Message from CSI Leadership

Dear Students,

It is been my pleasure to interact with you through this newsletter. I am writing to you with my capacity as Consultant with Computer Society of India, Education Directorate, and Chennai. There were some problems in bringing out a couple of issues of Whizkidd due to some unavoidable changes. We would like to have some changes in the magazine. We wanted to cover the events and activities happened in the student branches. Request you to send us the details about happenings in your Student branches. I would like to motivate the students to stick on to his/her goals and work constantly towards achieving it.

At the end of the day, I want the students are employable but I find more than 80 % of the budding and aspiring jobseekers are struggling to meet the industry norms and demands. Thanks to our education system, this grooms them only partially. Apart from the system, another major player is the Peer factor. To get to their dream job, let us inculcate the few traits in them and the following result will also catapult them out from peer factor.

What is career?

C means Creativity, which is the out of box thinking
A means Attitude, which shall make or break one’s career.
R is for Robustness i.e. strong self conviction to implement a winning plan
E is for Education which is a passport to gain entry into an organization
E means Enterprising seizing opportunities and seeing them through
R of career means Result/Refinement
We need to visualize what a career can do for him/her. Wish to state that with strong conviction that everyone can reach the goal by having these traits in them and by doing so they can easily overcome the fear factor for ever. (Courtesy Mr. Murali Srinivasan)

Wish you all the best.

S Ramasamy
Consultant, Education Directorate
(Past Regional Vice President)
Computer Society of India

Inviting the Professionals and Student Members!!!

Opportunity for Significant Benefits from IEEE-CS!!
CSI proudly announces a partnership with IEEE Computer Society which will bring substantial benefits to the CSI Members.

CSI and IEEE-CS signed a MoU, to facilitate the exchange and dissemination of technical information. The MoU also aims at promoting understanding and co-operation between members of both Societies and encouraging cross-membership.

The scope of the partnership extends to many inter-organizational collaborative initiatives. A unique advantage is the Sister Society Associate programme. All CSI Members joining IEEE-CS through this program will receive:

1. Three IEEE-CS digital publications: Computer, IEEE Software and IT Pro, renowned for the most updated content on computing
2. IEEE-CS Custom Newsletter
3. Other IEEE-CS Periodicals at reduced Sister Society rates
4. Discounts for IEEE-CS conferences in India

Urging all CSI Members to avail these benefits at a payment of US$ 12 for Professional Members, and US$ 10 for Student Members; please visit: http://www.csi-india.org/ieee-cs-ssa-program for more details of the partnership programme.

Enroll Today!

Enhance Your Profile!
Windows 8 Shortcut Keys

1. Windows logo key + start typing - Search your PC

2. Windows logo key + C - Open the charms

3. Windows logo key + F - Open the Search charm to search files

4. Windows logo key + I - Open the Settings charm

5. Windows logo key + O - Lock the screen orientation (portrait or landscape)

6. Windows logo key + Tab - Cycle through open apps (except desktop apps)

7. Windows logo key + Ctrl + Tab - Cycle through open apps (except desktop apps) and snap them as they are cycled

8. Windows logo key + Shift + period (.) - Snaps an app to the left

9. Windows logo key + period (.) - Snaps an app to the right

10. Ctrl + plus (+) or Ctrl + minus (-) - Zoom in or out of a large number of items, like apps pinned to the Start screen

Project Ideas for CSE / IT Students.
Please visit- http://projectideasincse.wordpress.com/
CSI Events

Report on Workshop for Special Educators by CSI Education Directorate

Computer Society of India-Education Directorate, Chennai and Jeppiaar Institute of Technology with Media Lab Asia organized a one day workshop on “Punarjani” for special school faculty working for mentally challenged children on 22-8-2013 at Jeppiaar Institute of Technology, Kunnam, Sriperumbudur.

Punarjani is a web based integrated evaluation tool for the mentally retarded children. It is a joint project of Media Lab Asia and CDAC, Thiruvananthapuram. A child with mental retardation undergoes a comprehensive evaluation to determine the nature of services required. Evaluation is done for three purposes: diagnostic, instructional, and progress monitoring. Following this evaluation, collected data is translated into statements of special education needs. The Functional Assessment Checklist for Programming (FACP) and the BASIC-MR both methods developed by the National Institute for the Mentally Handicapped (NIMH), Secunderabad is used for the evaluation. Madras Developmental Programming System (MDPS) is another method that is available for evaluation.

The package will be capable to assess each MR children based on the inputs given by the teacher. Based on the assessment results the system can suggest a suitable long term goal for each child. This long term goal will be further divided into short term goals. For each short term goal the system will try to suggest a suitable lesson plan. The system will be capable of generating charts and graphs on the development pattern of each child.
A total of 140 Special Educators attended the workshop which is a resounding success. This is our social responsibility to give training to the special educators using computers for the benefits of the special children.

The delegates and the Guests are invited by Dr. Kannan, Principal, Jeppiaar Institute of Technology. Program overview was given by Dr. Prof Jayachandran, renowned psychologist in India who works for this cause. The workshop was inaugurated by Mr. Baljit Singh Bedi, Former Senior Director, Deity and spoke about the Government initiatives in Health Care and Rehabilitation. Mr. Gaurav Takkar Sr. Research Scientist, Media Lab Asia, (A Section 25 company promoted by Ministry of Comm. & IT, Govt. of India) spoke about the impact of Media Lab Projects, who is one of the sponsors of this workshop. Mr. Rajan T. Joseph, Director (Education) narrated about the CSI Initiatives. The workshop sessions were handled by Mr. K.V. Johny, Principal Technical Officer, CDAC, a Scientific Society of Ministry of Communications and Information technology, Government of India. Concluding remarks were given by Mr. Bhatia, Research Director of Media Lab Asia. The meeting was moderated by Mr. S. Ramasamy, Consultant, CSI and coordinated by Mr. Gnanasekaran, Mr. Natarajan, ED staff. Thanks to Jeppiaar Institute of Technology who provided transportation for the delegates, Computer Lab facilities and Lunch.
Young Talent Search in Computer Programming – 2013

A report on National Final Competition

The National Level Final Competition of Young Talent Search in Computer Programming 2013 was held on Sunday 1st September 2013 at Rajalakshmi Engineering College, Chennai. 12 teams from different parts of the country, selected through their respective regional competitions, qualified for participation and all the 12 teams participated. Accommodation and logistics for the team members and accompanying teachers were arranged by CSIED.

