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Challenges and Importance of ICT in Quality Improvement of Higher Education

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Abstract - *Computer science is a very young and a rapidly developing discipline. Now the computer science discipline has completed near about 65 years. It's been an exciting and dynamic time and the contributions that our field has made to society and other disciplines have been profound. As the field has matured, there is a growing sense of diminished possibilities and this is understandable. At present the advances in mature areas may be harder to come but their absolute impact on society can be huge. This is a golden age for our field and in many important ways; the potential for research is unprecedented [1]. But there is still lack of identity in computer science as a discipline. In this paper we have shown challenges and importance of Information and Communication Technology in Quality improvement of Higher Education. We have proposed the necessary suggestions that need to be carried out to reduce the challenges of ICT and also for improving the quality of education in higher studies.*

Key Words: ICT, IT, CS, QUALITY, EDUCATION

1. INTRODUCTION

Computer Science is a very vast and continuously growing field. While the well-established parts of our field have matured, its boundaries continue to expand. Computer science and engineering has applications in all walks of modern life and in many areas we are just beginning to scratch the surface of what is possible. The ongoing revolution in the underlying electronics technology continues to create new opportunities for innovation. Computational barriers are coming down every day, bringing previously intractable problems within the realm of practical technological solutions. Real-time natural speech recognition and advanced computer vision systems are just two of the more obvious examples of technologies that are poised on the brink of widespread, practical applications, as the combination of technology and better understanding of the fundamental problems, removes the barriers that have prevented effective solutions in the past. One common characteristic of this new field is a growing emphasis on systems projects designed to demonstrate new research ideas and allow them to be evaluated in a realistic experimental setting. Increasingly, these projects require coordinated efforts by large groups, not simply the smaller efforts of individual researchers.

2. CURRENT CHALLENGES

- One of the challenges we face when discussing computer science education is that the field of computer science seems to evolve so quickly that it is difficult to clearly define its contents and prescribe its boundaries.
- Most of the people have made a mistake by thinking that the Computer Science field is only about the creation of software and software systems. Computer programming should not be at the heart of what we do, but instead, Computer Science should be relabeled itself as the field that focuses on "computational thinking" or one that "provides solutions to computational problems". Today there is a psychological problem with Computer Science: the field is in a malaise, experiencing an identity crisis [2] and questioning its value.
- Teaching Computer Science is also one of the challenge [3], at primary/10+2 level because there is no system of computer science certification or endorsement in present, teachers with little or no computer science training are also frequently assigned to teach computer science courses. There is a significant lack of consistency in computer science teacher certification standards in all the countries worldwide.
- There is no Curriculum for the computer science at the primary level due to lack of resources or any other reasons. It is treated as just only an optional subject,

  which is generally ignored by the rural area students, even some of them are experts in other subjects like mathematics etc. The impact of such criteria generates a huge gap between the rural students and urban students in respect of computer proficiency. And this gap reduces somewhere the quality of graduate and postgraduate

degree courses in computer science. This is also a great challenge in the quality of computer science discipline.

- One of the challenges that we must meet in this field is to find new models for organizing academic research, to allow the development of complex systems by larger research teams. While there have been many efforts along these lines over the years, the record of success is mixed. We need to do a better job, if academic research is to play a serious role in the development of advanced systems, and continue its record of important contributions to society and other disciplines.

3. COMPUTER SCIENCE IS A NATURAL SCIENCE

Initially the discipline was grown as Tool, known as "Artificial Science", and was also designated as the "3rd Pillar of Research"[4] joining theory and experiments but now it is regarded as "Natural Science" because the computing is inherently natural. The word "Computer Science" should be named as "Computing Science" because the word 'computer science' does not actually represent the actual spirit of the discipline. The sole of the discipline is "Computing", i.e. "Algorithm"[5]. The discipline of "Computing Science" is an outgrowth of Mathematics as well as Physics and hence is treated as the "Father" and "Mother" of the Computing Science.

4. CLASSIFICATION OF COMPUTING SCIENCE

The subject matter of computing can be broadly divided into two parts, applications and systems [6], respectively. The fig. shows the broad classification of computation field: applications and systems.

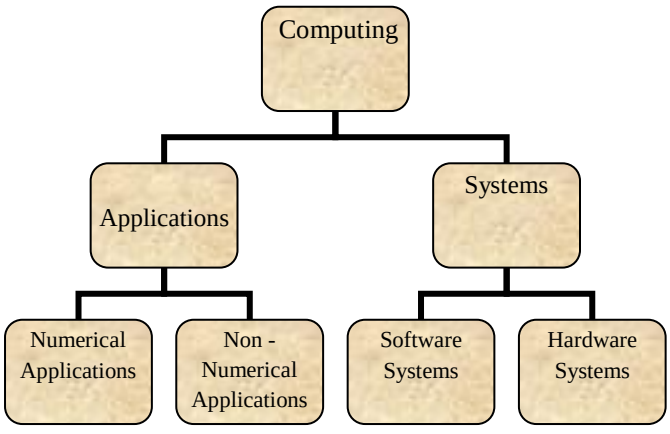

Fig.: Classification of computation

Computer applications can be subdivided into numerical and non-numerical categories.

