Clean Room Technology Based Automatic Control of Electrical & Electronics Appliances Control

T. Ramachandran, Sanjiv Kumar

Abstract— Day by day technological development to provide the sophisticated life to the human being is takes place in a large scale. Among the technical development the wireless control and communication for the device control is one of the fast growing sector. Electrical devices located in many place can be effectively controlled with the electronics control circuits through the wireless communication. This paper present is dedicated to design and develop a model for the automatic control of electrical supply based devices by using wireless communication technology and this is part of clean room technology. The clean room technology is providing fully controlled devices which can be automatically adjusted to have a user friendly environment in the home/room/hall. Clean room means that the room will provide fully effective comfortable environment to the living person in the room where the entire electrical and electronics appliance will be monitored and controlled as per standard specification which is required for the comfortable life in the room. Microcontrollers will be the controller for the input and output device control. For the wireless control the GSM technology also incorporated in the system. The GSM technology will allow the user to monitor the device control through the wireless cellular phone. Different types of sensors are used as part of sensing device for the monitor and control of various input parameters. The control circuit will get power from the solar during the sun light and from conventional source during the non availability of the sun power.

Keywords— Electrical Appliances, Bidirectional Input, Clean Room Technology, GSM Technology, Sensors, Controllers,

I. INTRODUCTION

Home automation becomes more famous nowadays among the people for the safe and green environment. Due to this reason there are many technological development and solutions are beings in progress in the research industry to cater them. No home can be find out without electrical and electronics devices in the world and more than 80 % of the homes are well equipped with sophisticated electrical appliance and hence the safe and effective control of them are also need of the hours. The effective and efficient control and operation of the electrical and electronics devices will results in cost reduction and less affect of the environment. Clean roo

does not limited with a specific living room but also the big room room/hall where many electrical and Electronics appliances are installed for the different purpose. The automation provides efficient & effective control and monitor of the equipments. The automation also save the energy & money to a large extend and also good for green environment.

II. CLEAN ROOM TECHNOLOGY (CRT)

A. Electrical appliances

There are many electrical appliances which are monitored and controlled through this clean room technology. The clean room technology means that the efficient and effective control of the electrical and electronics devices in order to improve the life style of person in the rooms and also to provided less pollution to the environment. There are five electrical equipments are taken to monitor /control/operation. The equipments are fan, light, temperature input from AC for temperature control, gas regulator input for gas leakage monitor and control, and main MCB input to ON/OFF of the all appliances in case of fire.

B. GSM Technology for Wireless Device Control

When the term wireless control comes there the GSM technology will play very important roll. The GSM technology provides the wireless control through the cellular mobile phone. GSM technology is being widely used for wireless communication with different operating frequency range (850MHz, 900 MHz, 1800 MHz and 1900 MHz) for the use of mobile phone voice & data communication operation. The GSM technology system is a digital system & this technology use the Time Division Multiple Accesses (TDMA) Technique, which provide the different time slot to each user without changing the operating frequency and the circuit is shown in fig.1

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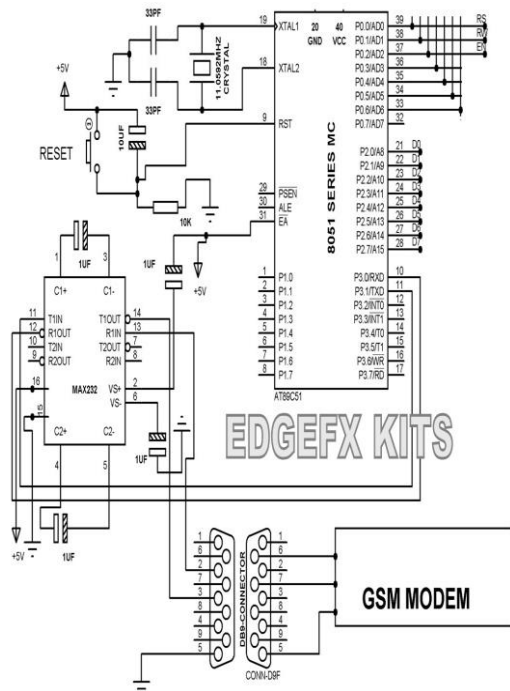Email: activesanjiv007@rediffmail.com

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Fig. 1 Test circuit GSM Technology

C. Temperature Sensor for Fan and AC Control

There are five electrical appliances which are planned to control and monitor through this developed model. For this purpose there will be a need of different sensors and relays to get the current status of the devices for their operation and control. The adjustment of the fan and the cooling temperature of AC have to be monitored for controlling them as per the need of the environment. So, there will be a need of sensing and the temperature continually with the help of temperature sensor. The temperature sensor used for this purse is shown in fig 2. The module shown is of thermometric ZTP 188MA thermopie IR sensor. This sensor provides very high accurate response in the application and there will be no need of any more recalibration. The sensor output is temperature compensated 8 line arrays. There will be 4: 2 number of wires required for output, 1 to provide power supply and another 1 for ground.

