Role of Microcontroller in Automation

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Abstract: Automation is the key word of today's era and has many parameters along with controlling the hardware through software. Microcontroller being a completely dedicated and self contained embedded processor chip has enormous applications. It is continuously gaining importance because of its features like speed, efficiency, portability due to small size, accuracy and above all the utility. Microcontrollers can be programmed to control many things surrounding us in a day to day life. It can even control many devices simultaneously and makes the job easy once programmed. Due to limited memory and thereby the program length, generally the microcontrollers are employed as a dedicated processors. Hence the program runtime reduces resulting in time saving which ultimately boost the speed. Today and in coming time, time management is and will be a crucial factor and it such circumstances controlling and accomplishing most of the daily routine tasks will be a challenge and these challenges can be met over by the microcontrollers.
Keywords: Automation, self contained, embedded, Chip, Utility, Programmed, Program run time

I.   Introduction

Microcontrollers are basically designed for the embedded applications and are use in automatically controlled products and devices. Today almost all of us are surrounded by so many gadgets like Mobile phones, Microwave Oven, Washing Machine, CD/DVD players, Electronic measurement systems, Cameras, Automobiles, Remote locking systems, Door openers, Security Systems and many more from the start of a day till we go to sleep and almost all these gadgets are controlled by the processor to be more specific microcontroller since its not just process the data but also controls the other parameters post processing. The process starts from sensing the changes in the physical parameters. So most of the things are sensed through the sensors and the sensed signal (data) is processed majority by means of Microcontrollers. Being dedicated, processor with limited parameters like RAM, ROM, Timer and Counters embedded on a single chip (IC) and hence known as a system on chip. It really has saved most of our physical energy, time, manpower and increased speed and thereby efficiency. [1]

II.   Generalized Block Diagram
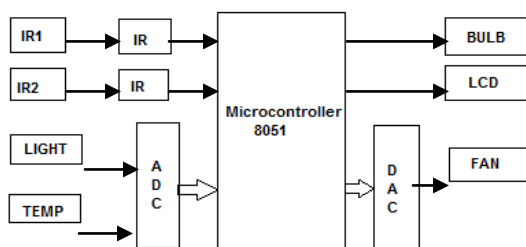
Block diagram depicted mainly focus the major contributing peripherals in making of the entire system and as an example the parameters like light and temperature to be sensed along with the respective sensors are shown.

ADC and DAC are basically the converters and aids in converting the sensed parameters quantize in analogue into its equivalent digital form and upon processing by the microcontroller again reproducing the output in an acceptable form by the output devices. Microcontroller is basically a complete automated system which can be used to run various peripherals with the highest efficiency possible. Being small in size it's handy and can be easily carried.

III. Basic action

The entire process takes place in four major parts as;
    1) Sensing the physical change
    2) Converting the sensed parameter into the value acceptable by the Microcontroller.
    3) Processing the received input/s.
    4) Obtaining the expected result and converting it back into an acceptable form by the output device.

These four processes are mainly performed with the SENSOR/S, ADC Converter, Microcontroller and DAC Converter. [2]

IV. Embedded Concept with plus and minuses

Microcontroller being a complete system includes processor, memory and peripherals and as a whole identified as an embedded system. Hence the system is having an advantages like small size, faster to load, easy to manage, low cost, engaging less resources and last but not the least is since these embedded operating system is dedicated to one device so the performance remain good and use less resources. Along with the advantages the embedded system is associated with shortcomings like; difficult to upgrade, needs to reset setting if problem occurs, not scalable, hardware is limited, difficult to troubleshoot, difficult to transfer data from one system to other . [3]

V. Programming Concept

Since microcontrollers are the system on chip naturally the Memory i.e. Program length and space required should be minimum while the maximum speed and efficiency. Hence the typical microcontroller program must be accommodated in an available on-chip program memory. Otherwise also adding an external memory is a costly affair. While designing a microcontroller aiding hardware and software developments of the target system/s, manufacturers are bound to design a special version of it. Initially EPROM versions having window on top were deployed wherein the program memory could have been erase exposing the memory to an ultraviolet light and could be reprogrammed many times. The most important feature of microcontroller is that they are having bit addressable instructions because of which the data in bits can also be processed along with bytes and word length data.

VI. Prominent features

6.1 General Purpose I/O Pins

Microcontrollers contain general purpose input output pins which can be configuring an input and /or output. While configuring input, input pins read sensors or external signals, while configuring output pins the said pins drives the output devices or displays or any other kind of output.

6.2 Pulse width Modulation [PWM]

It's an unit providing On / Off signals on general purpose input output pins at a predefined frequency.

6.3 USART

It's an **U**niversal **S**ynchronous **A**synchronous **R**eceiver **T**ransmitter. It allows reception and transmission of the data serially without loading CPU.[4]

VII. Conclusion

With so many features and in various versions, innumerous microcontroller based embedded systems are available and the time is not so far when almost every manual job will be assisted by the microcontroller world. [5]

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