Rajalakshmi Engineering College, Chennai were the sponsors of the competition and provided venue, break-fast, lunch and transportation. Prof P. Kumar, Dept of IT, Rajalakshmi Engineering College & Chairman, CSI Chennai Chapter coordinated the event. Prof. P Thrimurthy, Fellow and Past President, CSI, Mr. H R Mohan, Vice President cum President Elect, CSI and Dr P Sakthivel, Past Chairman CSI Chennai Chapter were the judges. The judges were assisted by Mr Bhuvaneswaran & other staff and students of Rajalakshmi Engineering College. Arrangements were made to display the current scores of all teams.

The following top two teams won the first and second positions and qualified to represent India at the SEARCC International Schools’ Software Competition 2013 which will be held in Colombo, Sri Lanka between 24th and 27th October, 2013.
The prizes were presented to the winners at a function organized after the competition. Prof P Kumar welcomed the gathering. Prof P Thrimurthy & Mr H R Mohan spoke on the occasion and advised the students for successful performance at the SEARCC International competition. Dr P Sakthivel announced the results. Trophies and Certificates were presented to the winning teams. Participation certificates and mementos for all the participants and accompanying teachers were presented by CSI. Mr. S. Ramasamy, Consultant, CSI proposed the vote of thanks and appreciated the arrangements provided by the college. He also thanked the management, principal and staff of Rajalakshmi Engineering College for ensuring excellent co-ordination and support for the event. He also appreciated the services of all CSI staff, particularly Mr. M Gnanasekaran and Mr. S Natarajan of CSI-ED, who coordinated the event.

**Rajan T Joseph**

Director (Education)
Project Positions / Fellowships / Jobs

1. **Research Assistant in IIT Bombay**
   - **Job Profile:** BE in Electronics or BE in Mechanical Engineering with experience in simulation of automotive systems. The job involves simulation of automotive systems, particularly as applicable to electric vehicles and hybrid electric vehicles.
   - **Last date to apply:** 30th September, 2013
   - **For more details:** [http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013077](http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013077)

2. **Project Engineer in IIT Kharagpur**
   - **Job Profile:** B.E/B.Tech in Computer Science/Electronics/Electrical Engineering with minimum 60% marks from reputed University/Institute. Minimum 2 years experience in computer networking, JAVA script, PHP, Web based application design and knowledge with MySQL database desirable. The candidate must have working experience in LINUX environment. The job involves developing suitable pedagogical methods for various classes, intellectual calibers and research in e-learning.
   - **Last date to apply:** 20 Sep 2013
   - **For more details:** [http://www.iitkgp.ac.in/topfiles/sric_job_details.php?serial=2427](http://www.iitkgp.ac.in/topfiles/sric_job_details.php?serial=2427)
3. **Programmer in Malaviya National Institute of Technology Jaipur**
   
   **Job Profile:** -
   
   **Last date to apply:** 04/10/2013
   

4. **Research Assistant in IIT Bombay**
   
   **Job Profile:** Developing gaming applications for the android platform
   
   **Last date to apply:** 30-09-2013
   
   **For More details:** [http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013080](http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013080)

5. **M.S/ Ph.D admission in various IITs with Fellowships**
   
   **For more details contact:** [http://www.cse.iitm.ac.in/research/prospective_students.php](http://www.cse.iitm.ac.in/research/prospective_students.php)
   
   [http://www.iitgn.ac.in/phd.htm](http://www.iitgn.ac.in/phd.htm)
   
   [http://www.cse.iitm.ac.in/research/prospective_students.php](http://www.cse.iitm.ac.in/research/prospective_students.php)
   
   [http://academic.iiti.ac.in/Admm/2013-July-PhD-Admission-at-IIT-Indore.pdf](http://academic.iiti.ac.in/Admm/2013-July-PhD-Admission-at-IIT-Indore.pdf)
6. **Internship positions with Virtual Labs Engineering and Architecture Division, IIIT**

   **Job Profile:** BTech/MTech in any discipline, preferably CS with sound knowledge in Systems (Linux or Windows), Design and Automation.

   **Last date to apply:** Throughout the Year

   **For more details contact:** [https://vlead.virtual-labs.ac.in/join-us/](https://vlead.virtual-labs.ac.in/join-us/)

7. **Project Engineer in IIT Bombay**

   **Job Profile:** We are seeking a software engineer to develop rCloud with advanced capabilities, maintain rCloud for use by CSE researchers and participate in research activities. The candidate should have taken courses in operating systems and data structures at the undergraduate level and must be proficient in Java and Java EE.

   **Last date to apply:** 30-09-2013

   **For more details contact:** [http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013085](http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013085)

8. **Postdoctoral Fellowships (PDF) at the Indian Institute of Technology Madras**

   **Job Profile:** Candidates with a Ph.D. Degree or who have submitted their theses for the Ph.D degree in appropriate disciplines and with consistently good academic record and research potential can apply for the PDF positions.

   **Last date to apply:** Throughout the Year

   **For more details contact:** [http://www.iitm.ac.in/sites/default/files/notices/details-of-pdf-fellowship.pdf](http://www.iitm.ac.in/sites/default/files/notices/details-of-pdf-fellowship.pdf)
9. **Student Program for Advancement in Research Knowledge (SPARK) at CSIR C-MMACS**

   **Job Profile:** SPARK is intended to provide a unique opportunity to bright and motivated students of reputed Universities to carry out their major project/thesis work and advance their research knowledge in mathematical modeling and simulation of complex systems.

   **Last date to apply:** Throughout the Year

   **For more details contact:** [http://www.cmmacs.ernet.in/spark/index.php](http://www.cmmacs.ernet.in/spark/index.php)

10. **Research Assistant in IIT Bombay**

   **Job Profile:** Software Development and Performance Testing - design and development of tools for performance testing and performance analysis. Performance testing of Web applications.

