Microcontroller Based Application in Electronics & Communication

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Abstract— This paper is showing the various applications of electronics and communication which are working paralleled to each other that makes our life easy and wonder fool. In our life style from morning to evening there are various devices which we are using, and there may be much more possibilities to innovate devices. Such as smart gadgets which are capable to measure rate of change of humidity, temperature, sun light as according to weather and then system should control fan and light. There are also need of electricity consumption analysis, which keep intelligent eyes on every instrument. Here we want to develop a smart system that can analyze vehicle maintenance cycle, losses of electricity, uses of water in home or offices. In this paper we will discuss about innovative research in electronics and communications and their future scope.

Keywords- *μ-controller; WiFi(Wireless Fidelity); GSM(Global system for mobile); Android software; Remote Monitoring; IOT(Internet of Things)*

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I. INTRODUCTION

World's first microcontroller was developed in last 1971, designed for usage in calculators. This single chip may make full electronic calculators available to everyone at prices that can put a calculator into every kitchen or businessman's pocket. Today, microcontroller production counts are in the billions per year and there are many companies which are making various kind of microcontroller. Now a days there are approximately 20 devices at our home which are using microcontroller, such as calculator cell phone television and audio players etc. Microcontroller is work as small computer, recently microcontroller used for vehicle controlling, heavy machine controlling, aerospace industry industrial instrument and home appliances. Microcontroller perform all tasks as written in their memory.

With the growth in technology, needs of human being are also increasing, And Machines makes life is too easy. Every field required some electronics, and automatic system. Microcontroller based system can be modified as according to requirement, can be easily calibrate over any range. Microcontroller was developed for multiple task by using single chip. Microcontroller is on board system there is in built CPU, RAM, ROM memory for their internal use.

Microcontroller can be interface with many types of integrated circuit and transducers to measure and control physical parameter of closed environment.

Microcontroller is playing an important role in telecom field, where this is used for controlling communication carrier, error correction and encoding-decoding of signals. Now a days there are limitations of bandwidth in communication carrier, so by using complex multiplexing algorithms large packets of data can be transferred, this algorithms are developed in microcontroller.

Microcontroller can perform signal processing, data analysis, digital filtering and data manipulations task.

For different applications different type of micro-controller is available, So there is need to find appropriate controller for the application to fulfil system requirement.

II. SELECTION OF MICROCONTROLLER

A. *According to Required Peripherals*

In every microcontroller there are limitation of input output ports, so designing of any application firstly know about every supporting peripherals. According to requirement of application input output devices are interfaced with controller, such as display, keyboard, motor drivers and physical transducer.
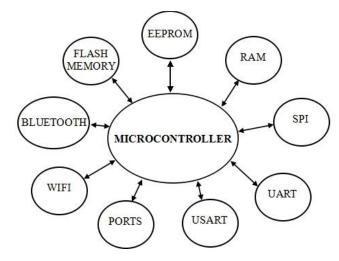

Figure:-1

B. *Communication Protocol based*

Microcontroller based application communicate with external devices to give their results, processed data, and control signal to driver etc. According to protocol microcontrollers are selected. which are as follows UART,

USART, MODBUS, I2C, I2S and SPI, these all are used for communication and interfacing with other devices.

C. Available memory for code and data

Every microcontroller have their own memory for program this is called flash memory this storage is only contain executable instruction for CPU and ALU of microcontroller. These memory of microcontroller are fixed type that cannot be increase with external memory, so complex application require big memory for large operations. For storing of run time variable and data RAM is used, and a special memory is used which store data even after power down of device which is called EEPROM(Electrical Erasable ROM). this memory is not available in every microcontroller so as requirement of application microcontroller are selected.

D. Power and clock

there is need of that type of controlled which uses very low power and perform every function perfectly. There are requirements brown out detection system which detect low power. And there are need of fastest controller that can execute every task in micro seconds. some microcontroller also developed with inbuilt RTC(Real Time Clock), which is used for clock application and for alarm. These all point comes in the selection of appropriate microcontroller.

III.   BASIC ARCHITECTURE OF DESIGN

As shown in figure all input output peripherals are connected through control unit. This diagram is showing basic structure of any embedded device. With the development in embedded devices or microcontroller based applications, it is too easy to update and debug.
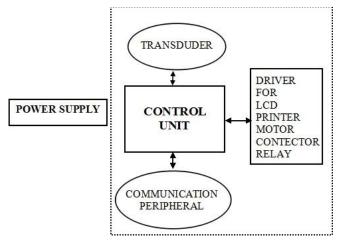

Figure:-2

Communication peripheral is used to interface the instrument to external environment for the sake of data transmission to another device or HMI(human to machine interface). There are various type of communication chips are available which works on different protocol, like RS232, RS485, USB, RF(radio frequency) WiFi, Bluetooth and I2c etc.

