

Information technologies and computer systems

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Brain-computer interface technology

A brain-computer interface (BCI), often called a mind-machine interface (MMI), or sometimes called a direct neural interface or a brain-machine interface (BMI), is a direct communication pathway between the brain and an external device. BCIs are often directed at assisting, augmenting, or repairing human cognitive or sensory-motor functions.

Research on BCIs began in the 1970s at the University of California Los Angeles (UCLA) under a grant from the National Science Foundation, followed by a contract from DARPA. The papers published after this research also mark the first appearance of the expression brain-computer interface in scientific literature.

The field of BCI research and development has since focused primarily on neuroprosthetics applications that aim at restoring damaged hearing, sight and movement. Thanks to the remarkable cortical plasticity of the brain, signals from implanted prostheses can, after adaptation, be handled by the brain like natural sensor or effector channels. Following years of animal experimentation, the first neuroprosthetic devices implanted in humans appeared in the mid-1990s.

There are several important topics in the neuroethical debate, such as:

- obtaining informed consent from people who have difficulty communicating;
- risk/benefit analysis;
- shared responsibility of BCI teams (e.g. how to ensure that responsible group decisions can be made);
- the consequences of BCI technology for the quality of life of patients and their families;
- side-effects (e.g. neurofeedback of sensorimotor rhythm training is reported to affect sleep quality);
- personal responsibility and its possible constraints (e.g. who is responsible for erroneous actions with a neuroprosthesis);
- issues concerning personality and personhood and its possible alteration;
- therapeutic applications and their possible exceedance;
- questions of research ethics that arise when progressing from animal experimentation to application in human subjects;
- mind-reading and privacy;
- mind-control;
- use of the technology in advanced interrogation techniques by governmental authorities;
- selective enhancement and social stratification, and communication to the media.

Researchers are well aware that sound ethical guidelines, appropriately moderated enthusiasm in media coverage and education about BCI systems will be of utmost importance for the societal acceptance of this technology. Thus, recently more effort is made inside the BCI community to create consensus on ethical guidelines for BCI research, development and dissemination.

The ability of computers to enhance and augment both mental and physical abilities and potential is no longer the exclusive realm of science fiction writers. It is becoming a reality. Brain-computer interface technology will help define the potential of the human race. It holds the promise of bringing sight to the blind, hearing to the deaf, and the return of normal functionality to the physically impaired.

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The latest technical achievements of Steve Jobs

Steve Jobs is a genius American inventor and businessman. His ideas became very popular in the field of electronic devices. He knew exactly what the machines were able to operate and he knew precisely how to achieve the necessary result. His inventions are great examples of his work which made a great progress in the field of electronics at all stages of his development.

The purposes of this work are to study the latest technical inventions of Steve Jobs and prove that he became the greatest inventor of his time in the field of electronics.

It is impossible to describe everything what Steve Jobs made during his life, all his achievements and innovations radically changed the established views of people. That's why in our work we decided to describe and analyze the latest innovations of Steve Jobs and how they affect on people all over the world.

First of all let's speak about such innovation as iPod. It is a line of portable media players created by Apple Inc. The distinctive feature of this device is that iPods can serve as external data storage device. Storage capacity varies by model (from 2GB to 160GB). Different models have been redesigned many times since their introduction. The most recent iPod software can be used to transfer music to the devices from computers using certain versions of Apple Macintosh and Microsoft Windows operating systems. The latest kind of iPod is touch iPod. The iPod Touch is a portable media player, personal digital assistant and Wi-Fi mobile device designed by Apple Inc. The fourth generation iPod Touch is available in 8 GB, 32GB, 64GB capacities. iPod Touch is wildly popular as it is an extremely versatile device – media player, internet communication device. The latest update is pocket camcorder, camera, handheld recorder and Face time video phone.

The next line of smartphones designed by Apple Inc. is the iPhone. The iPhone functions as a video camera, a portable media player and an Internet client with email and web browsing capabilities. It has both Wi-Fi and 3G connectivity. There are five generations of iPhone models. The original iPhone established design precedents such as screen size and button placement. The iPhone 3G added network capabilities and a GPS location. The iPhone 3GS added a compass, faster processor and higher resolution camera. The iPhone 4 has a rear-facing camera and a front facing camera. The iPhone 4S added a higher resolution camera, face detection and video stabilization, a faster, dual core processor.

The iPad is a line of tablet computers designed and marketed by Apple Inc. primarily as a platform for audio-visual media including books, periodicals, movies, music, games and web content. Its size and weight fall between those contemporary smartphones and laptops. iPad is controlled by a multitouch display – a departure from most previous tablet computer. iPad is sold in Wi-Fi and cellular models.

In addition we'd like to underline that on the site [www. maclife.com](http://www.maclife.com) it was written “Steve Jobs may just be the greatest inventor of our age. We dug through Google Patents and found that Steve Jobs is listed as the primary or co-inventor on 241 patents. Granted, some of those inventions were useless, no doubt. But some were pure genius, and did nothing less than completely change the way we use technology in our lives”.

