Available online at www.ijiere.com

International Journal of Innovative and Emerging Research in Engineering

e-ISSN: 2394 – 3343 p-ISSN: 2394 – 5494

Smart Automation System Using Arduino and Rain Drop Sensor

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ABSTRACT:
In this paper we present Idea related to agricultural based system in which as per our observation during the rainy seasons the cultivated crops gets affected due to the heavy rain fall. The main theme of this project which is presented in the paper is that to prevent the crops from the heavy rain and save the rain water. The rain sensor and soil moisture sensor is used for the working of automatic roof. This system involves protects the crops by the auto roof which covers the whole field. The rain sensor is activated when there is a rain fall. The soil moisture sensor will sense the water level in the field. If the water level is beyond the normal level it will gives intimation to the controller. So when both the sensor is 'ON', it will gives intimation to the controller, GSM and it will indicate to the DC motor and it will automatically open the roof. In this project, the roof is open automatically when both the sensor is 'ON'. This complete system can be handled manually If there is any problem with opening the roof automatically, it is blend idea with controlling operation done through Arduino. GSM is report the conditions in the field through SMS to the mobile phone. The power is supplied to this project is using renewable energy sources as solar power. Direct power supply can also be fabricated which affect the basic cost to build entire system

Keywords: Arduino, Automation, DC motor, GSM, Smart protection system, , Rain sensor.

1. INTRODUCTION

As human beings we cannot control the natural phenomenon such as rain, humidity, high temperature, etc. Some of the measures are taken against this environmental hazard but they are performed manually. Here comes the need of automation. Automation greatly decreases the need for human sensory and mental requirements as well. An automation system consisting of a connection between hardware and software has freed the individuals from their day to day chores. In this paper we try to establish new intelligent system which helps to protect the user daily home application and other useful material against environmental impact like rain.

This paper is based on the project which is an embedded system consisting of Arduino UNO and rain sensing system. Our design is a prototype of such system which consists of Rain drop sensor, a microcontroller unit Arduino Uno board and a SIM900 GSM module. Arduino Uno is the processing and controlling unit of this system which receives and processes the data from the sensors. The GSM unit act as an interface between arduino and user's mobile and is responsible for communication between them. The mobile phone can be used as a controller from anywhere in the world if the GSM network is available to switch on/off the system and to receive the alert messages. The rain drop sensor will be placed at open place. They will continuously send the moisture values to arduino. If the moisture value exceeds a certain set value then arduino will send an alert message to the mobile station and roof will get close automatically and covers the vehicle. Hence there exists an electro-mechanical system which continuously monitors the rain and automatically closes the roof to protect vehicle from wet.

2. LITERATURE SURVEY

Survey played a very vital role in this project, we analyzed the existing products for protection of vehicles and clothes during rain, there were many demerits which we noticed during the survey, some of them are the existing products are to be operated manually, and if incase there's no one in the home to operate the switch then the clothes easily get wet and the product will be of no use, and secondly if there's a disabled person in the house then he/she will not be able to operate the system and this kind of system needs knowledge regarding the operation. So, we chose to do automatic system which doesn't require any manual operation, which has rain sensors which get activated during anytime of the day or night. Some methods through various papers which we have surveyed are as follows.

2.1.An Automatic Sliding Door Using Infrared Sensor

In this research work, an Automatic sliding door System using an infrared sensor was developed. It uses a sensor, a control unit & drive unit to open and close doors at the entrance of a public building. The primary aim of this research work is to learn in details about how the automatic door system works and to understand the concepts involved. The secondary aim is to fabricate a simple circuit model to show how the system works. The main activities involved in this work are the research done on how the automatic door works, sketching a detailed circuit & then fabricating a simple model [1].

2.2 Intelligent Windshield for Automotive Vehicles

Windshield control is a vital operation of driver during driving. The mountings fitted in the windscreen or also called windshields are essential to use for smooth driving. These can be automated by using sensors and microcontroller. A complete windshield controlling system has been developed here to increase human comfort and flexibility. The wiper havebeen controlled by a water level sensor which regulate the wiper motor through sensing the level of water or rain. A dust sensor has been integrated to spill some water in the windscreen and then wipe it. It senses when a certain level of dust get accumulated in the screen. The sun visor which is mounted inside the car to shade the driver's eye from sun would be easier to control by a servo motor. Here an automatic sun visor has been designed to be controlled through a light sensor which is used to measure the light intensity and send the signal to the main control unit. This project focuses on improving human comfort in the existing system so that the driver can pay full attention in driving at all weather even in dusty, rainy or summer[2].

2.3. Automatic Rain Water And Crop Saving System Using Embedded Technology

Now a days, during the rainy seasons the cultivated crops gets affected due to the heavy rain fall. The main theme of this project is that to prevent the crops from the heavy rain and save the rain water. The rain sensor and soil moisture sensor is used for the working of automatic roof. This system involves protects the crops by the auto roof which covers the whole field. The rain sensor is activated when there is a rain fall. The soil moisture sensor will sense the water level in the field. If the water level is beyond the normal level it will gives intimation to the controller. So when both the sensor is 'ON', it will gives intimation to the controller, GSM and it will indicate to the DC motor and it will automatically open the roof. In this project, the roof is open automatically when both the sensor is 'ON'. If there is any problem with opening the roof automatically, manually set by remote access [3].

