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Solar Powered Automatic Flood Detection System for Remote Locations

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Abstract: ***Floods are one of the natural disasters which cause huge losses not only mankind but also causes financial losses to many countries in the world. Flood detection has become a key to avoid losses due to floods. In this article we proposed a low cost Solar Powered flood monitoring station for remote locations which is designed using the Arduino UNO as the core and the Water level sensors for measuring the water level and give the information to the Arduino which takes action according to the water level. The whole system is powered by a solar panel and battery. .***
Keywords: Floods, Solar panel, Arduino, Water level sensor, Remote Locations, Low Cost.

I. INTRODUCTION

Nowadays the extreme weather changes have affected the disaster significantly. Flood is one of the disasters that often occur due to extreme weather. The main cause of flooding is not only influenced by the weather but also the human activities that damage the forest. To avoid more victims, it is needed to anticipate the upcoming flood. The use of flood early warning system is one way to anticipate the upcoming floods [1].

Many individual and organization required to spend time and afford to reduce the overhead on the flood restoration plans for the infected locations and as well as for the victims. Most of these plans involve big amount of money and lots of human force such as rescue workers, doctors, nurses, engineers and etc. Other then the human forces, the government has to spend a big amount of money in various restorations of physical structures in the flood infected locations.

Several studies has been conducted in early flood detection and many people suggested different techniques for flood detection and communication but none were focused about the remote locations where network and power is available. So, as a team we proposed a system where we depend on solar power. Solar energy is one of the most important renewable energy sources. As opposed to conventional unrenewable resources such as gasoline, coal, etc..., solar energy is clean, inexhaustible and free[2]. All the previous systems used normal power for powering the system.[3][4].



Fig 1: Recent Flood rescue in Hyderabad

II. PROBLEM STATEMENT

Flooding is a great threat towards mankind as it is also considered one of the most devastating natural disasters in the world. Flooding is not any abnormal scenario worldwide, since flooding results in great damages to agriculture land, residential area and even cities with high cost in lives and towards the economy of the country. The government has to spend tons of money in flood mitigation plans in afford to help the victims and also to reduce the number in the long run. Most of the flood mitigating plans has high cost and only can be implemented base on priority.

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With real time detection and alert system all the responsible organization can be on their toes when there is an urge for a certain task related to their core job during flood. Such a system enables both private and government organizations to work on their emergency evacuation and mitigation plans for a saver move before the flood situation gets worse. Within a limited time and available man power the rescue team and fire fighting department has to plan for the best possible evacuation and rescue activities during flood. In most cases these rescue workers have to risk their life's in the afford to help.

So we propose a system in which we adopt solar power to the flood monitoring station which can be employed for multipurpose (Lighting and safety) in remote location. The system is autonomous once set up it will not require regular service.

III. BLOCK DIAGRAM

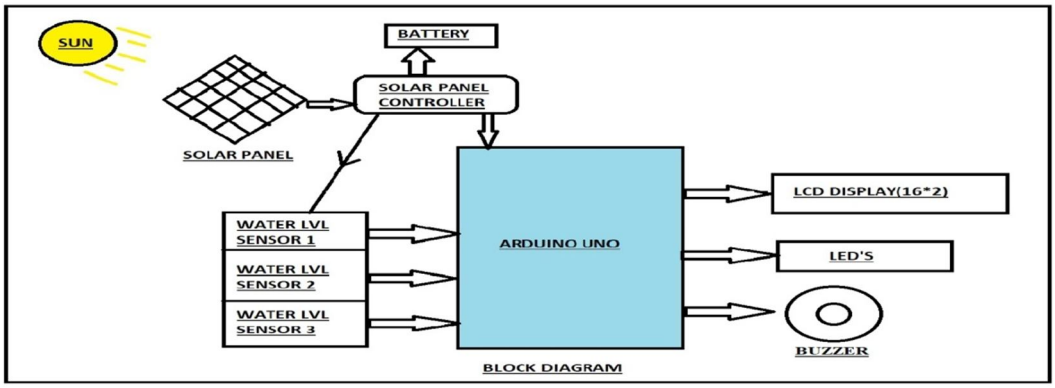


Fig 2: Block Diagram

The block diagram shows the components used in the project. We proposed to use a 3 water level sensors for accurate measurement of the water level and give alerts