   **Last date to apply:** 24-09-2013

   **For more details contact:** [http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013084](http://www.ircc.iitb.ac.in/IRCC-Webpage/rnd/RecruitmentGenerateCircular.jsp?srno=2013084)

**Conferences / Workshops**

1. **International Conference on Recent Trends in Communication and Computer Networks**
   **Date and Venue:** 08-09, November 2013; Hyderabad.
   **More details can be found at:** [http://comnet.theides.org/2013/date.htm](http://comnet.theides.org/2013/date.htm)

2. **IIT Madras&Tokyo Tech Symposium “Techniques and Applications of Bioinformatics"**
   **Date and Venue:** 27-28, September 2013, IC&SR Auditorium, IIT Madras, Chennai.
   **More details can be found at:** [http://www.biotech.iitm.ac.in/bif/workshop/index.html](http://www.biotech.iitm.ac.in/bif/workshop/index.html)
3. **Management Development Program on Training for Trainer**  
   Date and Venue: 18-20 September 2013, IIT Kharagpur.  
   More details can be found at: [www.iitkgp.ac.in/downloads/mdp_TT_RKP.pdf](http://www.iitkgp.ac.in/downloads/mdp_TT_RKP.pdf)

4. **IEEE All India Student Congress 2013 (AISC 2013)**  
   Date and Venue: 3-6, October 2013, Amritha University, Coimbatore.  
   More details can be found at: [http://ieeeaisc2013.org/](http://ieeeaisc2013.org/)

5. **Dell Empowering Women Challenge**  
   Date and Venue: September 23, 2013.  
   More details can be found at: [http://www.dellchallenge.org/about/dates](http://www.dellchallenge.org/about/dates)

6. **Fifth IBM Collaborative Academia Research Exchange (I-CARE) Conference**  
   Date and Venue: 17-19 October 2013.  
   More details can be found at: [https://university-relations.in/wps/portal/icare2013](https://university-relations.in/wps/portal/icare2013)

7. **The 13th Consortium of Students in Management Research (COSMAR 2013)**  
   Date and Venue: 15-16 November 2013.  
   More details can be found at: [http://www.mgmt.iisc.ernet.in/~cosmar13/](http://www.mgmt.iisc.ernet.in/~cosmar13/)

8. **IEEE Workshop on Nanotechnology and Sensors**  
   Date and Venue: 19 - 21 September, 2013, Indian Institute of Science, Bangalore.  
   More details can be found at: [http://www.cense.iisc.ernet.in/workshopsep13/impdates.html](http://www.cense.iisc.ernet.in/workshopsep13/impdates.html)

9. **Climate Change Quiz**  
   Date and Venue: 19, September 2013, Indian Institute of Science Bangalore.  
   More details can be found at: [http://www.dccc.iisc.ernet.in/Quiz%20Poster%202013.pdf](http://www.dccc.iisc.ernet.in/Quiz%20Poster%202013.pdf)

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**Tech Talk**

Dr. P. Uma Maheswari  
Professor and Head, Department of Computer Science and Engineering  
Info Institute of Engineering, Coimbatore – 641 107
‘Green Computing’ is the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems such as monitors, printers, storage devices, and networking and communications systems efficiently and effectively with minimal or no impact on the environment”. It covers the computing lifecycle from cradle to grave. Main objectives of Green Computing include:

1. Improving Computing Performance
2. Reducing the energy consumption and carbon footprints

**Why Green computing?**

1. Environmental awareness growing
2. To preserve our beloved planet
3. Save energy and money
4. Reduce waste

Predict by Climate Group [1] is given below:

“In 2020, Greenhouse gas emissions from the Internet industry will raise to approximately 1.3 Gigatons of CO2. The combined impact of smart grid; smart logistics; smart buildings; and Videoconferencing could reduce emissions by approximately 7.8 tons.”

Currently the Information and Communication Technologies (ICT) industry is responsible for 3% of the world's energy consumption. With the rate of consumption increasing by 20% a year, 2030 will be the year when the world's energy consumption will *double* because of the ICT industry.

<table>
<thead>
<tr>
<th>Activating sleep mode on one computer could save</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 200 kwh of energy per year</td>
<td>8. 40/7 metric tons of toxic lead,</td>
</tr>
<tr>
<td>2. 29,727/640 trees</td>
<td>9. 4,771/8,000 tons of dust each year</td>
</tr>
<tr>
<td>3. 89,181/80,000 tons of CO2 a year</td>
<td>10. 149/2 pounds of carbon</td>
</tr>
<tr>
<td>4. 160 gallons of water</td>
<td>11. enough energy to power a CFL for</td>
</tr>
<tr>
<td>5. 125/6 tons of waste</td>
<td>31/56 weeks</td>
</tr>
<tr>
<td>6. 89,181/64,000 tons of air pollution per year</td>
<td>12. $24.00, gain</td>
</tr>
<tr>
<td>7. 160 pounds of coal</td>
<td>13. almost 386,451/64,000 tons of oxygen</td>
</tr>
</tbody>
</table>
Present Scenario

The very first and most conclusive research shows that CO2 and other emissions are causing global climate and environment a huge damage. Therefore it is the top most priority and challenge for Green Computing technologist to preserve our beloved planet. In recent years focus of enterprises and technology firms has been shifted towards Green Computing rapidly. Green Computing discusses the options to support critical computing needs in sustainable manner by reducing strains on resources and environment.

Focus areas on green computing

1. Energy Consumption
2. Waste Recycling
3. Data Center Consolidation & Optimization
4. Virtualization
5. IT Products and eco-labeling
6. Utilization of resources.

Energy Consumption

Energy is considered as the main resource and the carbon footprints are considered the major threads to environment. Organizations are realizing that the source and amount of their energy consumption significantly contributes to Greenhouse Gas (GhG) emissions. Therefore, the emphasis is to reduce the energy utilization & carbon footprints. According to Environmental Protection Agency in around 30% to 40% of personal computers are kept 'ON' after office hours and during the weekend and even around 90% of those computers are idle.
**Waste Recycling**

Based on the Gartner [2] estimations over 133,000 PCs are discarded by U.S. homes and businesses every day and less than 10 percent of all electronics are currently recycled. E-Waste is a manageable piece of the waste stream and recycling e-Waste is easy to adopt.

**Data Center Consolidation and Optimization**

Today, nationwide, data centers use 1.5% of all electricity, and this is expected to go up to 3% by 2011. Currently much of the emphasis of Green Computing area is on Data Centers, as the Data Centers are known for their energy hunger and wasteful energy consumptions. Power costs have risen substantially in the last 25 years. How about the next 25 years? Power utilization by data centers is expected to double nationally in the next 5 years.