3. OUTCOMES FOR PROJECT

1. To develop and implement a system which protects the vehicles, clothes, small scale agricultural crops, etc automatically by detecting rain without the need of human beings.
2. This project entitled smart protection against environmental impact is small step towards the comfort ability and save our time. By considering above views, which encourage us to choose such a project.
3. To design a smart system to prevent the hazards caused due to rain using sensors and arduino microcontroller.
4. To develop electromechanical system to perform automatic roof mechanism as rain is detected using rain sensors.

At the end of this project we were able to design a system, which can solve the problem better idea for drying wet clothes especially in rainy season and many of other applications.

4. PROJECT DESIGN AND IMPLEMENTATION

4.1 BLOCK DIAGRAM

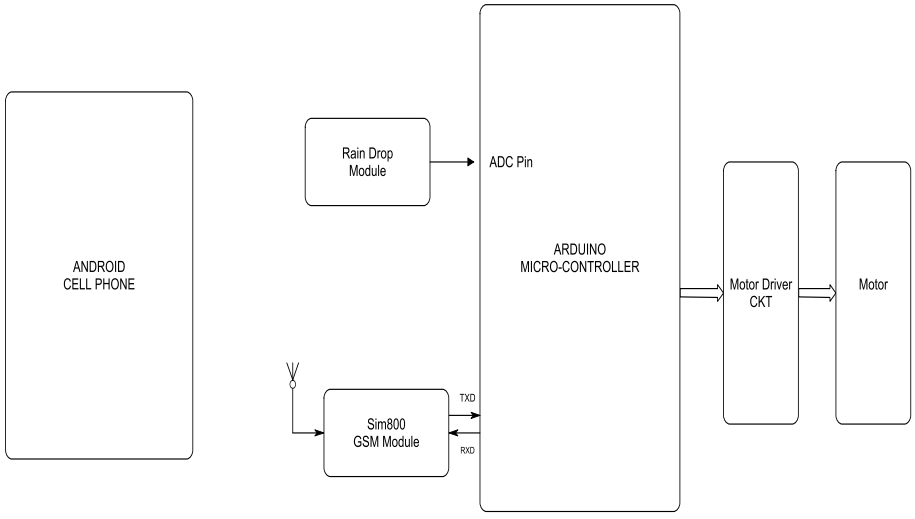

Fig.1 Block diagram

4.2 DETAILS OF COMPONENT

1. Arduino

Fig. 2 Arduino-UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter."Uno" means one in Italian and is named to mark the upcoming release of Arduino.

2. Water Sensor

Fig.3Water Sensor

A water sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The second is a device used to protect the interior of an automobile from rain and to support the automatic mode of windscreen wipers. An additional application in professional satellite communications antennas is to trigger a rain blower on the aperture of the antenna feed, to remove water droplets from the mylar cover that keeps pressurized and dry air inside the wave-guides.

3. Dc Motor

Fig.4 DC Motor

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances.The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

5. GSM Module

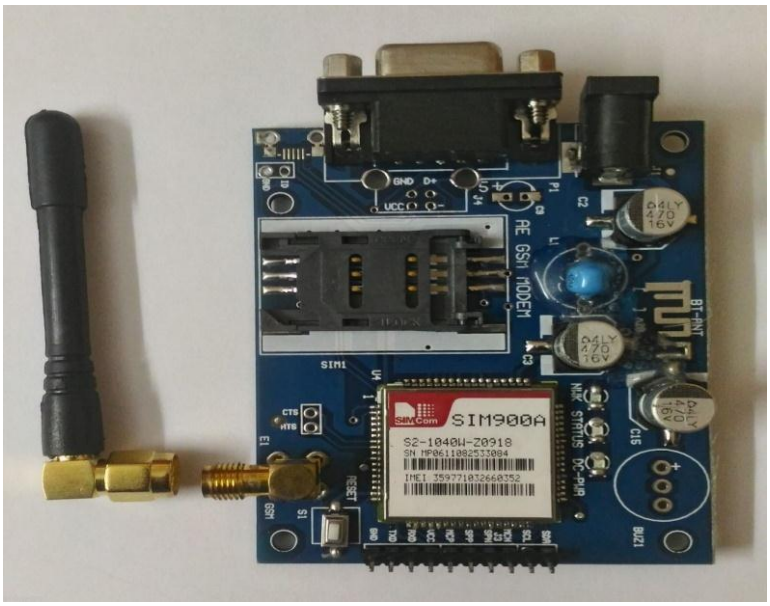

Fig. 5 - GSM Module

GSM is short for Global System for Mobile communication system. It provides three main services of short message, speech communication and data communication. Because service of short message makes the wireless communication module more popular to be used, wireless communication module is also called GSM short message module.GSM short message service has the character of always online, no dialing, low price, large coverage and etc. For GSM technology, short message service is the only one that needn't set up end-to-end channel and also provide service when the mobile device is in point-to-point communication. Short message service is asynchronous communication for sending only one sentence per each message. In GSM system, each message is handled as individual time and transmitted by SMSC (Short Message Service Center). GSM can offer speed of 9.6 Kbps data communication service when on-line whereas GPRS can offer speed of 100Kbps.Considering the feature of circuit breaker data acquisition and the cost for communication, GSM short message service is suitable to use for transmitting data in large-scale field measurement system.

