



MICROCONTROLLER BASED HOME AUTOMATION SYSTEMS

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ABSTRACT– In this paper, home is automated by means of Atmega 16A microcontroller. The objective is to develop certain home automation systems using controllers of low cost and to implement it in real life scenario. The cost of automating the whole system is too high. Therefore, instead of automating the whole system, important modules are automated. The system consists of three modules to keep the home secure and safe. The sensors act as input modules and send signal to the controller, the controller then process the input and based on the input, the output modules are actuated. It also helps in curtailing the energy consumed and makes the user more comfortable.

KEYWORDS: Home Automation, Security System, Tank level monitoring, Atmega controller, energy efficiency.

I. INTRODUCTION

In this modern world, everyone is busy in their work and has less concentration to home and needs their home to be automated, to make them more comfortable. And also, it is the duty of each person to consume less energy and also efficiently. This home automation systems satisfy the basic needs of the customer such as safeguarding the home and to cut down the energy that is wasted.

The system consists of microcontroller which receives input from sensors and sends output based on the input signal.

II. LITERATURE SURVEY

Home Automation generally refers to complete automation of home which includes switching of lights, fans and other electronic devices. For automating the whole system, the higher cost controller is needed. The already existing home automation systems use controller of high cost.

In tank monitoring system, already existing systems possess one or two float switches placed at the overhead tank only. But in this project, four float switches are used. The disadvantage of one float switch system is that the motor switches ON frequently once the water level falls. In case of two float switch system, the system does not consider about the status of the underground tank. But in four float switch system, both statuses of underground and overhead tanks are taken into consideration.

In case of switching of lights/ fans, the existing system does not check the necessity of switching. When the persons are detected, the lights and fans are switched ON automatically. But in this project, only when there is necessity only, it will switch ON.

III. OVERALL SYSTEM

The overall Home Automation system includes Security system, Tank Monitoring and Switching of lights and fans. The Security system helps in protecting the home.

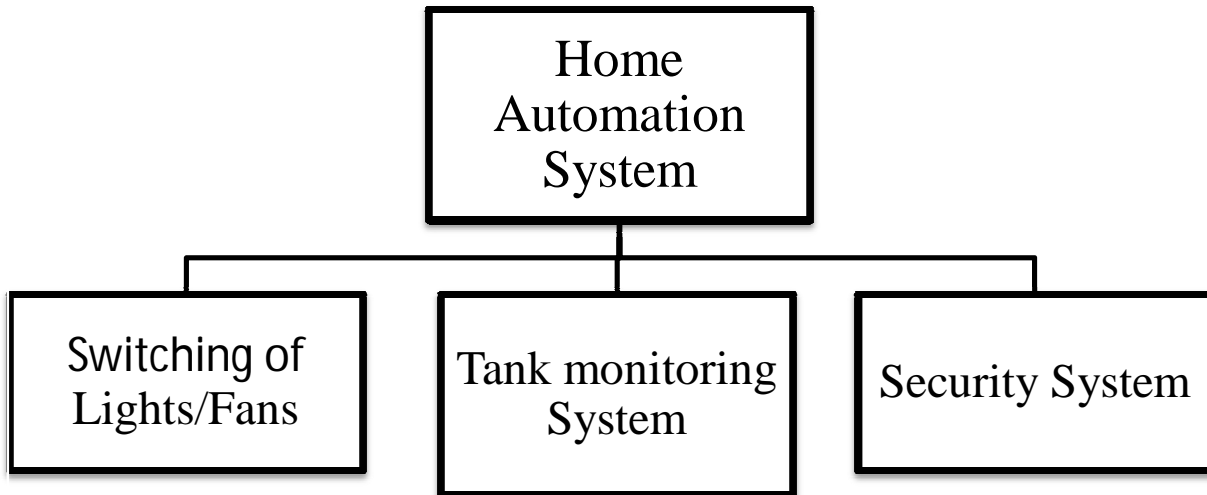


Fig. 1 Overall Block Diagram

Tank monitoring system helps to monitor each and every level of the tank and also to control the switching of tank motors. The third module helps in automatically switching ON/OFF the lights and fans based on the necessity and availability of the users.