With the purpose of reducing energy consumption in Data Centers it is worthwhile to concentrate on following:

1. It is estimated that up to 58% of power is used on wasted and/or inefficient components. Use efficient servers, storage devices, networking equipments and power supply selection
2. Cooling Systems: It is significant to consider both current and future requirements and design the cooling system in such a way so it is expandable as needs for cooling dictates.
3. Using direct current vs. alternating current can save significant energy.
4. In many places, the outside air is plenty cold enough much of the year for free. Yet only recently have data centers adopted systems that can filter outside air for cooling computer rooms.
5. Cloud Computing has recently received significant attention as a promising approach for delivering Information and Communication Technology services by improving the utilization of Data Center resources.
6. It is crucial for data centers to have a constant power supply. Therefore they need highly reliable power sources. However what happens if the power source is from renewable energy?

**Virtualization**

One of the main trends of Green Computing is virtualization of computer resources. Abstraction of computer resources, such as the running two or more logical computer systems on one set of physical hardware is called virtualization. Virtualization allows full utilization of computer resources and benefits in:

1. Reduction of total amount of hardware;
2. Power off Idle Virtual Server to save resources and energy
3. Reduction in total space, air and rent requirements
4. Ultimately reduces the cost

**IT Products and Eco-labeling**

Another approach to promote Green Computing and save environment is to introduce policies all around the World. These organizations provide certificates to IT products based on factors including design for recycling, recycling system, noise energy consumption etc. Companies design products to receive the eco-label. There are several organizations in the world which support “eco-label” IT products.

**Green Computing Research outlook**

Some of the research issues in Green computing are listed below:

1. Standard power monitoring
2. Integrated energy management with transparent visualization of consumption
3. Originator-based allocation and automatic load management.
4. Automated switching via mobile
5. Daylight saving
6. Motion control
7. Artificial light dimming
8. Light saving according to actual needs
9. Organic LED
10. Sharing and using the unused resources efficiently on idle computers. Leveraging the unused computing power of modern machines to create an environmentally proficient substitute to traditional desktop computing is cost effective option. This makes it possible to reduce CO2 emissions by up to 15 tons per year per system and reduce electronic waste by up to 80%.

11. Duplicated information management

12. Intelligent compression techniques can be used to compress the data and eliminate duplicates help in cutting the data storage requirements.

Road Ahead for Green Computing

- Processor manufacturers AMD and Intel are becoming green businesses and making big strides in the way of green computing with constant advancement.
- Companies such as Tesla Computers LLC offer green PC’s that are affordable, non-toxic and ultra low wattage.
- The University of Vermont reports that if 8,000 computer users activated sleep mode on a regular basis, there would be a total savings of 1.6 million kWh per year. This is equivalent to blocking the annual emissions of 150 cars, or planting 367 acres of trees.
- Government regulations are pushing Vendors to act green; behave green; do green; go green; think green; use green and no doubt to reduce energy consumptions as well.

Practices to be insisted

1. Banning screen savers
2. Turning off computers and machines not in use,
3. Setting automatic turn-off times for when computers are inactive
4. Printing only as needed and adopting double-sided printing as standard procedure among other actions.
Data Structures is one of the important subjects in Computer Science curriculum. One can expect at least half-a-dozen questions in data structures during a technical interview. Not only for job interviews, but for doing higher studies in any field related to computer science, through knowledge and understanding of data structures and computer architecture is essential. Data structure is a way of organizing data in a computer’s memory that considers not only the items stored, but also their relationship with each other. Advance knowledge about the relationship between data items allows designing of efficient algorithms for the manipulation of data. In general, data structures can be classified mainly into two categories, namely, i) Linear Data Structure and ii) Non-linear Data Structure

**Linear data structure**
A linear data structure traverses the data elements sequentially, in which only one data element can directly be reached and accessed. e.g. Arrays, Linked Lists, Stacks, Queues
Non-Linear data structure
Every data item is attached to several other data items based on specific relationships among them. The data items are not arranged in a sequential structure. e.g. Trees, Graphs

Basic Data Structure Operations
The following are the main operations that can be performed on the data structures

1. Creating the data structure newly
2. Inserting an item into the data structure
3. Deleting an item from the data structure
4. Updating an item in the data structure
5. Traversing the data structure by visiting all its elements
6. Searching for an item in the data structure
7. Printing all elements in the data structure
8. Counting all elements in the data structure
9. Other operations such as inversion, sorting, merging etc.

Data Structures are needed to build high quality software with good scalability. Few areas in which data structures are used extensively are given below:

1. Compiler Design
   - Hash Data Structure and Balanced binary tree structures are used to implement symbol table for storing information about symbols in lexical analysis phase
   - Tree data structures are used to generate intermediate code representation during syntax analysis phase
   - Stack data structure is used in the implementation of parser and semantic analyzer
2) **Database Management System**
- RDBMS uses Array Data Structure
- Network Data model uses Graph Data Structure
- Hierarchical data model uses Tree Data Structure

3) Operating System - Lists, Stacks and Queues are used in implementing Job scheduling algorithms, Memory allocation and several other tasks of OS

4) Various other fields such as Statistical analysis, Numerical Analysis, Digital Signal Processing, Artificial intelligence, Graphics, Simulation etc.

Though advanced data structures are used for building modern software applications, the following are considered to be basic data structures: arrays, lists, stacks, queues, trees and graphs. Both basic and advanced data structures are covered in several textbooks [1,2,3] of computer science curriculum. We believe that revisiting basics will definitely help students in understanding and enhancing their knowledge on these topics. Basics of Linked List data structure is discussed in this issue.

**Linked Lists**
A linked list is a linear collection of data elements, called nodes, where the linear order is given by means of pointers. i.e. a linked list is a collection of nodes. Each node in the list is divided into two parts:

1. **Data part** which is used to store the data; The data may be a simple element such integer, float, character etc. and it can be as complex as another data structure itself.
2. **Address part** which contains the address of the next node in the list.

Thus, linked list is a list of elements in which the elements of the list can be placed anywhere in memory, and these elements are linked with each other using an explicit link field, that is, by storing the address of the next element in the link field of the previous element. Figure 1 shows a typical structure of a node in a linked list.
Need for / Advantages of Linked Lists

1. Arrays are static structures, i.e. memory is allocated during compile time for arrays, hence they cannot be easily extended or reduced to fit the increasing / decreasing size of data set leading to wastage of storage space. Whereas, in linked lists, memory is allocated dynamically during runtime. The memory can be allocated and deallocated as per application requirements and hence there is no wastage of memory in linked lists.

