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SEPTEMBER 20-23 1989 BANGALORE

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M.P. Ramanujan
Engineer (Aero)
Aircraft Design Bureau,
ADA (Systems), ADE Campus,
C.V. Raman Nagar,
BANGALORE - 560 093.

Dear Sir/Madam,

* Welcome to Bangalore and CSI-89.

* I am very glad to inform that your paper on "*A Case for Sanskrit as Programming Language*" has been accepted for presentation in CSI-89. Hope you would have received my telegram already on this.

* I am sure that you would have received the registration forms from our Registration Committee for CSI-89. CSI-89 Organising/Programme Committees have decided that the author presenting the paper need not pay the registration fee; but he has to register by filling up and sending the registration form to us. Column under Registration fee must be filled as "FREE".

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Dr. R. Srinivasan, Chairman, Programme Committee
Head-Computer Centre,
National Aeronautical Laboratory
Post Box No. 1779, Bangalore-560 017.
Phone: 563410
Telex: 0845-2279
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* See you in CSI-89!!

Yours sincerely,

(R. SRINIVASAN)

Dr. R. Srinivasan, Chairman, Programme Committee
Head—Computer Centre,
National Aeronautical Laboratory
Post Box No. 1779, Bangalore-560 017.
Phone: 563410
Telex: 0845-2279
Grams: NAEROLAB

A Case for Sanskrit as Computer Programming Language

P. Ramanujan*

Abstract

This paper briefly enlists the features of Sanskrit language and suggests the use of the same for Natural Language Processing studies and applications. The potential predicted has to be verified by computer experts. Certain advantages of Sanskrit mentioned may find use in some of the frontier areas of Computer Engineering Research, notably in AI and Knowledge-based systems.

The view-point expressed here is that a Sanskrit-based Compiler or interpreter may have to be developed to unearth the hidden treasures in Sanskrit technical literature. Other countries in the West also, of late, have undertaken similar studies and it would only be appropriate if Sanskrit gets the type of recognition that it so richly deserves in its own land even in areas of advanced technological research, for which it is undoubtedly suited intrinsically.

Hardware and Software aspects involved in translating the suggestions contained here is for the Computer experts to consider while the Author would remain at the disposal of such interested researchers/organisations for further inputs and/or discussions/clarifications etc.

I. Introduction

Transaction Processing involves Receipt, Storage, Manipulation/Processing, Transfer and Retrieval of Information. Electronic Data Processing has a wide range of applications these days owing to the enormous strides the field has taken in recent years, both in terms of hardware & software developed and available to common man. Speed, flexibility, computing power, peripherals and interfaces have virtually extended the scope of computers to almost every facet of human endeavour.

Routine (mechanical) processing functions have given way to intelligent processing systems and high level languages are nearing natural language-like structure ceaselessly. Object-oriented programming languages are turning even symbolic programming languages obsolete; Programs tend towards expert systems. Such is the galloping progress of Computer Engineering (hardware & software) that, it is the time to think of an almost as-old-as-the-world language of the Orient, namely, Sanskrit, in all its majestic glory, to be considered as a candidate for computer programming, in the fields of Natural Language Processing & Artificial Intelligence.

Be it knowledge representation or speech synthesis, natural language processing or machine translation, intelligent tutoring systems or unambiguous semantic extraction, study of complex mathematical problems or linguistics, in virtually any field, one can think of utilising the richness, strength, accuracy, efficiency, structure, flexibility and the extant works available in the Sanskrit language.

* Aircraft Design Bureau, ADA (Systems),
C.V. Raman Nagar, Bangalore-560 093

One of the prerequisites for such an ideal blend of the oldest and gramatically best structured natural language and the newest of the emerging topics of computer world is an appreciation of the real potential of both sides of the equation. In fact, recent efforts at bringing together Sanskrit and computers show encouraging results. In 1984, Dr. Rick Briggs of USA highly recommended Sanskrit as 'the' candidate for machine translation interlingua. In 1985 & 1986, conferences were held at Bangalore to correlate data on perception, knowledge representation & inference, as found in science and shastras through Sanskrit. Ever since, many institutions at home and abroad, have engaged in research in this area and have brought new ideas to the fore.