IV. DESCRIPTION

The block diagram has an Arduino, water level sensors, solar panel, LED's, LCD and a Buzzer. Firstly we get input from the water level sensor. The output of the water level sensors is given to Arduino. Arduino will continuously monitor the inputs from the water level sensor and provides output to the LED's LCD & Buzzer. If everything is normal the system doesn't make any alerts. The system keeps on monitoring for the abnormal changes in the system if it detects the changes it will give an alert based on the level of change in the inputs. The water detecting sensor has a pins on its surface, if the water touches it will conduct providing the voltage as analog input to the Arduino. Arduino is a microcontroller which has analog inputs and digital input and output pins will process the inputs according to the code entered by the user. As a user we wrote a logic that if the below sensor i.e sensor water level 3 is filled with 3% then the aurdino will power up only green LED. Similarly for water level 3% of sensor 3 to 50% of the sensor 2 the Arduino will power up the Green and Blue LED and if water exceeds the maximum level the Buzzer will give a siren which alert the people who are near by.

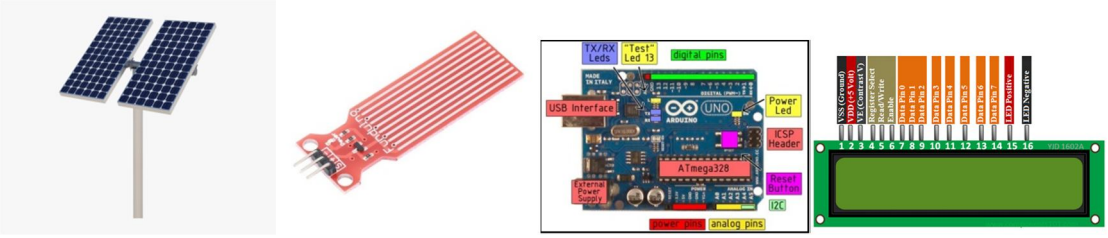


Fig 3 Images of Components Used

The whole system is powered by the solar power from the solar panel. The power from the solar panel and the battery is given to Arduino and sensors. We use a solar power regulator to regulate the power flow from the solar panel and battery to the load.

The output of the LED's is given by the input of the water sensor. The below table shows the outputs of the system according to the inputs.

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S.No	Water level	Output	Action Taken
1.	Below Lowest	Only Green LED	No action Free to pass
2.	Lowest to middle	Blue LED & Green LED	Free to Pass
3.	Middle to Highest	Orange LED & Blue LED	See & pass
4.	Above Highest	Red LED & Buzzer	Don't pass

Table 1:ouput and inputs

IV. SIMULATION

We used Proteus Software to simulate the above project and we acquired the results as per requirements mentioned in the table.

V. SIMULATION RESULT

1) CASE 1: WHEN WATER LEVEL IS BELOW 3%

OUTCOME: GREEN LIGHT AND "YOU CAN PASS" ON LCD

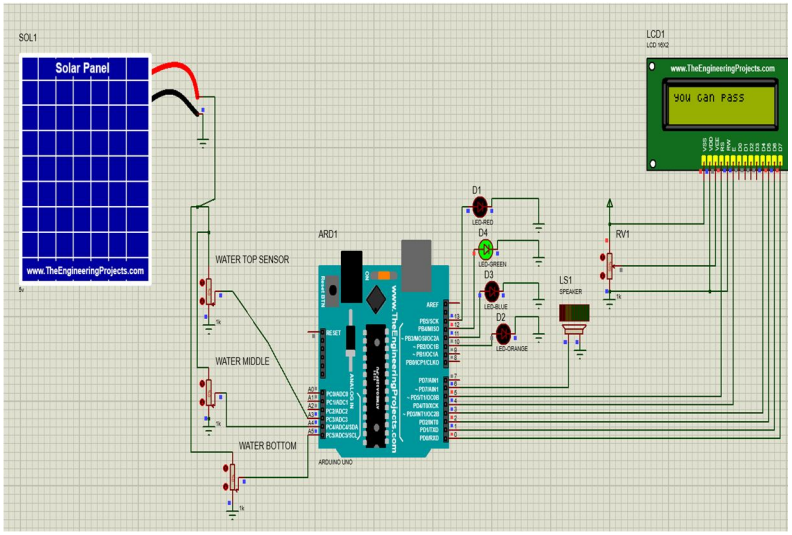


FIG 4:Case-1 Result

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2) CASE 2: WHEN WATER IS BETWEEN 3-50% OF NORMAL LEVEL