2. In arrays, insertion and deletion operations take linear time i.e. $O(n)$, which is expensive. Whereas, Insertion and deletion operations can be efficiently done in linked lists. Given the previous / next node’s pointers, linked list operations take constant time i.e. $O(1)$ which is less expensive when compared to arrays.

Disadvantages of Linked List

1. Linked organization of the list does not support random or direct access.

2. Each data field should be supported by a link field to point the next node in the list, which requires additional space.

Representation of Linked Lists in Memory

Linked lists can be represented in two ways:

1. Static representation using arrays. This is also called cursor representation. This type of representation is used mostly when a language does not support the use of pointers.

2. Dynamic representation using free storage list.
Static representation using arrays

In static representation, the linked list is maintained by using two linear arrays, one is used to store data and the other is used to store links that point to next nodes in the list. Figure 2, illustrates the static list representation for the following data: \( L, I, S, T \). A separate pointer, \( \text{Head} \) is maintained to point the first node in the list. NULL indicates the end of the list. In Figure 2, Head is pointing location 5, which contains ‘L’, the first element. The \( \text{Link} \) field of \( L \) has 11, therefore, the next element \( I \) is found at 11. The \( \text{Link} \) field of \( I \) has 2, therefore, the third element is \( S \). The \( \text{Link} \) field of \( S \) has 11, where we find \( T \). The \( \text{Link} \) field of \( T \) is NULL which indicates the end of the list.

![Figure 2. Static Representation of a List](image-url)
Dynamic/ Pointer Representation using Free Storage List

Dynamic representation uses dynamic memory management policy. Figure 3 shows the same elements L, I, S, T stored in a list using dynamic representation which is also called as pointer representation. In Figure 3, the Head pointer is pointing the first node which contains the element, L. It’s link / address field is pointing to the node containing I and so on. The link / address field of the last node is NULL (\(\ast\)) indicating that it is the last element.

![Figure 3. Dynamic Representation of a List](image)

Types of Linked Lists

There are several variants in linked lists. The normal one, with one data field and one link/address field is called as singly linked list. If the list contains two links, one pointing to the previous node and the other pointing to the next node in the list, it is called doubly linked list. If the link field of the last node points to the first node in the list, it is called as circular linked list. All variants are listed below:

1. Singly linked list
2. Doubly linked list
3. Circular linked list
4. Doubly circular linked list

In the next issue various operations on linked list and its variants will be discussed.
References


Technicoke
Your money or your life!

Look...
I'm a programmer

So?

I have no money and no life!
“With wireless sleep technology, the people in my dreams can send e-mail and faxes to the people in your dreams!”
“Your baby is developing very nicely. Would you like to send him an e-mail?”
I believe that your CPU needs extra cooling
but can I have just a little bit more
space for food in the refrigerator?
Know Your Code

BASICS OF PHP PROGRAMMING

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What is PHP?

PHP is a scripting language that is often embedded into HTML to add functions HTML alone can't do. PHP allows you to collect, process and utilize data to create a desired output. In short, it let's you interact with your pages. PHP is able to perform a number of tasks including printing data, making numeric calculations (such as addition or multiplication), making comparisons (which is bigger, are they equal, etc) and making simple boolean choices. From this you can create more complex loops and functions to make your page generate more specialized data.

Basic PHP Syntax

PHP is a server side scripting language used on the Internet to create dynamic web pages. It is often coupled with MySQL, a relational database server that can store the information and variables the PHP files may use. Together they can create everything from the simplest web site to a full blown business web site, an interactive web forum, or even an online role playing game. Before we can do the big fancy stuff we must first learn the basics from which we build on.

- Start by creating a blank file using any program that can save in plain text format.
- Save your file as a .PHP file, for example mypage.php.
• Saving a page with the .php extension tells your server that it will need to execute the PHP code
• Enter the statement <? php to let the browser know the PHP code is done.

Every section of PHP code starts and ends by turning on and off PHP tags to let the server know that it needs to execute the PHP in between them. Here is an example:

```php
<?php
//on
//and
//off
?>
```

Everything between the <?php and ?> is read as PHP code. The <?php statement can also be phrased as simply <? if desired. Anything outside of these PHP tags is read as HTML, so you can easily switch between PHP and HTML as needed. This will come in handy later in our lessons.

**Comments**

If you want something to be ignored (a comment for example) you can put // before it as I did in our example on the previous page. There are a few other ways of creating comments within PHP, which I will demonstrate below:

```php
<?php
//A comment on a single line
#Another single line comment
/*
Using this method
you can create a larger block of text
and it will all be commented out
*/
?>
```
One reason you may want to put a comment in your code is to make a note to yourself about what the code is doing for reference when you edit it later. You may also want to put comments in your code if you plan on sharing it with others and want them to understand what it does, or to include your name and terms of use within the script.

**PRINT and ECHO Statements**

First we are going to learn about the echo statement, the most basic statement in PHP. What this does is output whatever you tell it to echo. For example:

```php
<?php
    echo "I like About"
?>
```

This would return the statement I like About. Notice when we echo a statement, it is contained within quotation marks. Another way to do this is to use the print function. An example of that would be:

```php
<?php
    print "I like About"
?>
```

There is a lot of debate about which is better to use or if there is any difference at all. Apparently in very large programs that are simply outputting text the ECHO statement will run slightly faster, but for the purposes of a beginner they are interchangeable.

**Variables**

The next basic thing you need to learn how to do is to set a variable. A variable is something that represents another value.

```php
<?php
    $like = "I like About";

    print $like;
    $num = 12345;
    print $num;
?>
```
This sets our variable, $like, to our previous I like About statement. Notice again the quotation marks used, as well as the semicolon [:] to show the end of the statement. The second variable $num is an integer, and therefore does not use the quotation marks. The next line prints out the variable $like and $num respectively. You can print more than one variable on a line using a period [.],

**for example**

```php
<?php
$like = "I like About";
$num = 12345;
print "$like . $num;
print ";
print "$like . " . $num; print ");
print "My favorite number is $num";
?>
```

This shows two examples of printing more than one thing. The first print line prints the $like and $num variables, with the period [.] to separate them. The third print line prints the $like variable, a blank space, and the $num variable, all separated with periods. The fifth line also demonstrates how a variable can be used within the quotation marks [""]. A few things to remember when working with variables: they are CaSe SeNsitiVe, they are always defined with a $, and they must start with a letter or an underscore (not a number.) Also note that if needed you can dynamically build variables. For a more thorough look at variables, see our Guide to Variables. Another thing to keep in mind is that all of your print/echoing is contained between quotation marks. If you want to use a quotation mark inside of the code, you must use a backslash:

```php
<?php
print "Billy said ""I like About too"" . "" ?>
```
When you are using more than one line of code inside your php tags, you must separate each line with a semicolon [;]. Below is an example of printing multiple lines of PHP, right inside your HTML:

```php
<html>
<head>
</head>
<body>
<?php
print "I like About";
print "\\n";
print "Billy said ""I like About too""\"";
?>
</body>
</html>
```

As you can see, you can insert HTML right into your php print line. You can format the HTML in the rest of the document as you please, but remember to save it as a .php file.