In a recent national conference on "Samskritam and Computers" held at New Delhi, the signal was clear that concerted efforts to enlist all interested persons from scholarly and computer backgrounds for a national directory to be prepared to ultimately create computer programming environment using Sanskrit extensively, was very desirable.

In a paper presented at the said conference, the author had dealt with the concept of using Sanskrit as the natural language for AI-related, particularly, knowledge based systems, citing the case of determining sentential import.

A few fundamentals of the suggestion would be described here. The fundamentals dealt are: Definition & characteristics of knowledge, Phonetics, Analysis of parts & forms of speech, Flexibility in word formation, structure of Grammar, Disambiguation rules/procedures/criteria, variety and richness of technical literature and Etymological & exegetical aspects, as found in oriental works.

II. Definition & Characteristics of Knowledge

Knowledge is of two types, i.e. knowledge about self and that about other (non-self) things. The former is termed as "Consciousness" while the latter is a quality of it. Generally, the latter is meant when we talk of knowledge since the former is not a subject of anything other than itself. The Consciousness is sentient, i.e. possesses knowledge, animate, i.e. takes on inanimate bodies, and always aware of itself as one in number and pleasant and favourable to itself. That is to say, for any living being, the self is known automatically always, the Self or life is most desirable and all actions are intended to make the Self happy. This Consciousness is also called variously as Awareness, I-ness, Self, Soul etc.

Knowledge is an attribute of sentient (conscious or living) being. It is a matter existing in the dual forms of particle and waves (like light). It manifests in many forms. Scriptures list many 'states' of knowledge like Cognition, Inference, Happiness, Sorrow, Wish, Love, Hate, Envy, Effort, Determination, Doubt, Mistake, Decision, Religious Belief, Courage, Shame, Intelligence, Fear, Emotion, Avarice, Ignorance, Arrogance, Tranquility, Comprehension, Retentivity, Recollection, Logic, Devotion and Science. Knowledge always goes with its subject, i.e., knowledge of 'what?'. The subject of knowledge may be any object described by a name and form.

'Illumining' with an agent or object is an essential characteristic of knowledge. So also are unsurpassed Speed, Subtlety, Lightness and self-luminence while presenting objects. Knowledge is non-sentient, i.e. it does not possess knowledge. That is to say that knowledge does not know itself. The two concepts of self-illuminating and sentience are to be clearly understood. A lamp is self-illuminating in that it does illuminate itself as well as other objects. But it does not know itself, which is sentience, and hence we say lamp is non-sentient.

Knowledge is akin to a lamp in this sense. In contrast, Consciousness is sentient, i.e. it knows itself or it has knowledge as an attribute.

Since as yet there are no ways invented of creating life, we cannot aim to create knowledge. In AI, therefore, a simulation of an intelligent human activity can be attempted. For this also, Analysis in Metaphysics holds valuable clues. Here, all objects (things with name and form) are classified into two categories as Instruments or Sources of knowledge and Subjects of knowledge. The instruments of knowledge are of three types, viz. Sensory Perception, Inference and Verbal Testimony. The first of these could be simulated for applications like Robotics, while the last two are useful in AI research. The representation and usage of these according to Oriental works is well worth a try.

III. Phonetics

One of the significant advantages of Sanskrit is that the grammar ensures total precision and guards against ambiguity, mis-spelling and mis-pronunciation as the meanings are bound to get altered otherwise. The real advantage is that since the correlation between written and spoken forms is one to one, the two forms of input can be exchangeably used. The analysis of alphabets (characters) is based on sound production from well-defined places of utterance and hence, comprehensively and clearly covers all possible cases.