OUTCOME: GREEN AND BLUE LED & "MINIMUM WATER YOU CAN PASS" ON LCD

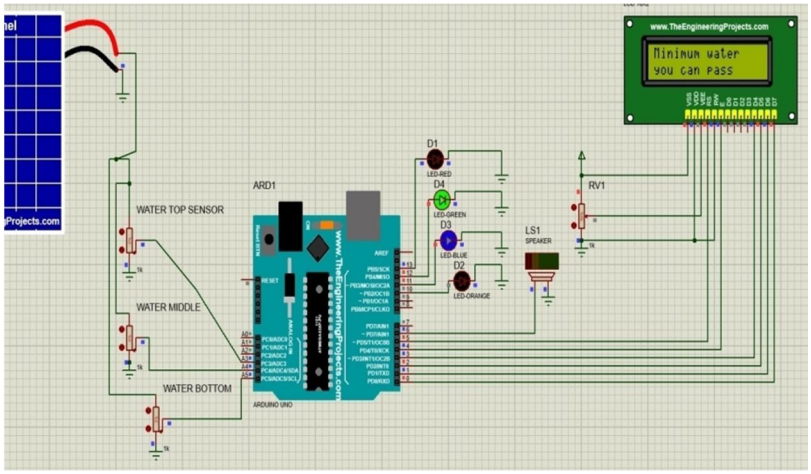


FIG 5: CASE-2 RESULT

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3) CASE 3: WHEN WATER LEVEL IS BETWEEN 50-80%
OUTCOME: BLUE & ORANGE LED AND "SEE N MOVE" ON LCD

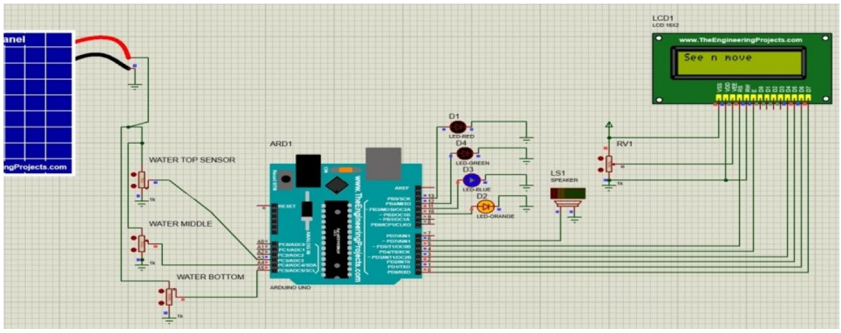


Fig 6: Case 3 Result

4) CASE 4: WHEN WATER LEVEL IS ABOVE 80%
OUTCOME: RED LIGHT AND "ALERT" ON LCD & BUZZER WILL MAKE NOISE

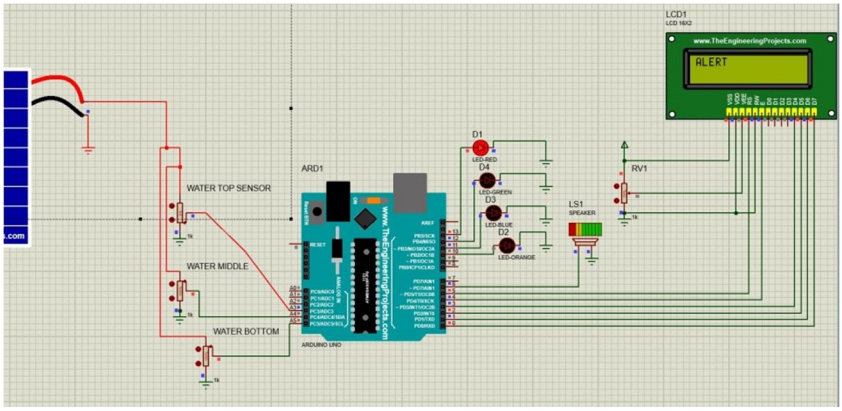


Fig 7: Case-4 Result

We got all the expected results and simulated the circuit sucessfully with solar power source.

VI. CONCLUSION AND RECOMMENDATIONS

We addressed the problem caused due to floods by building a cost effective and highly efficient "Solar Powered Flood monitoring station for remote locations" . With the use of solar power, Arduino, Water detecting sensors,LCD And LED's and Buzzer we are able to monitor the water level in real time and give information to people who reside near by .