**Arrays**

While a variable can hold a single piece of data, an array can hold a string of related data. Its use may not be apparent right away, but will become clearer as we start using loops and MySQL. Below is an example:

```php
<?php
$friend[0] = "Justin";
$friend[1] = "Lloyd";
$friend[3] = "Devron";
$age["Justin"] = 45;
```
$age['Lloyd'] = 32;
$age['Alexa'] = 26;
$age['Devron'] = 15;
print "";
print "Alexa is " . $age['Alexa'] . " years old";
?>

The first array ($friend) is arranged using integers as the key (the key is the information between the [brackets]) which is handy when using loops. The second array ($age) shows that you can also use a string (text) as the key. As demonstrated the values are called by print in the same way a regular variable would be.

The same principals apply to arrays as variables:
> they are CaSe SeNsitivE, they are always defined with a $, and they must start with a letter or an underscore (not a number.)

Operators

You have probably all heard the term expression used in mathematics. We use expressions in PHP to perform operations and give an answer to a single value. These expressions are made up of two parts, the operators and the operands. The operands can be variables, numbers, strings, boolean values, or other expressions.

Here is an example

a = 3 + 4
In this expression the operands are a, 3 and 4
b = (3 + 4) / 2
In this expression the expression (3+4) is used as an operand along with b and 2.
Now that you understand what an operand is we can go into more detail about what operators are. Operators tell us what to do with operands, and they fall into three major categories:

**Mathematical:**

+ (plus), - (minus), / (divided by), and * (multiplied by)

**Comparison:**

> (greater than), < (less than), == (equal to), and != (not equal to)

**Boolean:**

&& (true if both operands are true), || (true if at least one operand is true), xor (true if ONLY one operand is true), and ! (true if a single operand is false)

Mathematical operators are exactly what they are called, they apply mathematical functions to the operands. Comparison is also pretty straightforward, they compare one operand to another operand. Boolean however may need a little more explaining.

Boolean is an extremely simple form of logic. In Boolean every statement is either True or False. Think of a light switch, it must either be turned on or off, there is no in between.

Let me give you an example:

```php
$a = true;
$b = true;
$c = false;
$a && $b;
```

This is asking for $a and $b to both be true, since they are both true, this expression is TRUE

```php
$a || $b;
```

This is asking for $a or $b to be true. Again this is a TRUE expression

```php
$a xor $b;
```

This is asking for $a or $b, but not both, to be true. Since they are both true, this expression is FALSE
This is asking for $a$ to be false. Since $a$ is true, this expression is FALSE

This is asking for $c$ to be false. Since that is the case, this expression is TRUE

### Conditional Statements

Conditionals allow your program to make choices. Following the same sort of boolean logic you just learned about, the computer can only make two choices; true or false. In the case of PHP this is accomplished using IF : ELSE statements. Below is an example of an IF statement that would apply a senior's discount. If $over65$ is false, everything within the {brackets} is simply ignored.

```php
<?php
$over65 = true;
$price = 1.00;
if ( $over65 )
{
$price = .90;
}
print "Your price is $" . $price;;?
```

However, sometimes just the IF statement isn't enough, you need the ELSE statement as well. When using just the IF statement the code within the brackets either will (true) or will not (false) be executed before carrying on with the rest of the program. When we add in the ELSE statement, if the statement is true it will execute the first set of code and if it is false it will execute the second (ELSE) set of code. Here is an example:

```php
<?php
$over65=true;
$price = 3.00;
```
if ($over65)
{
$discount = .90;
print "You have received our senior's discount, your price is $" . $price*$discount;
}
else
{
print "Sorry you do not qualify for a discount, your price is $" . $price;
}
?>

Nested Conditionals

One useful thing to remember about conditional statements is that they can be nested within each other. Below is an example of how the discount program from our example could be written to use nested IF:ELSE statements. There are other ways of doing this - such as using else if () or switch () but this demonstrates how statements can be nested.

<?php
$age = 30;
$price = 3.00;
if ($age > 65)
{
$discount = .90;
print "You have received our senior's discount, your price is $" . $price*$discount;
}
else
{
if ($age < 18)
{  
$discount = .95; print "You have received our student's discount, your price is $" . $price*$discount;
}
else  
{
print "Sorry you do not qualify for a discount, your price is $" . $price;
}
} ?>

This program will first check if they are eligible for the senior's discount. If they are not, it will then check if they are eligible for a student discount, before returning the non-discounted price.
Questions:
Down:
1. Which is the main trend of Green Computing?
5. The Kindle Fire HD tablet comes in .......... forms (in words)
7. Which is the promising approach for delivering Information and Communication Technology Services?
9. How many ways are there to comment text in PHP?
11. Several organizations in the world support -- IT products.
12. PHP is a ---------------- language
14. Hierarchical data model Database Management System uses -------- Data Structure

Across:
2. The energy used by CoverFi Portable wireless router to power itself is _______.
3. Google launched _______ Smartphone in India.
4. In 2030 will be the year when the world's energy consumption will double because of the _______ industry
6. PHP creates _______ web pages
8. Data Structures are needed to build high quality software with good??
10. The extra features of Windows 7 calculator can be accessed from ________ menu
13. The energy consumption of organization significantly contributes of _______ gas (acronym)
15. Total number of basic data structure operation??