Sound emanating from distinct places of utterance have been identified, e.g., Throat (guttural), Palate (palatals), Head (cerebrals), Teeth (dentals), Lips (labial), Nose (nasal), root of the tongue and a combination of these. Besides origin of sound, all syllables have other attributes like effort (internal and external) required to pronounce, timing (short, long and prolated), accessories/instruments necessary, accents (acute, grave and circumflexed), connotation (vowel, consonant, conjunct), etc. ^{which} fix a given literal with its meaning. Besides this, all valid words have proper derivation/deduction from finite set of well-grouped verb-roots and noun-bases so that what is meant is uniquely determined and accuracy ensured. This concept is not opposed to that of flexibility in word formation as will be explained later in this article.

Speech synthesis can possibly benefit by this feature immensely since accent, frequency, emphasis and timing oriented discrepancies associated with other natural language speech inputs are absent here. Context and intention related choice of the right meaning when more than one possible meanings can be taken is to be treated separately as in any other natural language case, but even here, there are some precise guidelines available as will be clear later.

IV. Analysis of Parts & Forms of Speech

The Annexure brings out the various categories of words in Sanskrit and accordingly, a matrix of all possible, valid word forms can be automatically generated by formalisation of the grammar rules. This is an area for quite in-depth study and research through application programs, best written in Sanskrit, if the present suggestion is realisable. A detailed discussion of the parts of speech is not called for here, and about the forms also, it is enough to note that there are nine distinct types identified (as in Annexure) and this greatly enhances the utility of a natural language for computer interaction. The grammar has simple, effective rules for conversion between various forms and sentences.

V. Flexibility in Word-Formation

All valid word-forms have two significant parts, namely, the stem or substrate (verb-root for verbs and nounbase for noun-forms) and the affixes (prefix and/or suffix). These are also indicated in the Annexure. With respect to the admissible combinations of substrates and affixes, there are elaborate but clear rules specifying these with the attendant changes in the meanings denoted, the latter being derivable strightaway. This is the admirable blend of rigid framework but flexible application, often likened to a golden ingot that lends readily to a myriad forms of ornaments through malleability and ductility while retaining strength. It is remarkable that across the Universe, there cannot be distortions in Sanskrit either written or spoken, according to Paninian Grammar and violations of it will be transparent at once to the linguists.

VI. Structure of Grammar^a

Panini's structure of Sanskrit Grammar has won the admiration of linguists of all ages and regions. The grammar is sound based in that as explained earlier, throat, tongue, head, teeth, lips, nose etc. are identified as origins of various literals and in dealing with such analytically formed sounds, other parameters enumerated earlier are used effectively.

All technical literature in Sanskrit have a fundamental set of 'Aphorisms', which are short, pithy, versatile sentences that capture the concepts thoroughly. These are termed as "Sutras". (A Sutra by definition, is a statement that has minimum literals, i.e. very brief, unambiguous, purposeful, universal & versatile, i.e. can apply to a large number of cases by generalisation, free from errors, inadequacy, fillers, etc.). Grammar rules are also in this 'Sutra' style which greatly condenses the amount of instructions or information to be given to precisely convey a particular aspect. Hierarchy, Sequence, Precedence, Priority, Normal & Exception rules, Grouping, use of Designators or Operators (control characters), explicit instructions for interpretation in particular cases, generalisation, Chaining, Restriction, Extension, convention etc. impart the needed flexibility while maintaining the control on validity of word-formation.

The Grammar rules are contained in eight chapters with four quarters per chapter. They total a little less than 4000 in number, the longest of them containing no more than 90 alphabets! But within this, the total array of all possible, valid word-formations, are covered comprehensively with no ambiguity whatsoever. The verb-roots are separately listed and number a little above 2000. All declensions of noun-forms are categorised into about 225 different types based on gender and ending character (vowel, consonant), including special forms. Each noun take on 24 forms (3 numbers and 8 cases), viz. Nominative, Vocative, Accusative, Instrumental, Dative, Ablative, Possessive or Genitive and Locative. The numbers are singular, dual and plural. While an exhaustive list of Nouns has to be obtained from other sources (like the famous Lexicon-'Amarakosa' etc.), Panini has laid down general rules for determination of gender etc.

