

Multiple Objective Decision Based Modern Digital Home With Hybrid Renewable Energy Sources

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Day to day the technology is advancing and it's becoming a part of our life. In this situation this project will provides an innovative and a complete solution for home automation based on multiple objectives. These objectives involve the switching ON/ OFF of home appliances automatically using different sensors, GSM modules, Smart phones with Bluetooth control, Smart phones with voice control, House security through GSM, Camera modules to send SMS, MMS when an unknown person entered into our locked house, Water tank level monitoring, Gas level, leakage monitoring systems, RFID (Radio Frequency Identification) locks and Number locks in the place of manual locks. These all objectives are innovatively incorporated into our proposed prototype home model using Arduino and Raspberry Pi microcontrollers, GSM, Blue tooth, camera modules, RFID, Number lock and different sensors. Among all these objectives gas level monitoring, water tank level monitoring are our own proposed methods implemented successfully. We proposed and developed a multiple objective based a complete solution for home automation which will make or initiate the Omani people towards Modern home to lead their life more comfortably, securely and providing their contribution in saving the energy for the Oman and as well as to reduce Global warming.

Keywords: Home Automation; GSM; Bluetooth module; Switching by Voice; Water tank level ; Gas level; RFID

Introduction

Home automation is similar to smart home, digital home, e-home and intelligent household shown in Fig. 1. They both mean a high living condition with many smart devices. It is the residential extension of building automation which is using automation technology, computer technology and telecommunication technology to give the user a developed living condition, entertainment and security. It helps people to reduce house working and household management by its automation and loop system. Home automation is the use of one or more computers to control basic home functions and features automatically and sometimes remotely.

Monitoring and controlling automatic switching ON/OFF of any electrical devices without direct human intervenes. It will make the life in our home easily controlled automatically. It can be used in houses, banks, stores, colleges ,police stations ,supermarkets, and governmental buildings .The system intended to control electrical appliances and devices in houses with relatively low cost design, user-friendly interface and easy setting up works when the thief enter the building by switching the lamp, the bell and the camera take a picture and record a video. Moreover, the system send an SMS to the owners to alarm them also can using Bluetooth to control by any device.

We live in an age where home appliances are becoming "smarter" every day that means they have more powerful computer chips installed within their plastic/stainless steel bodies and they can talk to each other and to your smartphone via Bluetooth connectivity. There are many ways how to use Home Automation with Smart Phones. Such as Smart thermostats, which means to control the temperature of your home from anywhere, Motion activated security cameras, high-quality security cameras that allow you to be aware of anyone in your home, Security system, you will be able to lock, un-lock, and send time sensitive smart keys to your family and friends



Fig. 1: A Sample Modern Home

Objectives of Project

The main objective of this project is to develop a prototype home model which will involves the multiple objectives such as:

- ❖ Switching ON/OFF of electrical devices automatically (using different sensors) and using GSM module by sending SMS.
- ❖ Switching ON/OFF of electrical devices using Smart Phone through Bluetooth module.
- ❖ Switching ON/OFF of electrical devices using Smart Phone through Voice control.
- ❖ House security monitoring using GSM module and Camera module to send SMS & MMS.
- ❖ Water Tank level monitoring and SMS alert systems to owner and water tank persons.

Gas level monitoring, Gas leakage alert and information sending systems.

Utilization solar and wind energy as a hybrid energy source as an alternate to the conventional energy source.

Methodology

The block diagram of the proposed system as shown in Fig. 2, is used to develop a prototype model of modern home with multiple objectives.