**Techlinks**

**The latest technology in Gaming & Technology:**

This is a video of Natal and recognition system like no other, this is a example of linking new technology to the world. It's a demonstration of the ideas and creativity out there. Go INVENT!
Click here: [http://www.youtube.com/watch?v=yDvHlwNvXaM&feature=player_embedded](http://www.youtube.com/watch?v=yDvHlwNvXaM&feature=player_embedded)

**The latest technology in Green Transportation:**

This is a video for a bus being developed in China. Its talks about a new type of bus called the Straddling bus, where cars can actually drive under the bus while it's moving.
Click here: [http://www.youtube.com/watch?v=Hv8_W2PA0rQ&feature=player_embedded](http://www.youtube.com/watch?v=Hv8_W2PA0rQ&feature=player_embedded)

**Google Glass hands-on:**

We get our hands on one of the two Google Glasses available in Europe to find out what we've been missing.
Click here: [https://www.youtube.com/watch?feature=player_embedded&v=bVjPF3O1Goc](https://www.youtube.com/watch?feature=player_embedded&v=bVjPF3O1Goc)
From the printed word to the multimedia tablet!

The Guardian has embraced technology like no other newspaper. Now, Alan Rusbridger, editor in chief, unveils the latest exciting step in the Guardian's mission to harness the power of online media: Guardian Goggles, delivering our quality journalism straight between the eyes. Click here: http://www.youtube.com/watch?v=RY-WBBKDQJg&feature=player_detailpage

Handy Gadgets

Dell Latitude 3330

At a price of Rs39999 the Dell Latitude 3330 is another addition to the market of ultrabook. It comes with a 13 inch anti glare LCD screen powered by an Intel third gen i5 processor. The laptop is compatible with windows 7 professional and windows 8 pro with a maximum of 8GB ram, 500GB ssd, 720p HD camera and a 4/6 cell battery option. Users can also attach an external DVD drive to it. The laptop connects to Wi-Fi, Bluetooth 4.0, Mobile Broadband and GPS. To know more about this gadget click here: http://www.dell.com/in/business/p/latitude-3330-laptop/pd

Asus AiO

Asus AiO has an 18.4-inch IPS touch screen with 1920x1080p resolution. The device can be removed from its associated hardware and be used as a tablet. It operates on Windows 8 and Microsoft's latest OS when connected to a desktop PC. The device is further powered by a third-generation Intel processor with Nvidia GT370M graphics. The display angles of the device are 178-degrees and the sound is further enhanced by Asus Sound Master technology. To know more about this gadget click here: http://www.asus.com/AllinOne_PCs/ASUS_Transformer_AiO_P1801/
Nexus 4 Smartphone

Google launched its highly anticipated Nexus 4 Smartphone in India priced at 25900. Loaded with a 4.7 inch true IPS plus HD screen it has a 1280x768p resolution and a 318ppi pixel density. It runs on the latest mobile OS, the Android 4.2 also called the jelly bean with a 1.5 GHZ Quadcore C.P.U ready to do multiple tasks at a time. Its other features include 2 GB of RAM and 16 GB of hard disk space. The phone has an 8 MP camera at the back with LED flash and a 1.3 MP camera in its front making it a perfect device to capture still and moving images. The phone also supports 2G, 3G, Wi-Fi, Bluetooth 4.0, Micro USB 2.0 and NFC.
To know more about this gadget click here: [http://www.google.co.in/nexus/4/](http://www.google.co.in/nexus/4/)

Blackberry Q10

The Blackberry Q10 is quite expensive when compared to other phones in the market. It comes at a price of 44,990 with features including a Super A-MOLED display and resolution of 720x720p with 328ppi pixel density and a QWERTY keyboard. Q10 has 2 GB of RAM and a processor of 1.5 GHZ running on latest Blackberry 10 operating system. The 16GB onboard storage device also supports storage expansion of up to 64GB via microSD card. The phone is developed with an 8MP camera in the back and a 2MP camera in front. Q10 supports 2G, 3G, Wi-Fi, Bluetooth 4.0 NFC and microUSB 2.0. With battery power of
2,100mah, it is available in white and black colors in the Indian market. To know more about this gadget click here: http://in.blackberry.com/smartphones/blackberry-q10.html

Audi car

The computer mouse has physical features resembling an Audi car. At a price of 5,599 it is available at all authorized dealerships of the company across India. 2.4GHz technology with scroll wheel and high-resolution 2000dpi sensor with a minimum range of 6meter are some of the other features of the Audi computer mouse. The grey colored mouse is compatible with PCs as well as Mac computers with USB interface (1.1 or 2.0) To know more about this gadget click here: http://ibnlive.in.com/news/audi-launches-carshaped-wireless-computer-mouse-at-rs-5599/397659-11.html

Sony’s Xperia Tablet Z

Sony’s Xperia Tablet Z has a 10.1-inch TFT touch screen carrying Mobile Bravia Engine 2 display technology with a image resolution of 1920x1200p. Attached to it is a 1.5GHz quad-core processor, 2GB
RAM, and a 32GB onboard storage having microSD support of upto 32GB. Its Connectivity features include 4G LTE as well as NFC. It also supports 2G, 3G, Wi-Fi, Bluetooth 4.0 and microUSB. With an 8.1MP camera developed with Exmor R imaging technology and LED flash on the back, it has features that no opponents can match. Its battery produces upto 6,000mAh of power and the device will be available in black and white colors costing Rs 46,990.

To know more about this gadget click here: http://www.sonymobile.com/global-en/products/tablets/xperia-tablet-z/

The Kindle Fire HD 8.9 tablets

The Kindle Fire HD and The Kindle Fire HD 8.9 tablets were recently launched in India by Amazon with heavy customized versions of its Android 4.0 but without the Google Play store access. Both the tablets access Internet over WIFI but sadly it lacks Mobile data connectivity. With a 7 inch IPS display the Kindle Fire HD has a 1.2 GHZ dual core processor and a 1.3 mp primary camera but lacks a micro SD slot. The Kindle Fire HD tablet comes in 2 variants, one with 16GB hard disk priced at 15999 and the other with a 32 GB hard disk priced at 18999. Its bigger cousin the Kindle Fire HD 8.9 comes with an 8.9 inch IPS screen and a 1.5 GHZ dual core processor but having the same 1.3 mp primary camera as its smaller cousin with no micro SD slot. The 16 GB model of kindle Fire 8.9 has been priced at Rs 21999 while the 32 GB at Rs 25999.

