GSM Based Automatic Monitoring System for Efficient Power Management

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Abstract *Solar panel and wind mill are devices that cleanly convert renewable energy (sunlight, air) into electricity and offer a practical solution to the problem of power management(utilize and save) in domestic and industrial areas. This project involves the development of an automatic monitoring system of energy from Solar and Wind mills that could be further used for domestic and industrial purpose, making use of a GSM Module as the control system. Non renewable energy is relatively a short-term energy source consequently; the uses of an alternative sources such as solar and wind energy are becoming more wide spread. Proposed in this paper is a system that monitors the movement of a solar and wind mill so that it is constantly gives information to GSM. It is a hybrid hardware/software designed and constructed system, this paper offers are liable and affordable method for monitoring and saving. With the use of this system we can predict whether a particular place is suitable for establishing the solar power plant and/or wind power plant. The system will be implemented for industry and home appliances for efficient power management where in the system will be controlled using a PIC microcontroller and GSM technology.*

Keywords *PIC Microcontroller, GSM module, Sensors.*

1. INTRODUCTION

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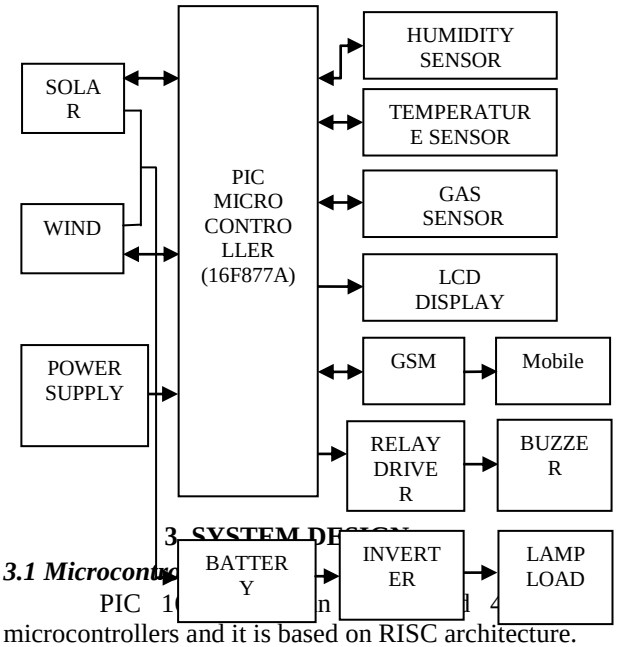
Electricity plays a vital role in growth of our country. With the fast growth of civilization there is also an ever mounting need for energy. There are many sources of energy. i.e. Geothermal Energy, Fossil Fuels, Coal, Oil and Natural Gas, Hydro Power and Ocean Energy, Nuclear Energy, Solar Energy, Wind Energy. Some of the energy we can use is called as renewable energy (solar, wind, geothermal and hydro). In the field of electrical or electronics current and energy consumption, which may effect on stabilization of the components, are playing an important role. Utilizing and saving are the only way for efficient power management.[1]

GSM is a kind of mobile phone. It has built in SIM. The decision making part will be carried out by the Microcontroller. GSM module and sensors are interfacing with PIC microcontroller. The sensor senses various surrounding parameters like temperature [2], gas and humidity. The output from the solar and wind panel is connected to the DC battery, and then the battery continuously charged. Main function of the inverter circuit is to convert the dc voltage into ac supply which is connected to the appliances used in our day to day life. The status of the system is displayed each and every second on the LCD display. When there is an error in the values of solar/wind mill an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through the GSM[4]. The system also supports to provide real-time monitoring of concentration of the values. This battery is controlled by microcontroller based GSM module. This is done with the help of PIC16F877A microcontroller. The traditional manual meter reading was not suitable for longer duration operating purposes as it spends much human and material resource. It becomes a hard task in handling and maintaining the power as per the growing requirements. It becomes very difficult in rainy season. Presently maintenance of the power is also an important task. This system is also used to control industrial and home appliances tenuously and offer efficient power management.

2. BLOCK DIAGRAM



3. SYSTEM DE

3.1 Microcontr

PIC 1 n l 4 microcontrollers and it is based on RISC architecture. It is low cost, wide range availability and re-

programmable flash memory device. It is used in remote sensors, security and safety devices, home automation and in many industrial instruments. Here it is communicated with both GSM and sensors. The information of sensors is received by PIC microcontroller and it compares the current information with predefined value. If the value doesn't match the particular device will be immediately disconnected from the PIC microcontroller [3].

• Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle

• Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory.

3.2 GSM module:

The security methods standardized for the GSM System make it the most secure cellular telecommunications standard currently available. Here it is used for wireless communication. It is interfaced with microcontroller which receives information from GSM and after reading the information; it turns on or turn off devices with the help of relay driver circuit connected with it. Serial communication is used for interfacing between two devices. SIM 300 modules are operating on 900MHz and 1900MHz frequencies. It works on AT command. If sensed parameter such as temperature or moisture is high the information is immediately sent to the authorized user through PIC microcontroller [1][5].