Operation of The Project

The project mainly consisting of Arduino board, SMS (Short Message Service) Module, SD (Secure Digital) module, PIR sensor to sense the human so that and relay board to switch on lamps through relay board and alarm ,Raspberry Pi camera used to take picture and SD card module is used for storing the pictures taken by camera , Bluetooth module switch (ON/OFF),Voice control sensor also switch (ON/OFF),Gas Sensor check leaking & measure the pressure and Water level Sensor is use if tank in our home is full or when come 25% we send message

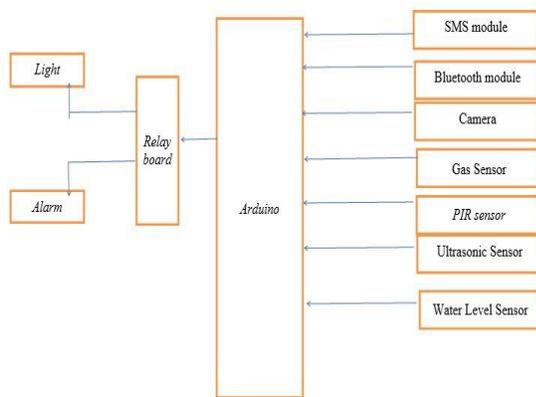


Fig. 2: Block Diagram of Proposed System

Implementaion Steps

Step 1: Switching ON/OFF of electrical devises automatically (using differnt sensors) and using GSM module.

When any person entering in to the Home sensor it will sense PIR sensor will give signal to Arduino board, therefore that the Arduino board will give signal to relay board then the Lamp will ON automatically also will send message to the owner act like this message (Some unknown person entered in your home)

Step 2: Switching ON/OFF of electrical devises using Bluetooth module.

The Bluetooth is work like switching (ON/OFF) we can control by any device in our home using Bluetooth such as (fan, TV .AC, lamp and project) act like remote control in our home.

Step 3: Switching ON/OFF of electrical devises using Voice control.

Voice is will connected with Bluetooth to can control by any devices using our voice, example (light 1 ON, light 1OFF also fan 3 OFF) it is very easy, useful and effective to control by any devices in our home.

Step 4: House security monitoring using GSM module and Camera module.

Camera will teak picture and video then it will send by SMS this picture or link for this video to owner or will store in SD module.

Step 5: Water tank level monitoring using GSM module.

When the tank of water is full or soon it will finished Water level Sensor will give signal to Arduino board, therefore that the Arduino will give this signal at same time SMS will be send message to the owner by using SMS module.

Step 6: Gas Quantity and Leakage monitoring and information sending system

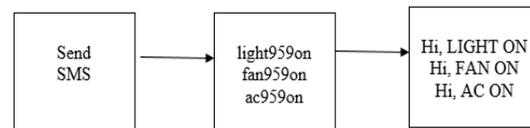
When gas is leaking in the house because old pipes or rusted gas, our sensor will be detected and gives an alarm, in addition to that it will send a SMS to the owner of house to take preventive steps. This type of feature is not available in the present gas detection system. Importantly our system will also indicate quantity of Gas in the Gas Cylinder based on its weight, to achieve this we have not connected any electronic circuit to gas cylinder as it is dangerous, we just calibrating the weight of gas as quantity of gas.

Step 7: Utilisation Renewable energy sources

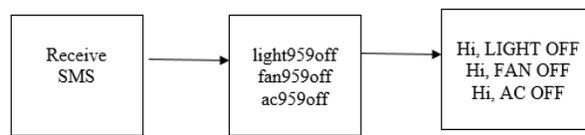
In order to achieve more reliability from the renewable energy sources, we used solar and wind energy together as a hybrid non-conventional energy sources.