Fig. 2 Temperature Sensor

D. Relay circuit

The relays will the one of the main device will provide information between control device and the power deice which have to be controlled/ON/OFF. So, the relay is an interfacing device between the control circuit and the actual device which have to be monitored and controlled. There are many power relays are available in the market. The relay circuit and its module have been shown in the fig 3 and 4 respectively.
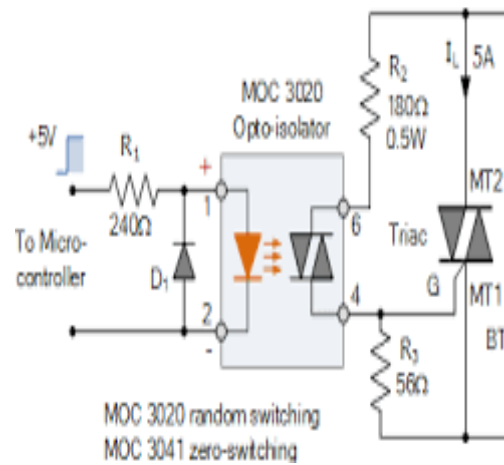

Fig.3 Relay Module

Fig.4 Relay Circuit Diagram

E. Light Sensor for Illumination Control

One of the options in the project is to adjust the illumination level of the light according to the need and that can be only done if the light intensity of the light is monitored. So, the light intensity of the room is continuously monitored through the light sensor for the effective and efficient control and adjustment of the brightness of the light. To achieve this light sensor has been incorporated in the project module. For this purpose the light sensor device have been used. Proper window arrangement at the time of construction of living place will provide good natural bright during the sun time. Various light sensors are available with different specification and standard. Among them the suitable one can be selected and the light sensor modules which need for this project have been shown in the fig.5.
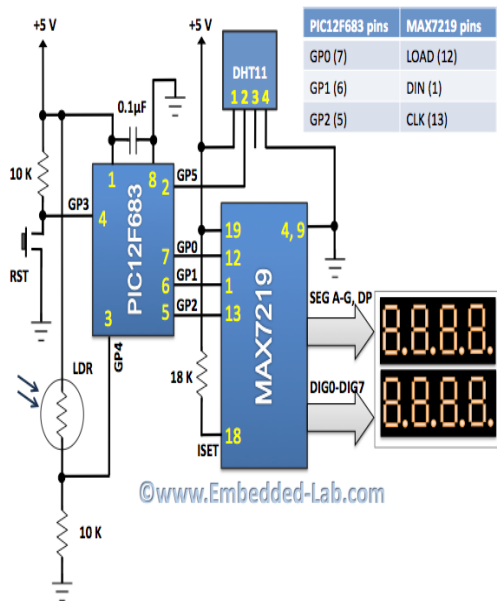
Fig. 5 Circuit arrangement of the light sensor

F. Smoke Detector

The purpose of smoke sensor is to OFF the electrical appliances in case of any fire due to any reason which also includes the fire due to gas leakage. At the time of any fire the smoke sensor sense the incidence and give the control signal to the relays to OFF the main circuit breaker in order to avoid any further electrical fire in the room. The smoke sensor used in the project is shown in fig.6
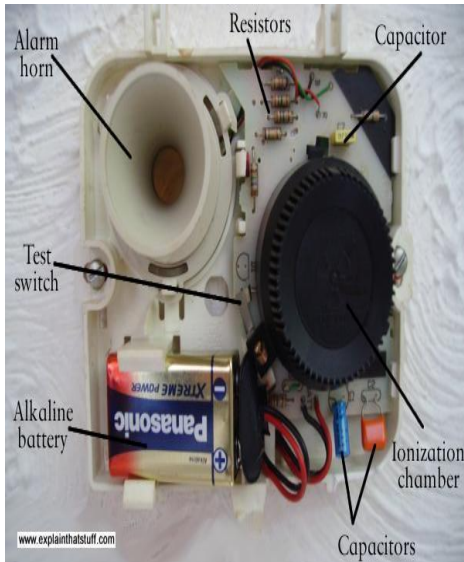