3.3 Relay driver:

Relay is an electromechanical switch. It operates based on logical operations. The sensed values are compared with predefined value which is already stored in PIC microcontroller, if the value is equivalent to the predefined value then the relay is turned ON. If present information (value) doesn't match with the predefined value the microcontroller triggers the relay to disconnect the power from the solar panel to battery by the electromechanical switch relay.

3.4 LCD and buzzer:

LCD is interfaced with microcontroller. 16*2 LCD is used to indicate status of the system. LCD is used to display the value of output visual information such as temperature, air, humidity. It displays which sensor is sending the signal to the microcontroller and detected by the microcontroller. In addition, the authorized person will automatically receive the notification SMS through GSM. Once the message sent, the LCD will display. Buzzer is used to alert, if any error occurs in wind and solar mills and it will be automatically enabled.

3.5 Inverter:

To convert the stored dc to ac we use this inverter. This is a quite simple DC to AC inverter that provides 220V AC when a 12V DC power source is provided. It can be used to power very light loads like night lamps and cordless telephones, but can be modified into a powerful inverter by adding more MOSFETs. It uses 2 power IRFZ44 MOSFETs for driving the output power and the 4047 IC as an astable multivibrator operating at a frequency of around 50 Hz.

3.6 SENSORS:

Each sensor is interfaced with microcontroller. With the help of GSM we can know the environmental values more easily.

i) Humidity sensor.
ii) Temperature sensor.
iii) Gas sensor.

3.6.1 Humidity sensor:

Humidity sensor is used to measure the wetness or dryness of the earth. The sensor senses the wet on surrounding of the earth, and to send the details to microcontroller. The microcontroller compares the details with predefined value. Then the information's are sent to mobile through GSM [7].

Now HIH 4030/4031 sensors are most available because it has low drain, battery operated systems and current draw only 200 µA. The sensing element's multilayer construction provides excellent resistance to most application hazards such as condensation, dust, dirt, oils and common environmental chemicals [6].

3.6.2 Temperature sensor:

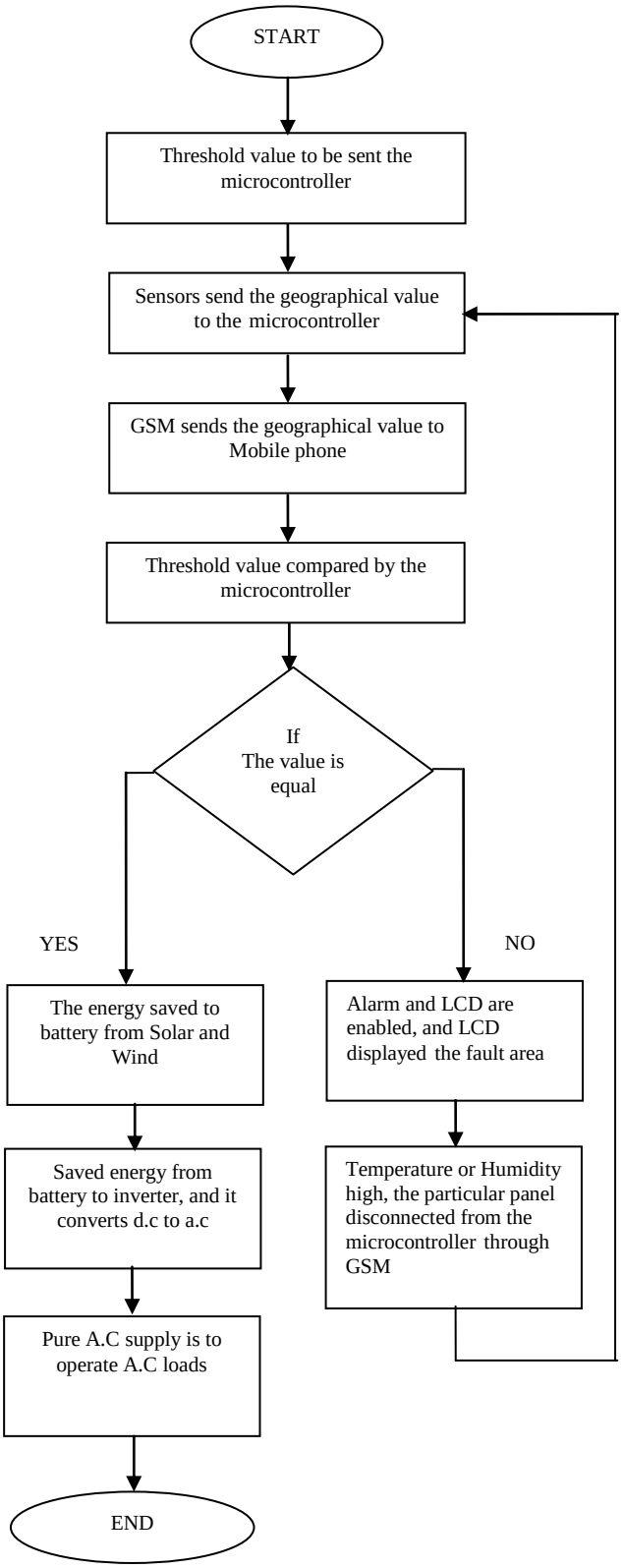
Temperature sensor is used to calculate the temperature on the atmosphere. LM 35 act as a temperature sensor, which's the output voltages are linearly proportional to Celsius. It has low output impedance and current draw 60 µA. Temperature range over a −55 □ to +150 □C [7].