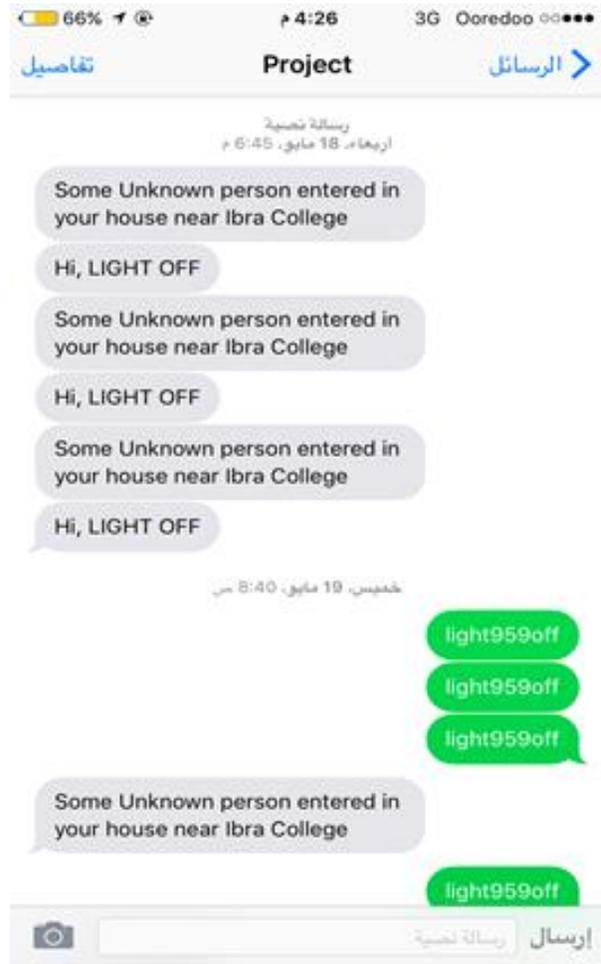
RESULTS

A. Result-1: To Send SMS



B. Result-2: To Receive SMS





F. Result-6: House Security Monitoring by GSM

G. Result-7: Gas Level Monitoring

The results shown in Table-I are used for the calibration of GAS level with weight sensor to develop Arduino program for continuous monitoring of quantity of GAS usage.

Table I: Gas weight Vs Arduino reading Display

| Weight of Gas (Simulated) in gram | Arduino Serial output With Map | Arduino Serial output Without Map | Arduino Display of Gas Level |
|-----------------------------------|--------------------------------|-----------------------------------|------------------------------|
| 0 | 6.5 | 23-25 | No gas |
| 100 | 7 | 31 | 20%gas |
| 200 | 9 | 37-38 | 40%gas |
| 300 | 10-11 | 43-45 | 60%gas |
| 400 | 12 | 50-51 | 80%gas |
| 500 | 13-14 | 56-57 | Full gas |

The material used for the arm is stainless steel.
Control mechanism for wheels

H. Result-8: Water Tank Level Monitoring

The results shown in Table -II are used for the calibration of water level with ultra-sonic sensor to develop Arduino program for continuous monitoring of usage of water.

Table II: Calibration table for Sensing Water Tank Level

| Water level from Sensor Position | Arduino Water Level Signal Reading | Arduino Display of Water level |
|----------------------------------|------------------------------------|--------------------------------|
| 1 inch | 1.02 | 100% |
| 2 inch | 1.82 | 75% |
| 3 inch | 2.60 | 50% |
| 4 inch | 3.32 | 25% |
| 5 inch | 0 | 0% |

CONCLUSION

The feasibility of implementation of project work titled Supervision and Regulation of Home Automation System with Smart Phones has been investigated, collected the suitable data, basic components to meet the following objectives.

- ❖ Switching ON/OFF of electrical devices automatically (using different sensors) and using GSM module.
- ❖ Switching ON/OFF of electrical devices using Bluetooth module.
- ❖ Switching ON/OFF of electrical devices using Voice control.
- ❖ House security monitoring using GSM module and Camera module.
- ❖ Water tank level monitoring using GSM module.
- ❖ Gas leaking monitoring using GSM module & measuring level of Gas.
- ❖ Utilization of hybrid nonconventional energy sources

Our project has many benefits in the present in the future by utilizing the advanced developments in the technology to lead easy, comfort, and secure life and as well as saving of energy consumption from unnecessary usage of basic needs of power, water and gas, in that way the implementation of our project is more useful for the customer and for the society from global warming.

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