Fig. 6 Smoke Sensor module

III. CLEAN ROOM TECHNOLOGY BASED ELECTRICAL APPLIANCES CONTROL

The aim of this paper is to design a Clean Room Technology (CRT) based Home Automation system using microcontroller in which different electrical and Electronics appliances located in home/office/conference hall are operated and controlled using microcontroller as control device [2]. The circuit of the proposed method is shown in fig.7
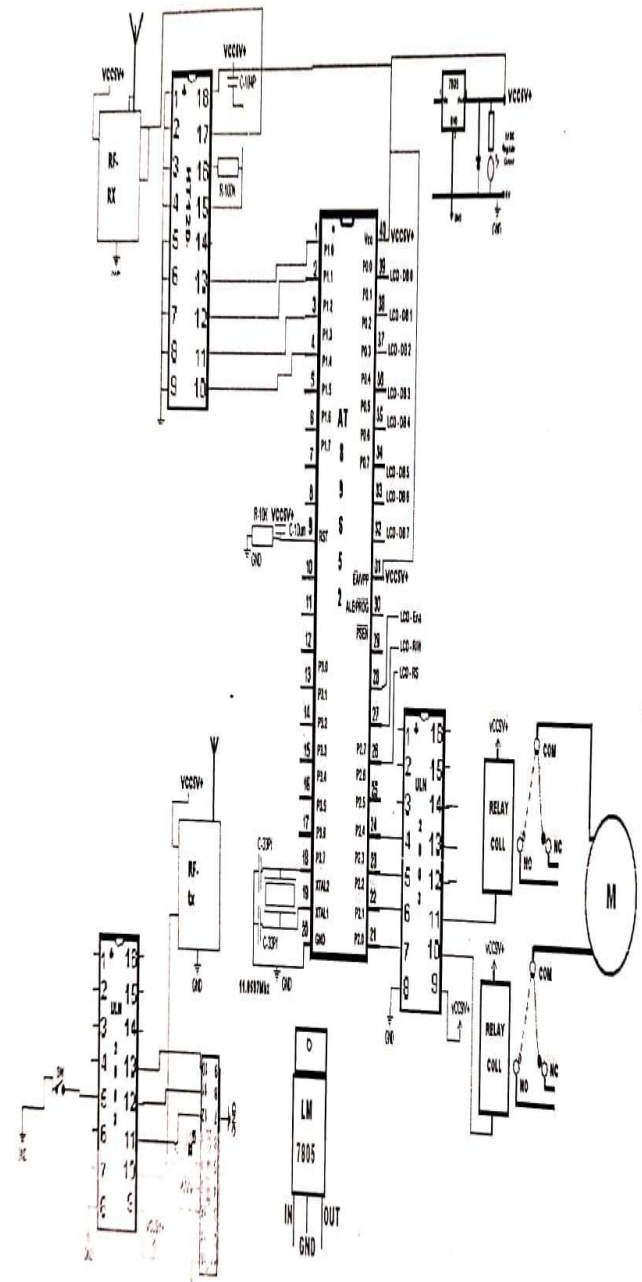

Fig.7 Circuit Diagram of CRT based device control

For wireless communication GSM based technology has been used and hence the working of the proposed system starts with the turn ON of the GSM modules transmission and receiving system. The main purpose of doing this is to avoid the junk data or clearing of junk data. After the successful pairing of the transmitter and receiver modules of the GSM technology, the display system attached with this proposed system will glow as an indicator. At this moment onwards the detector output pin would indicate it is in a high logic till any bittern of the transmitter is pressed. Now, turn ON of the microcontroller the OFF of the all loads as it receive logic high signal from the receiver.

The LED display system will indicate the current status of the condition of the all the loads. The microcontroller will turn ON/OFF of the corresponding Electrical /Electronic appliances if the corresponding button is pressed in the transmitter. In addition to just ON\OFF of the loads/devices, the operating conditions also changed with the help of the input signal comes from the corresponding sensors like temperature sensor, illumination sensor, fire indicating senor etc. If the same button is pressed once again, the microcontroller will turn off the load.

IV. RESULT AND HARDWARE DISCUSSION

The project is hardware based project and the software programming also inbuilt in the microcontroller. The 8051 microcontroller has been used in the project as part of controller and the programming have been done according to the project description.

A. Microcontroller AT89C51

The microcontroller used here is an of 8051 family and its block diagram along with the basic architecture of the same have been shown in the above figure number 5[3]. It has the following features such as Compatible with MCS-51™ Products, 4K Bytes of In-System Reprogrammable Flash Memory, Endurance: 1,000 Write/Erase Cycles, Fully Static Operation: 0 Hz to 24 MHz, Three-Level Program Memory Lock, 128 x 8-Bit Internal RAM, 32 Programmable I/O Lines, Two 16-Bit Timer/Counters ports and there will be a interrupt in continues function. RAM counts are saved but the other functions are stopped till the next hardware reset command comes, during the power down mode.the controller module is shown in fig.8
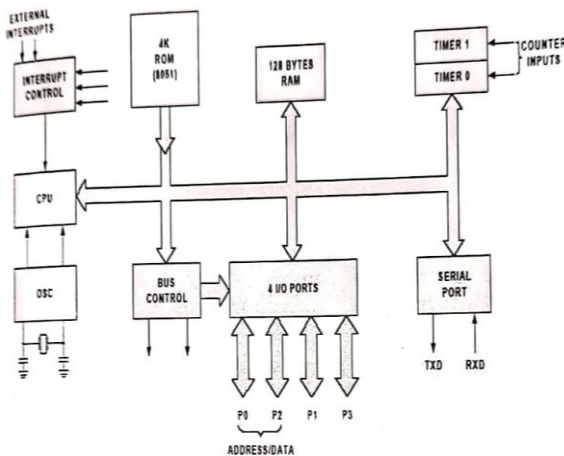

