

Networking of machines, microprocessors, IT and HRD— Need of the Nation in the next millennium

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The best known scientific Networking enjoyed by every living organism in this Universe is the networking created and maintained by the nature for which seasons are changed, spring comes at the end of winter, ebb comes at the end of tide, rain comes every year in time, crops and fruits are produced for our survival. India is a developing country and now it is a challenge to the people to make an artificial Networking of the systems like Machine, Microprocessor, Information Technology (IT) & Human Resource Development (HRD) properly which will meet the basic needs of the Nation in the next millennium.

Introduction

Now-a-days we live in the age of Science and Technology. Today London or Newyork is a matter of a few hours' journey and within a second one can talk over a telephone to any person stationed anywhere in the world. With the help of Internet we can get various information of foreign countries without going abroad, we can know about a product, about an organisation within a moment. Without purchasing a newspaper or going to a library we can read newspapers of our country or abroad through Internet. We can also study various international journals and books through Internet. All these facilities are the contribution of the Networking of Machines, Microprocessors, IT and HRD, all of which are contributing towards the formation of a highly developed human society across the globe.

Machine

A machine is a group of components joined together to fulfil certain predetermined objectives. Machine is an artificial system having definite motions and capable of performing useful work. Some machinery provides mechanical advantage for human effort and the need for machinery is to do a job at less cost.

Any system which gives mechanical power is called a machine. In earlier days machine was operated manually. But in course of time, with the development of Science and Technology, man has invented automatic machines. The great invention of man is Steam Engine which was used in rail, ship and factories and still now we find their usage. Thereafter Diesel Engine was invented and has reduced the use of Steam Engine. Diesel Engines of different sizes are available and are used in various fields, namely in rail, ship, factory, bus, car, tractor, power generation system, pumping system, etc.

In the meantime man invented electricity and most of the machines are now run by electricity. Electrical machines are used in most of the fields even where there is no supply of electricity by battery or solar energy in case of less power consuming machines. Now it is the era of electronics and so many sophisticated machines are being manufactured depending on the principles of electronics. The basic difference between the electrical and electronic machines is that in electrical machines current flows through the vacuum and in electronic machines current flows through the solid state medium.

Machine is a very useful tool by which we can perform a lot of precision jobs in minimum time and at optimum cost. Many jobs cannot be done without the help of machine. Now robots are used in space research, factories and other fields. By plane we can go anywhere in the world in a very short time and by rocket we can go even in the space. By telephone we can talk to the people of any part of the world. By television we can view the incidents that are happening around in the world. By computer we can perform various jobs and by Internet we can access the information required in our daily life. Now all these equipment are manufactured by machines. Machines are also used in medical fields for treatment and diagnosis of diseases, for example X-ray machine, ECG machine, space maker, EMG machine etc. Machines are also used in home appliances such as washing machine, floor cleaner, shaving machine, electric oven etc.

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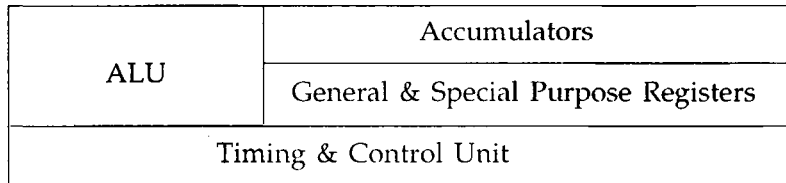
Microprocessor

Microprocessor is a semiconductor device and was first introduced by Intel Corporation of U.S.A. It consists of so many electronic logic circuits i.e. Gates, Flip-Flops, Counters etc. Now-a-days Microprocessor is manufactured using Very Large Scale Integration (VLSI) technique and has replaced the use of thousand of Logic Gates and IC's. As a result manufacturing costs of products have reduced, time and development costs have been cut short and overall size and weight too have come down.

Since Microprocessor is a programmable device, the same hardware can be used in many applications by changing the software only. The Microprocessor is designed to execute a set of instructions called program to perform a task. The Microprocessor understands only binary numbers 0 and 1 and the instructions written in binary numbers are called machine language, also called low level language. English like languages such as BASIC, FORTRAN, COBOL, PASCAL are called high level languages, and these are converted into binary code through another program called compiler or interpreter.

