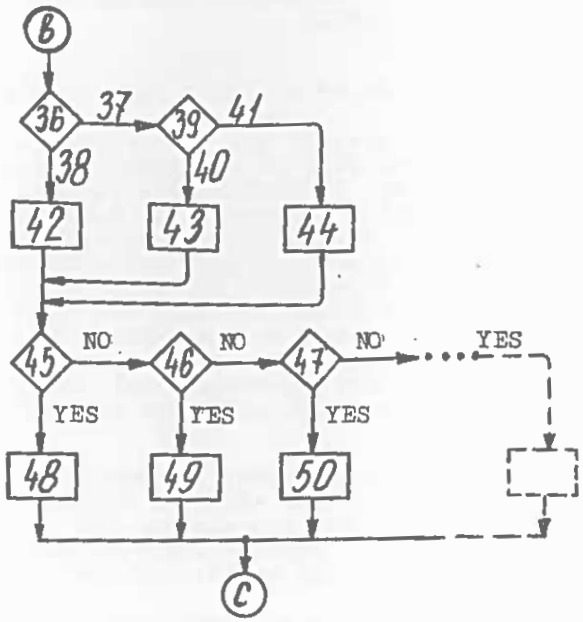


Fig. 2. A flow-chart of a part of the verbal phonetic perception based on the system of human memory (1. Phonetic units as speech chains in SIM and EIM; 2. Templates in LTM; 3. Is the phonetic unit a segment or a suprasegment? 4. Segment; 5. Suprasegment; 6. Do the templates correspond to sound images or not? 7. Corresponding to sound images templates; 8. Otherwise; 9. Comparison in OSTM of segments from EIM with templates from EIM with templates from LTM; 10. Are the compared images simple or compound? 11. Simple; 12. Compound; 13. Comparison of the simple segment image (coming from EIM) with primary templates; 14. Is the compared compound image of type A or type B? 15. Type A; 16. Type A comparison (using integral values); 17. Type B; 18. Comparison of type B (coincidende of all component parameters and nearness of their values); 19. Is the image-unit from EIM an intonation model? 20. Is it a rhythmic structure? 21. Comparison with appropriate templates from LTM; 22. The same; 23. Do we have a perfect fit (i.e. we are inside the ZIP)? 24. In the ZIP; 25. In ZST; 26. Interacting OSTM and LTM recognize the unit of the semantic zonal space of LTM; 27. A similarity is established; 28. Are parameter compensating? 29. Compensating parameters; 30. Not the case; 31. The compound unit is a "syllable/type A"; 32. The suprasegment unit has a template of sound image? 33. Sound image; 34. Not a sound image; 35. Comparison with templates which are not templates of sound images; 36. Simple or compound? 37. Simple; 38. Compound; 39. Type A or type B? 40. Type A; 41. Type B; 42. Comparison in OSTM of the simple image, coming from EIM, with templates from LTM; 43. Comparison of compound images of type A; 44. Comparison of compound images of type B; 45. Is this unit-image a feature of phonemes? 46. Is it a bemolity? 47. Is it a diffusion? 48. Establishing the corresponding property; 49. Establishing a bemolity; 50. Establishing a diffusion; 51. Is the fit exact? 52. Yes, it is in ZIP; 53. No, it is in ZST; 54. Evaluation of the nearness; 55. Interacting OSTM and LTM recognize the copo sition (identity reaction); 56. Forming the recognized unit-percept; 57. Ready for a new round.).