Making some conclusion, all these devices are used all over the world. Just imagine Apple released the first iPad in April 2010, selling 300 000 units on the first day. During the fourth quarter of 2011 Apple sold 15.4 million iPads.

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Adobe Flash overview

Nowadays it is impossible to imagine the world of information technologies without Flash. It is an important, rapidly developing technology used in different areas of present-day information resources development.

Adobe Flash (formerly Macromedia Flash) is a multimedia platform used to add animation, video and interactivity to web pages. This platform contains a set of design tools, such as Adobe Flash Professional and Adobe Flash Builder. Flash content may be displayed on various computer systems and devices using Adobe Flash Player, software that is available free of charge for common web browsers. Adobe Flash contains an object-oriented language called ActionScript.

It manipulates vector and raster graphics to provide animation of text, drawings, and still images. Flash also supports bidirectional streaming of audio and video, and it can capture user input via mouse, keyboard, microphone and camera. It is based on vector morphing technology i.e. smooth “overflow” of one keyframe to another one. It allows to create sophisticated animation scenes using only several keyframes.

Flash is frequently used for advertisements, games and flash animations to be broadcast, as well as for building Web sites.

The main advantage of Adobe Flash is that it is well-suited to the task of creating games. The entire gameplay mechanics can be prototyped in a few hours in an easily packaged form that runs on a PC or Macintosh. It has many positive features, such as zero graphics quality loss, smaller file size, full featured web design, the option of building good-looking Websites. Adobe Flash has many advantages over PowerPoint such as little amount of time to make a presentation, the possibility to have text and pictures move etc.

But there are also some disadvantages of Flash technology. Among them are the following: Web navigation is not very easy, a Website access cannot be accessed from all mobile devices. Web navigation becomes slightly difficult as web links on Flash websites do not change colors unlike standard non-flash websites. The websites’ ranking in search engines is decreasing because if texts and links are embedded in Flash websites and applications, search engines will not read them. Recently there have been made some improvements in the SEO area of Flash, but some problems still exist.

Using Macromedia Flash can also cause security problems for the users. Macromedia Flash files are not password protected or encrypted and can transfer viruses when downloaded on a computer. An Internet Security Threat Report published by Symantic indicated that executions of Adobe Flash Players in 2009 were the second-most attacked. Macromedia Flash also uses Flash cookies, or objects used to collect application data on a user's computer without the user's consent.

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The main steps of the development of Web design

Web design is the industry of web development and design variety, which is warrant to design user interfaces for web sites or web applications. Web designers make the structure of Web pages, think about the most convenient delivery of information solutions, they are also take part in artistic design web project. It is necessary for web designer to be familiar with the latest web technologies and have the artistic qualities.

The main purpose of this work is to study the main stages of the development of web design of different sites. It is also important to find out what possibilities the customers have ordering web design of their sites.

First of all we are going to analyze the main stages of web site design. It is necessary to underline that the work begins with the creation of a design in a graphical editor. Designers propose different options in accordance with the terms of reference. At the same time they create a separate design of home page and designs of standard pages. All these options are discussed with the project manager and art director who control the terms of executing and the quality of graphics. At this stage the customer approves the sketch.

The next stage is HTML layout. The approved design transfers to the maker-up who creates the final html page. As a result the special code is made for viewing the browser and a typical page is going to be used as a template. There are such cases when the designer of a site layout creates html code. The ready html file goes to the programmer. Programming can be carried out either from the very beginning or with the help of the system of managing the site. The main task of a programmer is to replace the standard template into the original one.

The final stage of site development is testing. Web site design should be looked like adequate in different browser such as Internet Explorer, Firefox, Safari, Chrome and Opera. The testing process includes different kinds of checking, for example, page view with larger font, absence of flash player and many others. The detected errors are sent to fix as long as they will not be eliminated.

One of the most important stages is the placement of the ready site in the Internet. Files are placed on the site provider's server and make the necessary settings. At this stage the site is still closed for visitors. Then the site is filled with content – text, images, files, downloads and etc. Finally, the customer or his authorized representative scan finished project and if everything is good they sign all necessary documents. It is also very important to teach the customer how to use this web site as an administrator.

Making some conclusions it is necessary to emphasize that during all stages of the site development a lot of people are involved in this process. They make everything in order to make a great design of web site for customers. So the second part of our work is about the possibilities which the customers have.

The customers have different possibilities in creating web design. Web designers can create absolutely new concept of the design and to develop it from the very beginning. Very often web designers receive special requirements (color, style, etc.) or ideas from the customer and web designers try to keep that direction in the design layout. But there are such situations when the designers can propose a design solution based on templates. It is more convenient for customers as it speeds up the job and costs less. Some designers are even specialized in making these templates and then it is possible to adapt them for the order of the customer.

Summarizing all the information we'd like to say that nowadays it is not a problem to order web design, there are a lot of companies which are involved in this work. The main task of the developers is to create such a design that a user must be able to understand how the web sites work. Of course, it affects their experience and that's why it is so important to take into account this fact and make clear instructions for users.

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The achievements of Bill Gates in the creation and development of the corporation Microsoft

Bill Gates, an American businessman, the chairman of Microsoft, the software company he founded with Paul Allen, remains the largest individual shareholders. He is one of the best known entrepreneurs of the personal computer revolution. In the later stages of his career, gates donates large amount of money to various charitable organization and scientific research programs.