Verb-roots are grouped into ten categories each having a given group suffix, besides verb forming suffix, added to the roots to form verbs. Clasification of verbs is quite elaborate and there are six tenses and four moods in which verbs can be expressed. Besides, there are many special forms derivable from verb-roots. Verbs used to denote action for self and for others have different connotations, as also those that go with either or both the types. There are 3 numbers as in the case of Nouns and verb-roots can take one of 3 persons (analogous to cases), i.e. first, second and third (I, you and It). Verbs are invariant with gender.

There are other interesting word-forms such as Governance or functional Clauses, the combined and compound types with the attendant rules for operation on them. These are the ones that require utmost

ingenuity to formalise and represent in Computer. Also, these are intention-dependant and require context information for interpretation. This is a very challenging area for research and has a potential to achieve maximum brevity possible in a given situation. Certain word forms that are invariant with gender, cases, numbers, roots, etc. are called Indeclinables and these are also dealt with effectively in Panini's Rules. The emphasis here is not on details but to highlight the scope for computerised research to benefit from. After all, there are celebrated works analysing very critically these sutras and we should be able to adopt them usefully before it is late. The advantages of traditional form of study in Sanskrit could then be had by all.

VII. Disambiguation Rules/Procedures/Criteria

The absence of syntax in Sanskrit is a definite plus point in its favour. The semantics also can be extracted by well laid out procedures. Here, apart from Grammar, the rules of Syllogism (a branch of study dealing with logic) and Mimamsa (study of Scriptural Texts) are utilised. Mechanism of associating meanings with words is dealt with in detail and guidelines for establishing meanings at word, sentence and discourse levels are given. Accordingly, various criteria like Expectancy, Proximity, Compatibility, Primary and Secondary. Denotation, Implication, Context, Suggestion, Relevance, Placé, Time, Commencement, conclusion, Repetition (Emphasis), Novelty, Utility or Objective, Figurativeness, Propriety etc. are indicated for getting at the meanings intended to be conveyed.

Within the rules of a particular branch of study also, rules to guide priority, conflict handling, exceptions, special cases etc. are well-defined to ensure precision and accuracy. Also, there are numerous illustrations provided in later works to explain the fundamentals contained in Sutras, which are invariably authored by great Sages. These works include commentaries, treatises, notes and expositions. The extent of technical literature available as of today also is by no means small and one should impartially analyse them for what they are worth with an open mind. When the same language is used for such a study also, it would be very appropriate and original, as the ideas can be captured precisely.

VIII. Variety and Richness of Technical Literature

Technical literature in Sanskrit comprises of 14 branches of Learning. These are the four Vedas (Scriptures), Rig Veda, Yajur Veda, Sama Veda and Atarvana Veda, the six vedic auxiliaries, namely, Phonology, Grammar, Prosody (Metrics), Etymology, Astronomy and Ceremonial Directory (Ritualry), Study of Vedic Texts, Syllogism (Logic), Epics and Codes of Moral Rectitude. There is a great treasure of knowledge contained in these in an efficient and streamlined manner. Discounting controversial claims and exaggerations, we need to dispassionately study these and take what is worth.

There are other branches of study dealing with matters like Vedic mathematics (which is currently undergoing a great resurgence), Astrology, Chemistry, Medicine, Aeronautics, Metallurgy, Warfare & Weaponry etc. which are less popular and more depleted in terms of available, useful literature, but nevertheless require a tool like the one suggested to tap the contents properly. It is not an easy task either, but concerted efforts have no barriers that are unsurmountable.

Besides technical literature, there are numerous literary works that enrich the language particularly and Linguistics in general. For intelligent Tutoring etc. this may prove quite useful. Thus a study of Sanskrit literature using Sanskrit in a Computer seems to deserve consideration.