5. RESULT AND COMPONENT ANALYSIS

The components were first connected on the bread board (since no soldering is required on the bread board), it is easy to change connections and replace the components used. By virtue of first placing the components on breadboard, the components will not be damaged so they will be available for reuse, to test how well the components will function as a unit and to transfer the connection to a board for permanent connection.

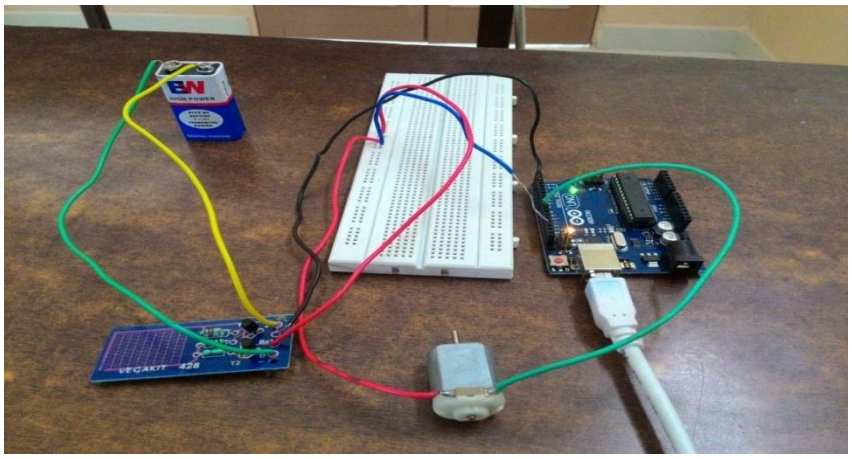

Fig. 6 Testing

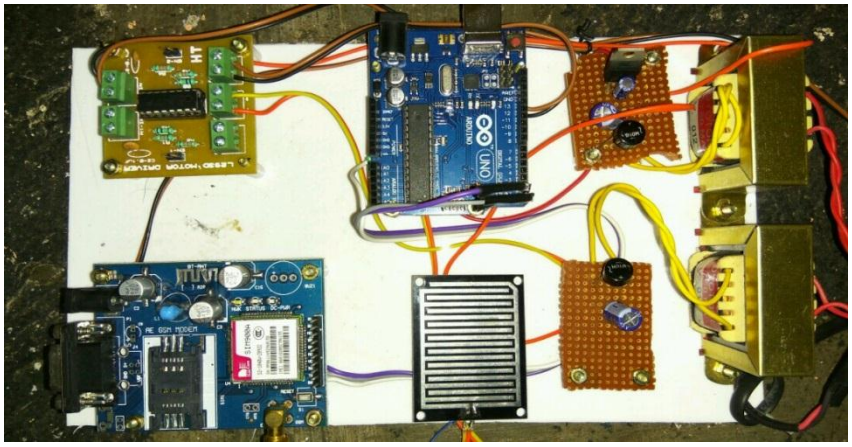

Fig. 7 Component Arrangement

Construction of Physical Model

A model of an automatic slide roof was made using plywood. The scale is of ratio1:10 and this was chosen to make the model look close to reality, for mobility sake and base on the material used for the opening system in this project. The length is 55cm, height 30cm and the width is 30cm. The materials used in joining the plywood are top-bond, glue, tack nail and pieces of woods. The roof is made of medium density sheet.

Fig 8. Side View Of The Model When Roof Is Opened

Fig 9. Side View Of The Model When Roof Is Closed

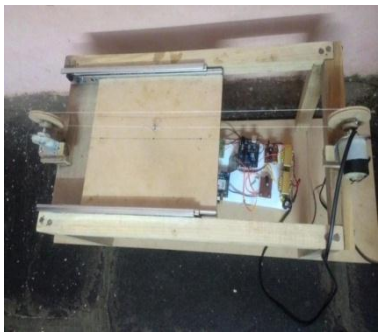

Fig10. Top view of The Model

6. CONCLUSION

This is real time model which is used to automatic rain water and crop saving system protects crops from excess amount of rain water and also saves water from wastage. By using arduino operations of the entire system is going to be controlled these system saves the electricity, maximizes the productivity during both rainy season and sunny season. Solar energy is also the best outcomes of this project. Controlling of system on users virtue can also be achieved through device like GSM. hardware implementation are reliable and cheap of this project.

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