The purpose of this work is to study the achievements of Bill Gates in the creation of Microsoft.

First of all we decided to begin our work with the analyzing of the creation of the corporation Microsoft. It is considered that Bill Gates is a founder of Altair 8800 computer but in reality, Gates and Allen didn't have an Altair and hadn't written code for it. They wanted to gauge the interest of Micro Instrumentation and Telemetry Systems (MITS). Further, Bill Gates and Paul Allen with the creator of MITS developed an Altair emulator that ran on a minicomputer and then the BASIC interpreter. All these people made everything in order to promote Microsoft's BASIC and a lot of people were interested in it and Bill Gates persisted that software developers should be able to demand payment. So, in 1976 Microsoft became independent of MITS and continued to develop programming language software for various systems. It is important to emphasize that Gates oversaw the running business details and he continued to write codes, he personally reviewed every line of code the company shipped and Gates rewrote parts of it as he saw fit.

On of the most relevant achievements of Bill Gates is the creation of operating system for IBM Company, but the executive chiefs of that company decided that it was impossible to reach a licensing agreement. Later he proposed using 86-DOS, an operating system similar to the PC. Microsoft became the exclusive licensing agent, a full owner of 86-DOS. In 1981 Gates became the president of Microsoft and the chairman of the board.

In 1988 the development of Windows NT began and it was considered as reliable solution for the work stations (Windows NT Workstation) and servers (Windows NT Server).

It is necessary to underline that Bill Gates became an executive officer of Microsoft in January 2000. He remained the chairman and created the position of chief software architect. From Microsoft's founding in 1975 until 2006, gates had the responsibility for the company's product strategy. He made everything in order to broaden the range of the company's products.

In conclusion it is important to underline that Gate's role at Microsoft for most of its history was primarily a management and executive role. He was an active software developer, particularly on the company's programming language products. For the whole history Microsoft accounts a row of operating systems such as Windows NT, Windows 95, Windows 98, Windows Me, Windows 2000, Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008, Windows 7, Windows 8. It was also created a row of version Microsoft Office and other products.

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SciDB: a DBMS for storing and processing big scientific data

SciDB is an open source data management and analytics DBMS for scientific research that is now being actively developed. SciDB is supposed to be used in LSST (Large Synoptic Survey Telescope) project in Chile (2019-2020) and Lyra project (2014-2015).

SciDB was founded as a result of discussions during some scientific conferences, like XLDB. It became clear that the current science produces a huge amount of data which cannot be processed by existing tools and DBMSes. Scientific database management system should meet the following requirements:

1. A data model based on multidimensional arrays, not just sets of tuples.
2. A storage model based on data versions and consistent original data.
3. Scalability to 100s of petabytes and 1,000s of nodes with high degrees of tolerance to failures.
4. Support for "external" data objects so that data sets can be queried and manipulated without ever having to be loaded into the database.
5. Open source in order to foster a community of contributors and to insure that data is never "locked up" – a critical requirement for scientists.

SciDB is based on multidimensional arrays that have several dimensions and attributes. Every array cell like tuple can have several attributes. Originally dimensions were only of integer type but now non-integer dimensions are supported too. Attributes can have one of the built-in or user defined data types.

Cells in arrays are grouped into chunks, or input/output and data distribution units. Physically, a chunk keeps elements of only one attribute. A user does not know about the physical structure of the array but he sees its logical cells. Chunks are distributed through all cluster nodes and every node processes its own chunks. Chunks can be distributed over network by one of the possible distribution schema: round-robin, by columns or by rows, replicated to all nodes.

SciDB cluster is a set of nodes which run SciDB processes or instances. There are several nodes in the cluster called coordinators. These nodes accept client connections and control query execution. They accept queries, parse them, optimize and send them to other nodes for execution. Then the coordinator gathers statuses of execution and sends the result of execution back to the client.

Nodes can be connected to each other and can directly send messages. Connections between nodes are established on demand. Network layer is based on asynchronous messages from Google Protocol Buffers library.

Metadata and other useful system information like cluster structure is stored in a system catalog. A system catalog is a small database that is stored in the PostgreSQL DMBS.

SciDB supports two native query languages: Array Functional Language (AFL) and Array Query Language (AQL) which is similar to SQL in relational databases.

To achieve good performance SciDB uses vector operations. Every operation is applied not to a single cell element but to a bunch of values that allows to avoid function call overhead.

SciDB functionality can be extended by plugins or libraries in terms of SciDB. Such libraries contain a set of user defined objects: user defined types, user defined functions, user defined aggregates, user defined operators.

SciDB will primarily be designed to meet the needs of data-intensive scientific analytics in the public and private sectors. User communities expected to benefit include sciences such as astronomy, biology, geoscience (geology, oceanography, atmospheric science, environmental science), medicine, and physics; science-based industries such as remote sensing, resource extraction (oil, gas, minerals), medical imaging, and pharmaceuticals; and other organizations with vast amounts of data and complex analytical needs such as Internet, telecommunications, and financial services.