APPLICATION OF ELECTRONICS IN MODERN COMPUTER SCIENCE

[1] Swagatam Roy
Department of Cse-Data Analytics, The Neotia University

ABSTRACT

There is always a connection between the field of computer science and electronics. Actually both of them compliments each other but the application of modern computer science is somehow a little different. In modern technology it increases application power of computer. Without the help of electronics, development of computer is impossible. The history of development of computer from the first to fifth generation and typesetter forms an excellent electronic era followed by appraisal of computer science topics which are applied to problems in typesetting and other things. Electronic circuit helps to develop the different parts of computer. The internal circuit of motherboard inside cpu is made by the different chips and ICs. Now a days wireless network and remote is more preferred. So high level ideas and development of computer science and electronics is discussed in the paper and the interconnection between electronics and computer science field is established here.

Key Word: Electronics, modern computer science , VLSI , signal processing

I. INTRODUCTION

The large scale application of the computing to publish could not take place until computers became cheap, fast and reliable and so there might be a temptation to dismiss electronic publishing as yet another area whose assimilation into the computer age was catalysed by an advance in many technology like hardware technology (or a lowering of its price) coinciding with a well timed breakthrough in some of particular pieces of the software .[2]

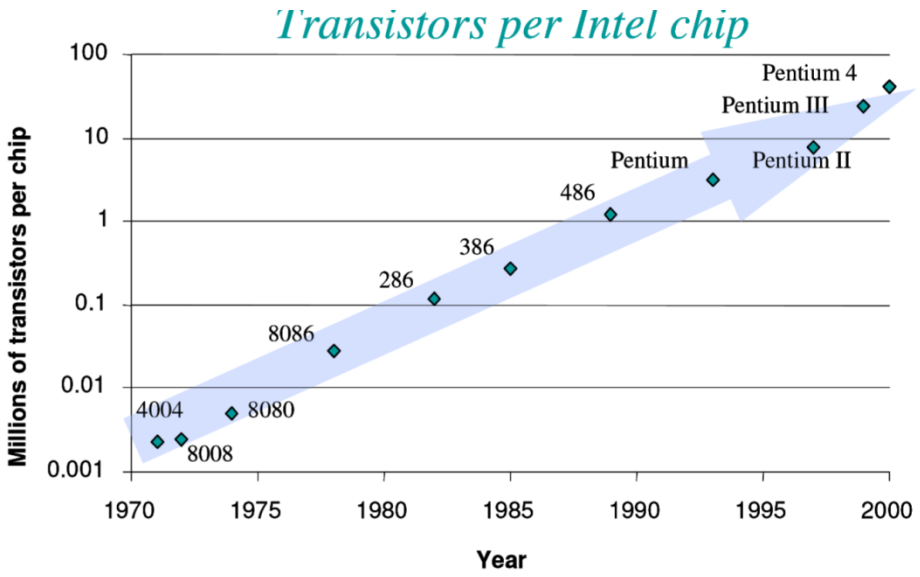
The development of computer technology took place in stages and the VLSI took the development to a next level. The advances in ICS and VLSI technology and development of it have been the main contributing factor behind improvements of computer field. The most important application reliance on increasing levels of performance is well established in the fields of computer science . In these fields computers are used to simulate phenomena that are either impossible or too costly to observe through empirical methods.One example of such high-end applications is the electronic Computer Aided Design (CAD) tools, which are essential in design of the chips that are the driving engine of a computer system. Microprocessors commonly used in general computing tasks include those embedded in laptops or desktop computers. These microprocessors are responsible for the core computing processes, such as calculation and data transfer. ASPs are specialized to perform one function well. [2][4]

II. DETAILED STUDY:

Very-large-scale integration (**VLSI**) is the procedure of creating an integrated circuit (IC) by combining whichhundreds and hundreds of transistors or devices into a single chip. VLSI began in the 1970s when semiconductor and communication technologies were being developed. The microprocessor is a VLSI device. Before the invention of VLSI technology most ICs had a limited set of functions to perform. An electronic circuit might consist of a CPU, ROM, RAM and other logic. VLSI made IC designers to add all of these into one chip.

The first semiconductor chips held only two transistors each. Subsequent advances of technology added more transistors. The first integrated circuits held only a few devices, perhaps as many as ten diodes, transistors, resistors and capacitors, making it possible to fabricate one or more logic gates on a single device. Actually a small-scale integration (SSI), improvements in technique led to devices with hundreds of digital logic gates, known as medium-scale integration (MSI). Further improvements led to large-scale integration (LSI), i.e. systems with at least a thousand logic gates. Current technology has moved very fast and today's microprocessors have many millions of gates and millions of individual transistors.