When Microprocessor (4004) was first produced in 1971, the word length was 4 bit and clock frequency was 750 KHz. Now-a-days due to advancement of technology, Microprocessors (Pentium III- Processor) are used with word length of 32 bit and clock frequency 450 MHz in Microcomputer and even can execute millions of instructions in a second.

The architecture of different Microprocessors are different according to their version. The major sections of a Microprocessor are arithmetic and logic unit (ALU), timing and control unit, accumulators and general purpose registers.



Simple Architecture of Microprocessor

ALU—It performs arithmetic and logical operations.

Accumulator—It is a buffer register and is used to store intermediate results during an arithmetic and logical operation.

General purpose registers are used for temporary storage of data and results during the execution of a program. **Special purpose registers** are used by Microprocessor itself.

Timing & Control Unit—It generates timing signals for the execution of different instructions and controls the flow of data.

After switching on a system, Microprocessor first reads the instruction written in memory and is called fetch cycle. Then it starts understanding the instruction. This is called decode cycle. Then Microprocessor executes the instruction and this is called execution cycle. For executing an instruction Microprocessor uses Address Bus, Data Bus, Control Bus, Memory and Input-Output Ports. Microprocessor itself is not a machine or a system, it is a programmable chip. When Microprocessor is interfaced with Memory and Input-Output devices by using Address Bus, Data Bus and Control Bus depending upon the type (version) of Microprocessor, then it can be said a system or machine or microcomputer.

The application of Microprocessor is increasing in various fields day by day. They are used in robotic systems, temperature control of furnace, numerical control of lathe machine, control of motors, voltage control of generator, etc. in industry. They also find use in calculator, electronic typewriter, teleprinter, telephone system, television, electronic games, traffic light control, home lighting and heating control, etc.

Microprocessors are also used in the control of aircraft, surface vessel, submarine, satellite, weapons system etc. They are also used in cash register machines in bank, in the machines of computerised reservation centres of Airlines and Railways, in computer aided design (CAD), computer aided manufacturing (CAM), to prepare drawings, pictures, graphics etc.

Information Technology (IT)

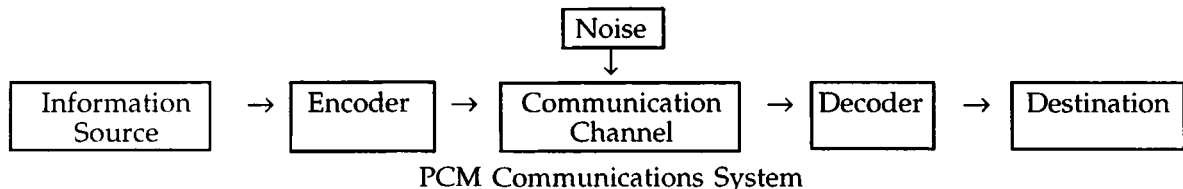
The communicating knowledge or data which is meaningful to the user is called information and the application of the process by which we can transmit, store, or receive the data is called Information Technology. Information Technology is used now-a-days in every walk of life in education, health care, research, defence, banking, commerce, industry, agriculture, marketing etc. Transmission of information takes place in our daily life. For example, when we talk over telephone, listen to radio, watch television, use fax or teleprinter, use computer, access internet and even read newspapers, read books, view cinema, attend social function and so on, they are all nothing but manifestations of the use of Microprocessors in various fields.

In earlier days information was transmitted as signal, voltage or pulse after the modulation. But due to advancement of science the technology has improved and has replaced the use of Analog Communication System by Digital Communication System. In Digital Transmission System information is converted into binary code i.e. either 0 or 1. Here information is a measure of uncertainty of the occurrence of a particular symbol and is based on the probability concepts and can be written as

$$I(E) = \log \frac{1}{P(E)}$$

where $P(E)$ is the probability of event E and $I(E)$ is the information carried by the symbol.

The information theory is mainly concerned with the theory of Communication System as briefly described and shown in figure below :



In order to transmit the information to a distant place Encoder converts the information to a special code known as binary code.

The Channel is the medium over which information signal is transmitted. The Channel may be air, co-axial cable, microwave link, fiber optic cable etc.