Fig. 8 Microcontroller AT89C51

B. Programming Algorithm

Before programming the AT89C51, the address, data and control signals should be set up according to the Flash programming mode table and Figures 3 and 4. To program the AT89C51, take the following steps [5].

1. Input the desired memory location on the address lines.
2. Input the appropriate data byte on the data lines.
3. Activate the correct combination of control signals.
4. Raise EA/VPP to 12V for the high-voltage programming mode.

5. Pulse ALE/PROG once to program a byte in the Flash array or the lock bits. The byte-write cycle is self-timed and typically takes no more than 1.5 ms. Repeat steps 1 through 5, changing the address and data for the entire array or until the end of the object file is reached.

C. Result Explanation

The project is design to operation and control of the five different electrical appliances with the clean room technology and for the wireless communication the GSM technology has been used. The fan speed, AC temperature control, gas stove regular control, main MCB control, and smoke identification can be controlled automatically. The same status of the same can also be monitored, controlled and communicated through the mobile phone with the registered mobile phone number. The different key numbers has to be in build in the program for the wireless communication. To know the status, ON/OFF and control the different appliances the following key are assign for each load/device /appliances.

Table.1 The Key function for wireless communication of the appliances control

S.No	Key Number	Load/Appliance to be controlled
1	4	To known the status and ON/OFF of the Fan
2	5	To known the status and ON/OFF of the AC
3	6	To known the status and ON/OFF gas stove regulator
4	7	To ON/OFF of the MCB in case if the room is locked but the appliances are still in ON condition.
5	8	To know and control the fire sensor

The electrical appliances are automatically adjusted in the room itself and the above table is for the wireless control and monitoring only.

D. Hardware and its Descriptions

The proposed project is to control the different Electrical and Electronics Loads which are located in the room by using clean room technology. The clean room technology is used to design a environment friendly home appliances. There are five different electrical loads are taken in to account for the effective control of the devices. The fan regulator will be adjusted automatically in accordance with the temperature variation in the room. The cooling of the room will be monitored continuously and the same will be auto adjusted as per the room temperature. If any gas leakage is from the gas stove then the gas regulator will be closed automatically and in addition to that the all electrical loads will be switch off by opening the main circuit breaker. The hardware of the proposed system has been shown in the fig. the two modules namely on is the main module and the other one is the remote module of the proposed system. The hardware of the project is shown in fig.9
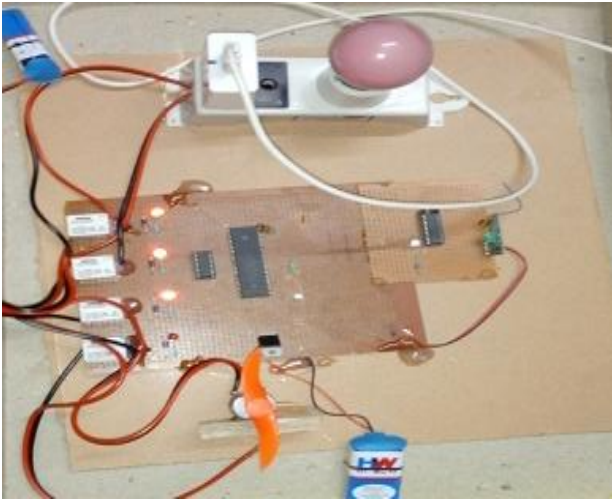
Fig. 9 Hardware image of the CRT device control

V. CONCLUSION

Clean Room Technology based electrical and electronics appliance control technology has been applied in this paper to control and automatic operation of the room/home/office appliance. There are five electrical appliances (Fan, Air Conditioner, Gas stove regulator, MCB, Smoke data) has been controlled using the proposed CRT based device control technology module. Microcontroller AT89C51 is used as part of programming & controlling device. The controlling of the electrical loads was by wireless & microcontrollers based control methodology is adopted. In addition to the control of the loads the room atmospheric conditions also monitored with the use of sensing devices which take the feedback information for controlling the devices. Based on the response obtained from the sensing devices the microcontroller send command to the electrical appliances concern so that operation of which would be controlled. Two ways supply has given to the load that one from conventional (EB) and the other from solar supply system. The supply is connected to the load based on the availability of the source.

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