At one time, there was an effort to name and calibrate various levels of large-scale integration above VLSI. But the huge number of gates and transistors available on common devices has rendered such fine distinctions moot



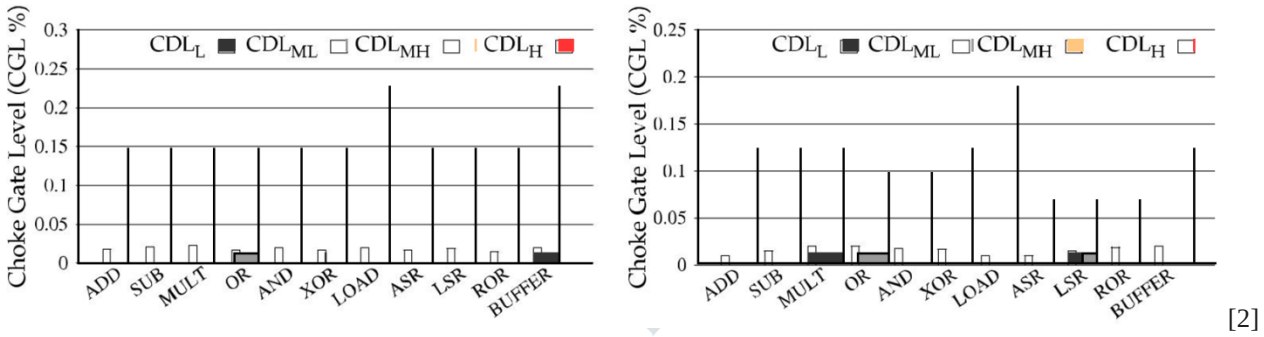
[5]

As the number of components on the chip increases day by day the need for modeling activity increases and clearly there is more to simulate rising of VLSI chips makes the verification task much tougher, mainly because complex designs require more test vectors and each vector must run for a larger number of clock cycle to cover for the extra levels of chip functionality[2][4]

PROCESS VARIATION(PV) and condition used in submicrometer VLSI circuits

Over 30 years NTC regimes specially processor of architecture design were vehemently explored by the researchers. Markoric demonstrate the efficiency of energy of near threshold system but Dr Kaul opposed by NTC design space .There are various models designed by many scientists which increased the role of PV at NTC. 30 years of NTC regimes specially processor of architecture and design were vehemently explored. There are various models designed by many scientist which increased the role of PV at NTC.

A choke point consists of a single or a small group of PV affected gate(s) that can convert a shorter delay path into a critical path (choke path), when sensitized .A critical paths with consequently have higher delays than the nominal. The effect of choke points can be observed in sensitized path only through these can be formed from anywhere in circuit. Ideally circuit depends on the instructions executed on the circuit, as well as, the inputs to those instructions.



[2]

Integrated circuit design(IC design): It is subset of electronics engineering, encompassing the particular logic and circuit design techniques required to design integrated circuits, or ICs IC design can be categorized into the mainly 2 categories of digital and analog IC design. Digital IC design is to produce parts such as microprocessors, FPGAs, memories and digital ASICS. Digital design highlights on logical correctness, maximizing circuit density, and placing circuits so that clock and timing signals are routed efficiently. Analog IC design also has specializations in power IC design and RF IC design. Analog IC design is used in the develop and format of op-amps, linear regulators, oscillators. Integrated circuit design provides the creation of electronic components, such as transistors, resistors, capacitors A method to isolate the individual parts formed in the material is necessary since the substrate silicon is conductive and being conductive in nature it forms an active region of the individual components. The two common methods are p-n junction isolation and dielectric isolation. The power dissipation of transistors and interconnect resistances and current density must be taken care since ICs contain very tiny devices compared to discrete material. Electromigration in metallic interconnect and ESD damage to the tiny components are also noted and marked. Digital IC design can be catigorised into three parts.[4]

- Electronic system-level design: The user functional specification is created by this step. The user use a variety of programming languages and tools to create this description. Examples include a C/C++, MATLAB.
- RTL design: Conversion of step the user specification into a register transfer level (RTL) description is done in this step. The RTL describes the exact nature of the digital circuits on the chip. Also the the interconnections to inputs and outputs.
- Physical design: This step takes the RTL, and a huge collections of available logic gates, and creates a chip design. This involves figuring out which gates to use, determining places for them, and wiring them together.