3.6.3 Gas sensor:

Gas sensor is used to detect or sense the gases in the particular area. There are many sensors are available depends upon the constituency. These types of sensors are used to industrial area and find the locations of the gases [2].

4. SYSTEM FLOW MODEL

The flow diagram for geographical value is set to be microcontroller. The microcontroller compares those values into current geographical value. The values are coinciding, and then the energy is saved to battery. This energy is converted to a.c from d.c by using inverter circuit. The a.c supply is used for operate a.c loads. The flow diagram is as given.



The fig. 4 consists of overall setup in our system. With this help of system we can monitoring the geographical value (such as temperature, air and humidity) at every 30 sec through GSM.

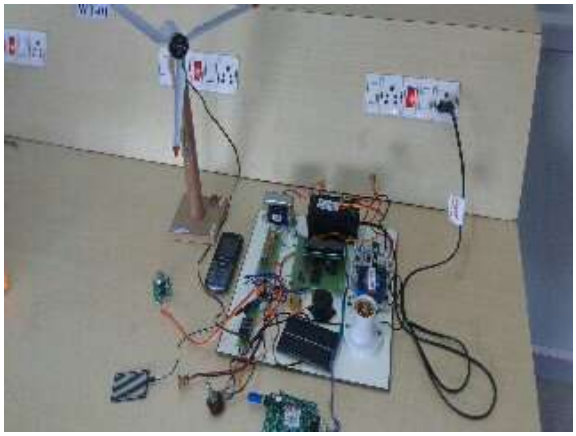


Fig. 4 Overall circuit of this system

After the sensors are connected to microcontroller, and the sensors sense the surrounding information to microcontroller. And LCD is used to displays those

values. The fig. 5 & 6 are shows the display the geographical values.

Fig. 5 Sensors sense the surrounding values to microcontroller

5. RESULTS AND EXPRIMENTS

In the case any changes in temperature, air, and humidity levels the values are sent to mobile through

Fig. 6 LCD displays the geographical value from sensors

GSM. And LCD displays in sequence of values. The fig. 7 indicates the temperature at high levels.

Fig. 7 Displayed value from sensor

When there is an error in solar/wind mill an alarm is turn on immediately and also an alert message (SMS) is sent to the authorized person through the GSM. The fig. 8 & 9 shows the fault occurs in solar and wind.

Fig. 8 Solar fault

Fig. 9 Wind fault

GSM is used to send the details of solar and wind de to authorized mobile. The fig. 10 indicates the receiving message from mobile.

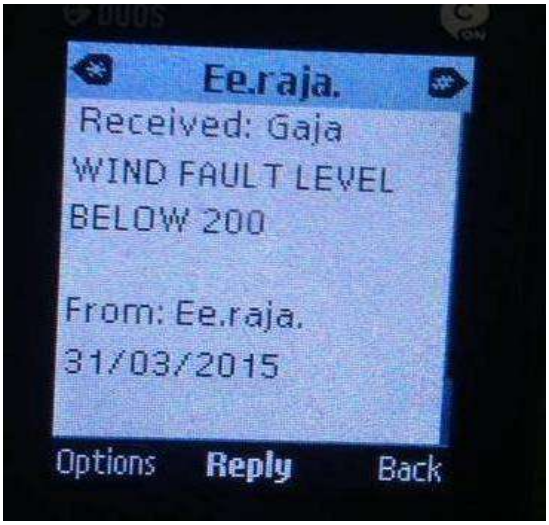


Fig. 10 Received date from mobile

6. CONCLUSION

This system is used to efficient way to generate the renewable energy. The sensors sense the climate condition to microcontroller through GSM. The output of the solar and wind power is connected to battery, and the battery is continually charged from solar and wind power. This energy can convert d.c to a.c with the help of inverter. So we can operate any a.c loads with this energy. At every 30 seconds the sensors sense the various parameters like temperature, humidity and air to microcontroller through GSM module. If any changes on those values, the LCD and buzzer enable and we can rectify the fault. GSM sends the information to users mobile.

7. REFERENCES

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