C. E. Shenon has defined the capacity of a continuous noisy Channel (the noise in the Channel is zero mean, additive, white and Gaussian)

$$\text{Channel Capacity } C = B_T \log_2 \left(1 + \frac{S}{N} \right) \text{ bits/second}$$

[where B_T = Channel Bandwidth in hertz.

S = Average power of signal

N = Average power of additive noise]

Noise is a thing which always occurs mainly in a communication channel and also to some extent in the receiver. The various types of noise are atmospheric noise, white noise, thermal noise, tube noise etc.

The Decoder converts the binary coded signal to the original transmitted signal to the destination.

Human Resource Development (HRD)

Manpower is called human resources in an organisation and represents workers as well as the top management. It is a preparatory step for the action that is to be taken in future. Planning of human resource in advance of the actual requirement is regarding the number and qualification of people necessary to achieve full utilization of all input factors such as machine, plant and inventories into production system. Planning is to be made in such a manner that each worker from the highest level to the lowest should feel that he has been trained to carry out his respective responsibility in the best possible manner.

Development of human resource is urgently required to make our country a developed country. Because in the present era machines are used in every sphere of life and Microprocessors

are used in most of the latest electronic equipment as well as in the electro-mechanical equipment. Information Technology is also being used tremendously in our daily life. To use the equipment properly people should be familiarized with the equipment in any organisation or society. People should be imparted proper training to increase the skill for doing a specific job. Today due to technological advancement and mass production, a very high skill labour is required which can only be developed by proper training. Those few employees who are interested to achieve higher knowledge and would like to carry out research work for the innovation of new technology, should be encouraged for better technical knowhow of the organisation as well as for the ultimate betterment of the society.

But despite imparting proper training human resource may not be useful always. To make human resource fruitful firstly job security is to be guaranteed to the employees and then other welfare activities to be undertaken for the satisfaction of the employees. The examples of welfare activities in a factory are clean environment, hygiene, health, comfort, ventilation, lighting, sanitation, first-aid, rest room, canteen facilities and outside the factory are housing accommodation, education of children, library, reading room, club, recreation facilities, medical treatment, etc. Because until an employee is satisfied with the job, with welfare, his morale will not be developed and he will not give attention to the work properly. After the development of morale, a worker will co-ordinate with the activity of his head, hand and heart because head is concerned with skill of work, hand is concerned with the energy of work and heart is concerned with the attention of work. This is the main objective of Holistic Management.

Need of the Nation

India is a country with a population of about one billion, 75% of which live in rural areas with only minimum infrastructural facilities for food, shelter, education, health care, drinking water, sanitation, recreation, etc. So our objectives should be overall development of the socio-economic structure by introducing technology appropriate to rural needs as well as to the need of the people residing in urban areas.

To transform India from a developing country to a developed country more technological activities should be initiated with a view to improving the quality and standard of life in rural and urban areas. The basic needs which are to be solved in the rural areas are proper irrigation system for which water is to be supplied to the agricultural land in artificial way to fight out drought and excessive water accumulated due to heavy rain or flood should be cleared by proper way so as to prevent flood related disaster. Fertilizers are to be made available to the farmer at a reasonable cost. Farmers should be equipped with necessary information well in advance about weather report so as to enable them to take proper measures to overcome any sort of devastation likely to arise. Proper training should be given to the farmer as to when and what type of pesticide will have to be applied for the better output of crops. Loan facility should be available to the farmer so that they can purchase equipment of cultivation and also subsidy is to be provided to them keeping in view their financial condition. Proper education by audio-visual systems should be given to the farmers regarding the utilization of high yielding crops to cope with ever-increasing demands of foods. All these problems are possible to be solved if co-operative society is introduced in every village to extend all sorts of co-operation to the farmers in respect of training and other important information. Industries should be set up in the village depending upon the availability of raw materials. For the development of overall infrastructure of rural areas the other requirements are proper road, transport, communication, low cost housing technology, supply of drinking water, conventional and non-conventional energy systems, health centre, educational institution, etc. This aside, in the urban areas prima facie importance should be given for introduction of small and large scale industries, general and technological college and University, pollution reducing system, telecommunication centre for interfacing rural and urban areas, etc.

It is thus expected that a planned networking of machines, Microprocessors, IT and HRD shall bring about the desired changes in a significant manner so as to ameliorate and improve the lots of the poor of our country in much less a time than may be envisaged without their application.