The project is autonomous once set up and requires less maintenance. The project is easy to setup and can be implemented in all locations. We as a team reviewed many existing solutions and found out the backdrops of each project and came forward with this solution.

We should also integrate the same kit with GSM module and send real time data to mobile phones of the fire and rescue department and the authorities and to the people so that they can leave the place as early as possible before the flood hit the places.

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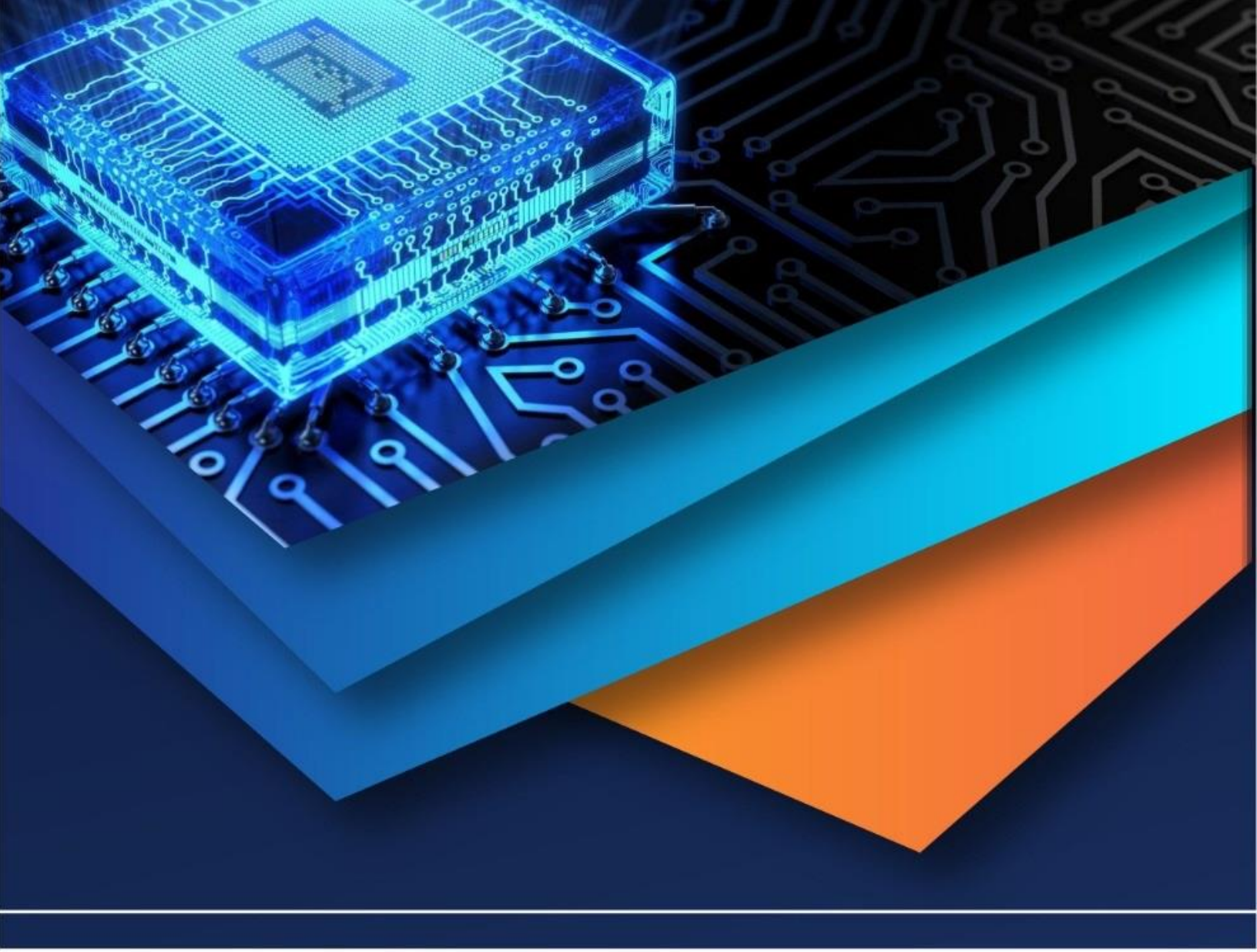
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