IX. Etymological & Exegetical Aspects

As mentioned earlier, all Sanskrit words can be properly traced to their origin or 'root' and the process of derivation/deduction is straightforward, transparent and simple. The Vedas contain word-forms that are relatively tougher to analyse compared to those used colloquially but even their analysis is well defined by various high level processes like Aphaesis, Syncope, Haplology, Anaptixis, Metathesis, Assimilation, Dissimilation, Aspiration, Deaspiration etc. in Exegetic / etymological studies. Morphology, Synonyms, Homonyms etc. aid the process of Semantic Extraction even in the toughest cases so that ambiguity is removed at all costs. This is a very fertile area for in depth research to formalise a rational theory of Natural Languages.

X. Conclusion

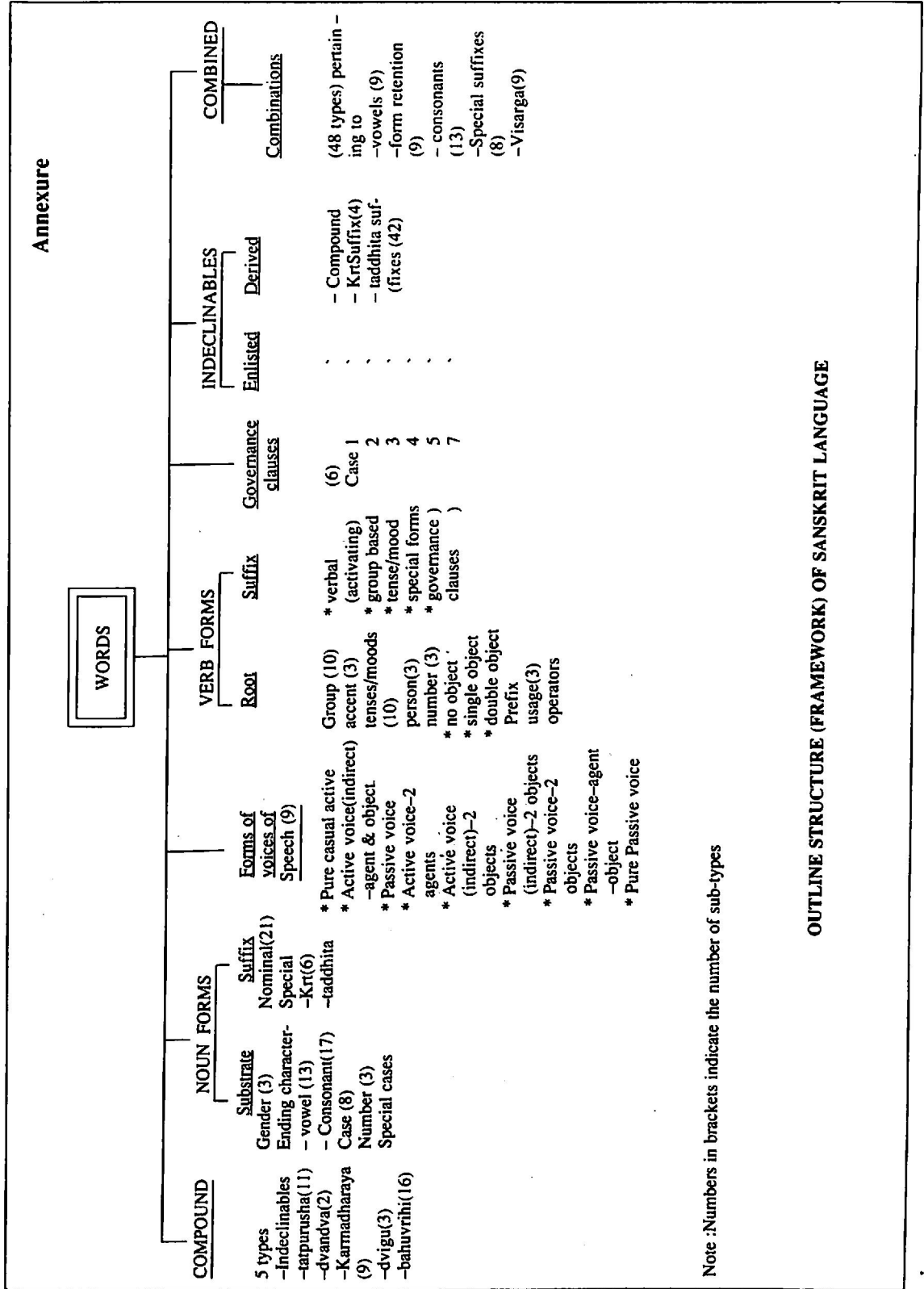
The Author wishes to request the Computer experts to spare a thought to the prospect of devising a way to realise Sanskrit as a computer language for analysis of classical treatises on topics aforesaid available in that language. It is felt that a few basic primitives/processes, if defined suitably, to cover the various branches of study would amply aid in the venture so that the fast fading generation of erudite traditional scholars could be given an opportunity to write application programs in Sanskrit for a critical and scientific analysis of shastric literature.