IV. SECURITY SYSTEM

Security system helps in safeguarding the home and makes the home more secure and safe. It is done by means of two processes. One is Motion Sensing, and another one is Face Detection.

In the first process, it acts as Automatic Door Bell. If any person crosses the door, the sensor which is placed at the entrance of the door, sends signal to the microcontroller and in response, the microcontroller sends output to the doorbell to ring. The sensor that is used to detect the human is PIR sensor (Passive Infrared Sensor).

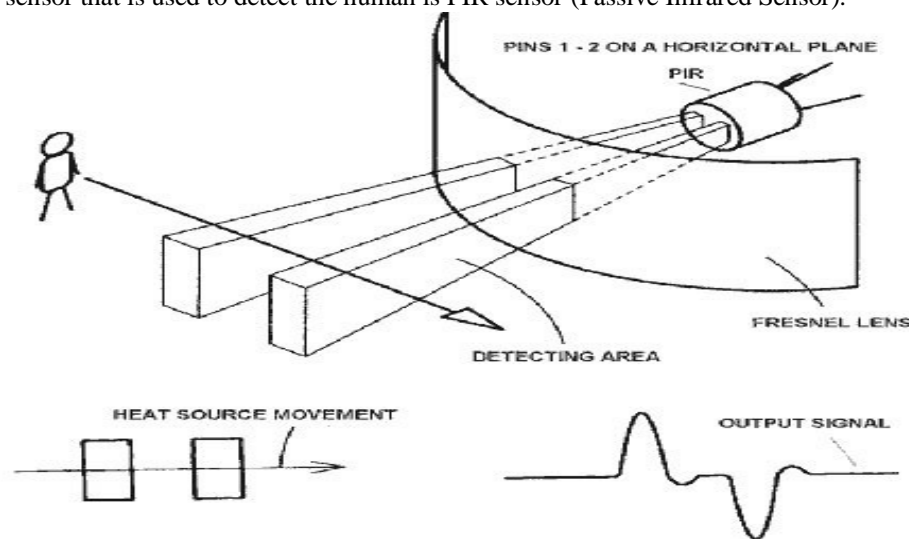


Fig. 2 Working of PIR Sensor

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PIR sensor is a motion sensor that detects any type of motion. The motion is detected in the form of infrared radiations. Whenever there is no motion, the sensor gives some output in the form of low level radiation. When something hotter is sensed, the sensor emits more radiation as shown in Fig. 2.

The motion detector is split into two halves; whenever one half detects more or less than the other half, the output will swing either high or low. Using this idea, when a person interrupts/ crosses the sensor, the motion is detected and in turn sends an electrical impulse to the controller, the controller then actuates the doorbell.

In second process, it is done by means of Image Processing. The face of the family members can be stored. The camera is placed at the entrance of the home. The persons who are entering the home are captured by the camera. Using python, the face that is captured is compared with the face that has been already saved. If the face compared is same, then the door can be opened by actuating pneumatic cylinder. Else, it will send a caution that some stranger is waiting outside.

V. TANK MONITORING SYSTEM

This system is used to monitor each and every level of the tank. And also the motors will automatically switch ON/OFF depending upon the level of the tank. The level of the tank is continuously monitored using electrodes placed at certain levels.