The mathematical models and numerical data are dominant in numerical applications, and supported by numerical analysis, optimization, simulation, mathematical libraries, computational geometry, and computational science. The problems and information are represented as symbols and rules in Non-numerical applications, which are supported by artificial intelligence, multimedia systems, language processors, graphics, mathematical expression systems, database systems, information retrieval systems, and combinatorial processes.

Here Computer system is subdivided into software systems and hardware systems.
The machine-level representations of programs and data, schemes for controlling program execution, compilers, programming environments, network communications and management, and operating systems are related to the Software System. Now the logical designs, machine organization, processors, memory, and devices in various technologies such as VLSI, silicon are concern to hardware. Computer architecture and computer engineering are concerned with both software and hardware.

5. CONTRIBUTION OF COMPUTER SCIENCE IN OTHER DECIPLINES

Computing is also contributing to other fields by showing them how to model their processes as information processes. Some examples [7] are here:

- ***Library science*** is concerned with archiving texts and organizing storage and retrieval systems to give efficient access to texts. As digital library systems are built and attached to the Internet, libraries will change from storage places for books to electronic data centers, and will grant access well beyond their local communities.

- ***Management science*** is concerned with using computer models for planning and forecasting economic conditions for business.

- ***Economics*** is concerned with using computer models to forecast economic conditions and to evaluate the possible effects of macro-economic policies.

- ***Medicine and Biology*** have used computer models and algorithms in ingenious ways to diagnose and treat diseases.

- ***Forensics*** uses computer models and large databases to identify evidence and discover whether other forensic data matches current evidence.

- ***Psychology***, Cognitive, and Behavioral sciences are concerned with understanding human thought and emotions. They use computer models to gain insight into the operation of human brains and nervous systems and to design effective interventions into human problems.

- ***Linguistics*** is concerned with using computers to recognize speech, translate between languages, and to understand the role of language in human affairs.

- ***Philosophy*** is concerned with the way people acquire knowledge, create social realities, and act morally and ethically.
- ***Humanities*** have begun to use computer extensively to correlate and search through historical artifacts that can be represented digitally.

- In the ***space domain***, computer are used in mission planning that covers the generation of timelines of activities to be carried out by the various entities of a space mission in order to achieve its goal.

- In ***defense***, computers are used to track incoming missiles and help slew weapons systems onto the incoming target to destroy them. They are also used on Intercontinental Ballistic Missiles (ICBMs) that use GPS and computers to help the missile get to the target.

6. PROPOSED SUGGESSIONS

- Filter admissions: Here is a chance for multidisciplinary research; work with psychologists to devise a test that can be administered to students who apply to CS programs at UG and PG level. If any applicant is prone to develop math envy or envy of other field, then he/she should be advised to send the application to another field as per interest. It should only take about five years before we see a significant change in the students emerging from undergraduate and postgraduate programs. In this way boundaries of Computer Science will become higher and stronger.

- Thinking that Computer Science is only for developing software systems should be changed because this terminology about computing completely misses the key feature of Computer Science, if it stops dealing with the real world of computing then Computer Science will become irrelevant.

- There should be a certification degree or any other certification diplomas or professional certification in computer science that should focus on teachers' content knowledge. We believe that any preparation program for computer science teachers must include the following four major components:

  1. Academic requirements in the field of computer science,
  2. Academic requirements in the field of education
  3. Methodology (a methods course) and field experience.
  4. Standard academic certification in computer science education.

- A new Curriculum should be developed for the elementary computer education from initial level to the senior secondary level, so that the gap in computer proficiency level between a rural student and an urban student can be reduced. Curriculum is not only limited to decide or plan about teaching, learning and medium of instruction but in fact curriculum is an important pillar of an educational system, which is expected to improve the overall quality of education.

- Set up mini training session for faculty. Enable CS faculty to learn enough about commercial products to be literate. There are two benefits. First, if computer scientists can learn enough to be slightly ahead of an average user, they will feel better. Second, if they understand the limits of commercial products, faculty will help devise ways to improve them. The good news is that little is required to stay ahead of the general public. Many problems have a trivial fix (e.g., plug it in or reboot). Someone with a little technical knowledge who proceeds logically can seem like an expert when compared to an average user. Thus, a small amount of training can create confidence.

7. CONCLUSION

Computer science is a tool with a core set of scientific principles that can be applied to solve complex real-world problems and promote higher-order thinking. Today students want to be part of a discipline that is solving real problems, and they do not understand that computing is at the root of all of the new sciences. It can be used in any discipline as a tool for research, higher education and to solve real world problems of their own discipline in which they are expert. So the students should be suggested and motivated to search the real problems of their own discipline and should be trained to use computer science as a tool to solve these problems in their discipline. In this way the quality of education and research in India can be improved at a maximum level.

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