To know more about this gadget click here: http://www.amazon.com/dp/B0083PWAPW

Cordless hands-free

This is the cordless hands-free book light that illuminates the page without tangled wires or an awkward clamp that can interfere with reading. The reversible earpiece hooks comfortably over either ear and moves with the reader's head, precisely targeting its light like a miner's headlamp without constant repositioning.
The LED provides clear white illumination for up to 100,000 hours--the equivalent of 11 straight years--with two settings that adjust the brightness from 8 lumens to 4 lumens to adapt to ambient conditions. The compact device does not heat up and contains no breakable filament or tubing, so it can be packed into a purse or suitcase without worry. Includes two CR2025 batteries. To know more about this gadget click here: http://www.hammacher.com/Product/Default.aspx?sku=83261&refsku=71931

CoverFi | Portable wireless router

CoverFi | Portable wireless router that uses solar energy to power itself and utilizes wireless charging technology. The device will give you WiFi connectivity even when you hit the beaches or are on a campsite. To know more about this gadget click here: http://pinterest.com/pin/128211920613581060/
"Students sometimes ask my advice on how to get rich. The best advice I can give them is to dig up some old algorithm that once took forever, program it for a modern workstation, form a startup to market it and then get rich."

- Maurice V. Wilkes (1967 Turing award winner)

Maurice Vincent Wilkes (1913 - 2010) in Dudley, in the county of Staffordshire in the English Midlands. He went on to read Mathematics at St John's College, Cambridge from 1933-34, continuing to complete a Ph.D. in physics on the topic of radio propagation of very long radio waves in the ionosphere in 1936. He received Turing award for his contribution towards building and designing of the EDSAC, the first computer with an internally stored program. Built in 1949, the EDSAC used a mercury delay line memory. He is also known as the author, with Wheeler and Gill, of a volume on "Preparation of Programs for Electronic Digital Computers" in 1951, in which program libraries were effectively introduced.

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Good programmers know what to write. Great ones know what to rewrite (and reuse).

- Eric Raymond

Eric Steven Raymond, often referred to as ESR, is an American computer programmer, author and open source software advocate. After the 1997 publication of The Cathedral and the Bazaar, Raymond was for a number of years frequently quoted as an unofficial spokesman for the open source movement. He is also known for his work on the popular Roguelike game NetHack for which he wrote the Guidebook, in addition to being a member of the "Dev-Team". More recently, he is recognized in certain circles for his 1990 edit and later updates of the Jargon File, currently in print as the The New Hacker's Dictionary.
“Crash programs fail because they are based on the theory that, with nine women pregnant, you can get a baby a month.”

- Wernher Von Braun

Wernher von Braun was a German rocket scientist, aerospace engineer, space architect, and one of the leading figures in the development of rocket technology in Nazi Germany during World War II and, subsequently, in the United States. He is credited as being the "Father of Rocket Science". Von Braun developed and published his space station concept. Braun was instrumental in the development of the U.S. Space & Rocket Center in Huntsville. After leaving NASA, von Braun became Vice President for Engineering and Development at the aerospace company, Fairchild Industries in Germantown.

Program testing can be a very effective way to show the presence of bugs, but is hopelessly inadequate for showing their absence.

— Edsger Wybe dijkstra (1972 Turing award winner)

Edsger W. Dijkstra (1930 - 2002) was born in Rotterdam Dijkstra studied theoretical physics at Leiden University, but quickly realized he was more interested in Computer Science. In 1962, Dijkstra was appointed as Professor of Mathematics at the Eindhoven University of Technology. Some of his popular contributions to Computer Science are the shortest path algorithm also known as Dijkstra's algorithm, Reverse Polish Notatioin, THE multiprogramming system and Bankers algorithm. He received the Turing award for his fundamental contributions to programming languages.
“Don’t handicap your children by making their lives easy.”
— Robert A. Heinlein

Robert A. Heinlein - science fiction author and inventor of the waterbed, worked in the 1940s on pressure suit technology for the US Navy; this work led almost directly to the development of space suits. But some 21 years before Armstrong and Aldrin even walked on the moon, Heinlein published a short story in which an astronaut experiences a problem with his oxygen; by looking at a small device attached to his belt, the astronaut confirms that the oxygen content in his blood has fallen. Such a device might not seem all that impressive to us today, particularly since, in the past 20 or 30 years, portable medical devices like this have become commonplace technologies in popular media like TV and film. Each generation of Star Trek doctors, for example, uses similar devices. But Heinlein was among the first writers to describe a device based on the idea of real-time biofeedback.

“All travel is, after all, a journey in time and in mind.... physical landscapes are a mirror of, or perhaps a key into, our inner landscape.”
— John McCarthy (1971 Turing award winner)

John McCarthy (1927 –2011) was an American computer scientist and cognitive scientist. He received a Ph.D. in Mathematics from Princeton University during 1951 as a student of Solomon Lefschetz. He invented the term “artificial intelligence” (AI), developed the Lisp programming language family, significantly influenced the design of the ALGOL programming language, popularized timesharing, and was very influential in the early development of AI. McCarthy received the Turing Award for his contributions to the topic of AI.
Everyday life is like programming, I guess. If you love something you can put beauty into it.
- Donald Knuth (1974 Turing award winner)

Donald Ervin Knuth is a computer scientist and Professor Emeritus at Stanford University. His undergraduate work was so distinguished that he was awarded a simultaneous MS by special vote of the faculty. In 1963, he earned a Ph.D. in mathematics from the California Institute of Technology. Knuth has been called the "father" of the analysis of algorithms, he received the Turing award for his major contributions to the analysis of algorithms and the design of programming languages, and in particular for his contributions to the "Art of computer programming" through his well-known books in a continuous series by this title.

“We’re long on high principles and short on simple human understanding.”
— Vernor Vinge, A Deepness in the Sky

Vernor Steffen Vinge is a retired San Diego State University (SDSU) Professor of Mathematics, Computer scientist, and Science fiction author. He is best known for his Hugo Award-winning novels such as “A Fire Upon the Deep (1992)”, “A Deepness in the Sky (1999)”, “Rainbows End (2006)”, “Fast Times at Fairmont High (2002)”, “The Cookie Monster (2004)” and “The Peace War”. In his essay “The Coming Technological Singularity (1993)”, he argues that the creation of superhuman artificial intelligence will mark the point at which "the human era will be ended", such that no current models of reality are sufficient to predict beyond it. Within thirty years, we will have the technological means to create superhuman intelligence. Shortly after, the human era will be ended.

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