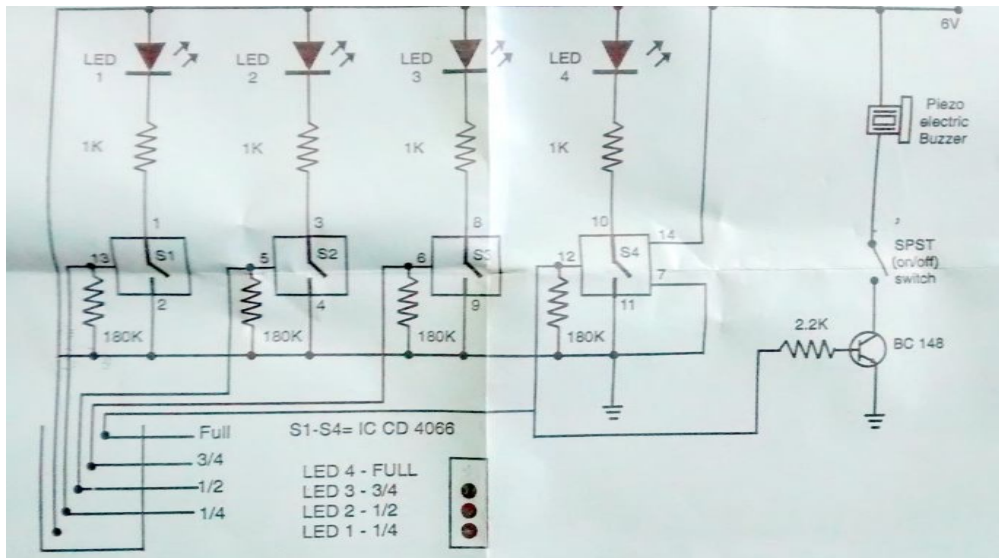


Fig. 3 Water Level Indicator Circuit

Fig. 3 represents the water level indicator circuit which is used to indicate the level of water. Initially 5V is passed through the common wire and when water level increases, makes the electrode to keep in contact with the water. Since the water is a good conductor of electricity, the 5V from common wire now passes through water and reaches the electrode and makes the LED to glow.

Automatic switching of motors is controlled using float switches. Four float switches are used to control this operation. Two float switches are placed at overhead tank and another two float switches are placed at underground tank. In both underground and overhead tanks, one float switch is placed at the bottom level of the tank and another one is placed at the top of the tank.

When there is no water at the underground tank which is monitored by the float switch at bottom level, the motor will be in OFF state. When water level rises above that float switch, then the switching of motor depends on the status of the overhead tank. When the water level falls below the float switch which is placed at the bottom, the relay



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which is connected is excited and the motor is switched ON. When the water level reaches the top float switch, the motor is switched OFF. This reduces the wastage of water and also increases the comfort zone for the users.

VI. SWITCHING OF LIGHTS/ FANS

Lights and fans are automatically switched ON/OFF based on the availability of the user. When a person enters the room, the motion is sensed by PIR sensor and this sends input to the controller.

The lamps need not to be kept ON, if sufficient light prevails, even when there is a presence of man. The light intensity is measured using lux meter. If light intensity falls below a certain level only, the lamp will be switched ON; otherwise the lamp will be in OFF state.

Likewise, the fan will be controlled using temperature sensor. The temperature sensor is placed inside the room which senses the temperature and gives signal to the controller. Then the controller will either switch ON/OFF the fan. Whenever the person leaves the room, the lights and fans will be automatically turned OFF.

VII. RESULTS

In Security System module, Table 1 represents the status of PIR sensor, when it is detected and gives the output when sensor is detected or not.

Table1. Status of PIR sensor and Output

Input	Sensor Output	Output
When a person is detected	4.7 V	Doorbell is actuated, rings
When no one is detected	0.8 V	No supply to Doorbell

In tank monitoring system, Table 2 represents the status of four float switches and also represents the status of the motor whether it is in ON condition or OFF condition.

Table2. Float switch and Motor status

Float Switch at Underground Tank		Float Switch at Overhead Tank		Motor Status
S1(Low Level)	S2(Top Level)	S3(Low Level)	S4(Top Level)	
0	0	0	0	OFF
			1	NP
		1	0	OFF
			1	OFF
	1	0	0	NP
			1	NP
		1	0	NP
			1	NP
1	0	0	0	ON
			1	NP
		1	0	ON
			1	OFF
	1	0	0	ON
			1	NP
		1	0	ON
			1	OFF

*NP – Not Possible case. Because the top float switch cannot be raised unless bottom float switch is raised.

Likewise, for automatic switching of lights and fans, the relay is excited when PIR sensor detects motion and also either the intensity of light falls below par or the temperature of room increases.



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VIII. CONCLUSION

The main contribution of this paper is to satisfy the basic needs of a people who want his home to be automated. It curtails the energy consumed by the user and provides them a home automation system at affordable price with greater efficiency. It also safeguards the home and makes it more secure and safe.

The future investigation can be done to reduce the wiring techniques. Wireless technologies such as Wi-Fi, Bluetooth, Zigbee can be implemented to make the system more efficient.

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