IV.   RELATED WORK

This paper discussed one such use case, which can be implemented by the automobile industry, using technological advancements in the areas of internet of things and Analytics. Any passenger vehicles, which are capable of internet connectivity and sharing of various kinds of data with backend applications. The data being shared can be about the location and speed of the car, status of various parts/lubricants of the vehicle, and if the vehicle needs urgent service or not. Once data are transmitted to the backend services, various workflows can be created to take necessary actions, e.g. scheduling a service with the vehicle service provider, or if large numbers of care are in the same location, then the traffic management system can take necessary action. 'Connected vehicle' can also communicate with each other, and can send alerts to each other in certain scenarios like possible crash[1].

in this paper a microcontroller based energy meter are developed, the whole system consist of smart meter, smart plug, smart mobile devices, and database server. The smart meter consists of a power metering unit, a data storage unit, a meter interface unit and a ZigBee module. The smart plug is composed of a core control unit and a remote monitoring module. User can use smart phone to check and control the operation of appliance, and the power consuming information can be remotely monitored by connecting smart plug to the internet via Wi-Fi media. Besides, the load characteristics in the database server can be employed to identify appliance operation mode by Support Vector Machines (SVM) method, which provides effective message for home electric energy saving application.[2]

This paper is showing basic architecture of microcontroller based weather station and their required components. a small weather station which collect the data from analog sensors connected through ADC(analog to digital converter) section of microcontroller, which convert analog parameter to digital information. The collected data from various sensors send to the server using internet connection through any wifi device. Any of the user can see that physical value from anywhere in the world.[3]

Many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving bad smell. To avoid all such situations we are going to implement a project called IoT Based Smart Garbage and Waste Collection bins.

These dustbins are interfaced with microcontroller based system having IR wireless systems along with central system showing current status of garbage, on mobile web browser with html page by Wi-Fi. Hence the status will be updated on to the html page[4]

V.   RESEARCH METHODOLOGY AND PROBLEM STATEMENT

In all of the literature we have seen that every embedded system required a central processing unit or microcontroller, we have classified that every design depends on   application requirements that may be input peripherals, memory and power requirements. System can be designed with more central processing units, every microcontroller perform own task

separately, but in this category there are also two type of systems are design which are as follows, system with a master device which control every other slave microcontroller units, and other one is peer to peer microcontroller each one perform their task and share information to neighbour microcontroller not to others, which reduces complexity of system.

Use of multiple controller increase size of system architecture and complexity of system, this problem can be solve by using appropriate controller which have large number of ports and memory space to hold big programming code. A single controller store state of every section and easy show results over the HMI(human to Machine Interface) and communications ports.

Whenever a system is designed which have communications system with external device with microcontroller there are also some issue of EMI(Electromagnetic Induction) and RFI(Radio Frequency Interference) both of this factors are affecting the functionality of device, the solution of this problem is, system should be designed with proper isolated ICs or circuitry, and proper use of communication filters.

Another one of the most commonly issue comes in the development of microcontroller based devices is there life cycle or memory storage elements life cycle, so this can be solve by using external non-volatile memory rather than using internal EEPROM, because internal storage have some limitation of write cycles.

VI. CONCLUSION

Study of microcontroller based devices and instruments is accomplished. We have concluded that microcontroller is used in everything from small toys to war machines for military instruments. Microcontroller is used for versatile devices which must be need to upgrade. Recently in market special microcontroller are available which have capabilities to update their firmware from remote locations via WiFi or LAN connection. Microcontroller changes the face of future development in small devices , like heart beat measurement, blood pressure instrument and other small gadget in our home like fridge AC(air conditioner) washing machine.

Microcontroller based instruments save processing of computer for various applications, such as digital camera, signal analyzer scanner, voice recorder, audio and image compressor etc. Many more devices and MCU ICs are available in market which convert raw data to usable information.

Microcontroller used in any device is a smart solution on the place of large logic gates circuits. A 8 bit microcontroller is available on the price of two logic gate ICs. So microcontroller is also a chip and good solution for low power logic low frequency counter timer circuit.

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