An Expert System for extracting the contents of the works noted also might be a good attempt in this direction.

It is not intended to oversimplify matters and hold out empty promises but as latest feasibility reports resulting from researches conducted at home and abroad indicate a trend conducive to this that a few merits are brought out in support of the same.

References:

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3. "Masthishka yanthre Sabda - bodha Prathiroopanam" and "Computer Representation of Sabda-bodha" by Ramanujan. P. Pre-Conference Papers of the National Conference on "SAMSKRITAM AND COMPUTERS", April 27-28, 1989 at New Delhi.
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OUTLINE STRUCTURE (FRAMEWORK) OF SANSKRIT LANGUAGE

கம்ப்யூட்டர் கட்டளை மொழியாக சம்ஸ்கிருதம்!

பெங்களூர், செப். 24— கம்ப்யூட்டரின் கட்டளை மொழியாக (Programming Language) பழம்பெரும் மொழியான, சம்ஸ்கிருதத்தை உபயோகப்படுத்த முடியுமா?!

முடியும், என்கிறார் விமான இன்ஜினீயரும், வேத அறிஞருமான பி. ராமானுஜம்!

இங்கு நடந்து முடிந்த இந்திய கம்ப்யூட்டர் சங்கத்தில், “கம்ப்யூட்டர் ஆணைத் தொடர் மொழியாக சம்ஸ்கிருதம்” என்று ஆய்வுக் கட்டுரையை அவர் சமர்ப்பித்துள்ளார்.

சம்ஸ்கிருத மொழி துல்லியமானது; இம்மொழியின் இலக்கணம் மிகக் கட்டமைப்பானது. மேலும் தொழில் நுட்ப வார்த்தைகளை உருவாக்குவதற்கும், அவற்றை தொகுத்து வைப்பதற்கும் சம்ஸ்கிருத மொழி பெரும் பொக்கிஷமாகும் என்று ராமானுஜம் கூறுகிறார்.

சம்ஸ்கிருதம் ஓ சில பேருக்கு மட்டுமே தெரிந்த மொழி என்றும், ப்ராண

இதிகாசங்களின் மொழி என்றும் சிலர் நினைக்கின்றனர். ஆனால், உண்மையில் சொல்லப் போனால் இசை முதல் வானியல் வரை எல்லா விஷயங்களையும் கம்ப்யூட்டரில் பயன்படுத்த சம்ஸ்கிருதம் ஒரு பொது கட்டளை மொழியாக அமைய முடியும் என்று ராமானுஜம் கூறுகிறார்.