[4]

A **printed circuit board** (**PCB**) supports and electrically connects electronic components and electronic components using conductive tracks, pads and other features engrave from more than one sheet layers of copper overlay onto or between sheet layers of a non-conductive substrate. Components are generally soldered onto the PCB Printed circuit boards are used in all but the simplest electronic products.

Some alternatives to PCBs are wire wrap and construction, now obsolete. PCBs require additional design effort to lay out the circuit, but manufacturing and assembling are now automated. CAD software is now available to do the work of layout. The circuits with PCBs are cheaper and faster than other wiring methods as a result it gets popularized, and components are mounted and wired in one operation. Large numbers of PCBs can be invent at the same time, and the only layout has to be done. PCBs can also be made manually in small quantities, with reduced benefits.

PCBs can be single-sided , double-sided , or multi-layer. Multi-layer PCBs allow much higher component density, as the circuit traces on the inner layers would otherwise take up surface space between components. The rise in popularity of multilayer PCBs with more than two and four copper planes was concurrent with the adoption of *surface mount technology*[4]

The first PCBs used by applying hole technology is by mounting electronic components by leads inserted through holes on one side of the board and soldering is done onto copper traces on the other side. Boards may be single-sided, with an unplated component side, or more compact double-sided boards, with components soldered on both sides. Horizontal installation of through-hole parts with two axial leads of the components such as resistors, capacitors, and diodes and other are done by bending the leads 90 degrees in the same direction, inserting the part in the board soldering the leads, and cut off the ends..[4]

Signal processing

The tremendous growth of microelectronics with computing has a great impact on digital signal processing(DSP) which in modern times is used to analysed processing signal and data arising from social economic,medical,engineering and other field. Many people can access DSP with electronic,electrical,computer science ,physics,mathematics background. Other may be interested in data processing applied to economic,social and other branches of sciences. The moto of DSP is to introduce basic theory and application explaining the elementary concept opoeration as digital storage and designed techniques through computer program. It is not expected from everyone to run the program by himself because graphical outputs are reproduced at various points in context.For the convinence use of DSP theory and application programmable microprocessor are now available ,attached to general purpose dcomputer which is produced by many manufucturer according to the requirement making signal processing popular.

The main term used to describe of processing:

DISCRETE TIME SIGNAL:-It is defined as only for a particular instance of time

Eg:Humidity and temperature of particular places on particular days

They are of 2 Types:

a>*Sample data signal*:It is a signal which display continous range of amplitude values

b>*Digital data signal:*It is a signal where amplitude value are quantatised in a series of finite step.

Though in practise Discrete time and digitsl signal are often used by interchange

There are some advantages :

- It is stable and relaible
- Cost is decreasing day by day
- Many DSP used to process a number of signal at a time which is done by *interlacing sample* derived from various channels. The technique is called *time division multiplexing* and there is no true substitue for digital method.

A typical DSP scheme

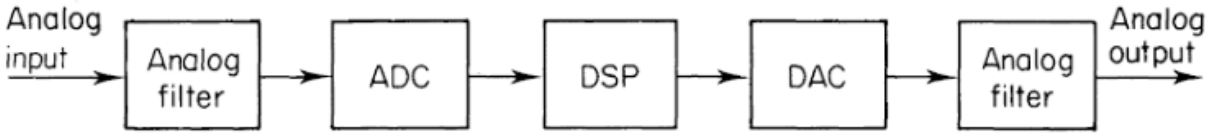


Figure A typical DSP scheme.

[3]

We used to stay in analog world and most signal starts with analog form but a now a days everything is digitized. Any signal is inherently electrical. First conversion takes place to form a proportional voltage fluctuation by a transducer which gives analog input to the signal processing chain(Analog filter).Signal sampled is converted to binary code by ADC. Using DAC the digital signal processing can be changed to analog form. In final stage ,to remove sharp transition from DAC and another analog filter. [3]

Some common application is :

1. **SPEECH PROCESSING:**
   Speech processing is the study of speech signals and the processing methods of these signals. The signals are usually formatted and processed in a digital representation, so speech processing can be called as a special case of digital signal processing which are conducted to speech signals. Aspects of speech processing includes the acquisition, manipulation etc
2. **VIDEO PROCESSING**:-
   In electronics engineering, **video processing** is a referred as a particular case of signal processing, in particular image processing, which often employs filters to the videos and where the input and output signals are videos
   There are many more applications of it. [4]

III. CONCLUSION:

So with help of electronics computer technology has a reached a very high level. Now a days wireless technology is coming. Computers has a become a part of corporate life and useful and reliable for daily official work. There is no scope in the limited space to give all the application method.

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