சம்ஸ்கிருதத்தை ஆழப்படித்தால் தான் அது ஓர் உயிருள்ள மொழி என்பது புரியும் என்றும் 20-ம் நூற்றாண்டின் மனிதத் தேவைகளுக்கு ஏற்றபடி சொல்லாகக் கம் உள்ள மொழி என்றும் தெரிய வரும் என அவர் கூறினார்.

கம்ப்யூட்டர் இன்ஜினீயர்கள் சம்ஸ்கிருதத்தை கற்று அதை ஆணைத் தொடர் மொழியாக பயன்படுத்த வேண்டும் என்றும், இதே போல சம்ஸ்கிருத அறிஞர்களும் கம்ப்யூட்டர் பற்றி தெரிந்து கொள்ள வேண்டும் என்றும் அவர் கேட்டுக்கொண்டார்.

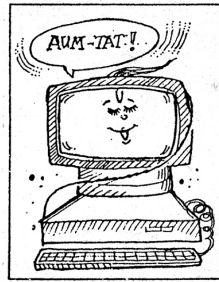
சம்ஸ்கிருதத்தை கற்றுக் கொள்வதில் இன்று வெளி

நாட்டினர் ஆர்வம் காட்டுகின்றனர். சம்ஸ்கிருதத்தை வர்த்தக ரீதியில் பயன்படுத்துவது பற்றி ஆராய்ச்சி நடத்த பெங்களூரில் உள்ள ஒரு பல்நாட்டு வர்த்தக நிறுவனம் 60 லட்சம் டாலர் (சுமார் 9.6 கோடி) தர உத்தேசித்துள்ளது என்று கூறிய ராமானுஜம் புனையில் உள்ள நிறுவனம், கம்ப்யூட்டர் கட்டளை மொழியாக சம்ஸ்கிருதத்தை பயன்படுத்த தமக்கு உதவ முன் வந்துள்ளதாகக் கூறினார்.

கம்ப்யூட்டரில் உபயோகிப்பதற்காக மற்றொரு வெளிநாட்டு நிறுவனம் வேதங்களிலிருந்து சொற்களை சேகரித்து வருகிறது என்று அவர் கூறினார்.

வெளிநாட்டினர் செய்து வங்கினால் நம்மால் ஏன் முடியாது? என்று ராமானுஜம் கேட்டார்?

இவ்வாறு சம்ஸ்கிருதம் கட்டளை மொழியாக மாற்றப்பட அரசுமற்ற அமைப்புகளின் ஆசிரியம், ஆர்வமும் இல்லை து பற்றி ராமானுஜம் வருத்தம் தெரிவித்தார்.



The Booting Of Sanskrit

● Incredible as the digging up of a dead language to transform it into the hi-fi lingo of the 21st century may seem, the event might just take place. If a certain Vedic scholar by name P Ramanujan has his way, that is. The gentleman, who presented a paper titled 'Sanskrit as a computer programming language' at the recently-concluded 24th annual convention of the Computer Society of India, claims that the ancient tongue is just

perfect for technical use. "When you speak of Sanskrit, people only think it is a language of a few and known for its kavyas," stated Ramanujan. "But a deep study of the language will show that it is so dynamic that it can easily adapt itself to 20th-century human needs. And if a foreign agency can collect data from Vedic scriptures for computer use, why can't we?" So, will the brogue of the olden-day brahmins soon be ranged alongside Basic and Fortran? Watch this space.

Times Of India
Bombay 26-9-89

Sanskrit bit by bit

DOES Sanskrit, the ancient tongue of Vedas, have the potential to become the language of the modern computer?

A vedic scholar, Mr P. Ramanujan, who presented a paper, "Sanskrit as computer programming "language" at the just-concluded 24th annual convention of Computer Society of India (CSI), said "yes."

Mr Ramanujan, who is an aeronautical engineer by profession, said that the language was precise and had a well-structured grammar. Apart from this, Sanskrit was also a treasure house of technical literature and documentation.

Utilisation of Sanskrit as a computer language would help covering a wide range of subjects such as musicology and astronomy. When you speak of Sanskrit, people only think it is a language of a few and know for its Kavyas. But a deep study of the language will show that it is such a dynamic language that it can easily adapt itself to the 20th century human needs," he said.

Indian Express Cochin Edition
26-9-89

Sanskrit for computer

Bangalore, Sept 25 (UNI): Does Sanskrit, the language of the Vedas, have the potential to become the language of the modern computer?

Vedic scholar P. Ramanujan, who presented a paper "Sanskrit as computer programming language" at the just-concluded 24th annual convention of the Computer Society of India here, said "yes".

Mr Ramanujan, who is an aeronautical engineer by profession, said that the language was precise and had a well-structured grammar. Apart from this, there was a treasure of technical literature and documentation in Sanskrit.

"The utilisation of Sanskrit as a computer language would help to cover a wide range of subjects like musicology and astronomy. When you speak of Sanskrit, people only think that it is a language of a few, known only, for the kavyas in it. But a deep study of the language will show that it is such a dynamic one which can easily adapt itself to the 20th century human needs", he said.

Mr Ramanujan wanted computer engineers to learn Sanskrit and attempt to use it as a computer language. Similarly, Sanskrit scholars should be exposed to computers.

He said foreigners were showing interest in the commercial use of Sanskrit. A well-known US multinational, which has a

unit in Bangalore, has proposed to fund about six million US dollars to study the prospects of Sanskrit for commercial application.

Mr Ramanujan himself has an offer from the Pune-based Centre for Development of Advanced Computing, for working on Sanskrit in the programme called "Knowledge-based computer systems".

Another foreign agency was collecting data from Vedic scriptures for computer use. "If they (foreigners) can do that why not we?" he asked and added "if we can use Sanskrit on computer, the whole effort would at least be indigenous".

Mr Ramanujan said that he was also aware of the difficulties in the way of Sanskrit becoming a computer language. There was also lack of organisational and governmental support to use this language in these areas.

Mr Ramanujan, who is said to have completed the study of the Vedas at an early age, was to have continued in that line. However, he became an engineer and joined the Hindustan Aeronautical Limited from where he was deputed to the Aeronautical Development Agency.

It is his job as aeronautical engineer that made the 32-year-old Ramanujan think why the study of Sanskrit "a second nature to me", could not be linked to the modern computer.





DELNET
Developing Library Network

Dr. H. K. Kaul
Director

DELNET/NACLIN/KEYNOTE/2007

August 27, 2007

Dear Dr. Ramanujan,

I take pleasure in informing that DELNET is organising the **Tenth National Convention on Knowledge, Library and Information Networking** (NACLIN 2007) at the India International Centre, New Delhi from November 20-23, 2007.

The first nine National Conventions were organized in Delhi, Chennai, Hyderabad, Cochin, Kolkata, Pune, Bangalore and Jammu. The tenth National Convention is being organised on "*Libraries without Boundaries: Reaching the Unreachable in Knowledge Era*". Library and Information Science professionals from India and outside India are participating in this convention.

I would like to request you to kindly contribute a keynote-paper on "**Creation of Content in Local Languages**" for NACLIN 2007. DELNET will provide the air -ticket and hospitality in New Delhi.

We would appreciate if you would kindly agree to contribute the key-note paper on the subject which is very dear to you. The paper should reach us by October 15, 2007.

I look forward to receiving your acceptance.

With kind regards,

Yours sincerely,

H. K. Kaul

Dr. P. Ramanujan
Team Manager
C-DAC Knowledge Park
Opp. HAL Aeroengine Div.
No. 1, Old Madras Road
Bxappanahalli
Bangalore – 560038
Karnataka

J. N. U. Campus, Nelson Mandela Road, Vasant Kunj, New Delhi 110070
Tel: 91-11-32471001, 32471002; Fax: 91-11-24619325
E-mail: hkkaul@delnet.ren.nic.in; Web: www.delnet.nic.in