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Solar Powered Forest Fire Detection and Indication System

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ABSTRACT

A work on "SOLAR POWERED FOREST FIRE DETECTION & INDICATION SYSTEM" is build. Knowledge and experience was gained in order to make it. Satisfactory results have been received. In future we can also fulfil our technical requirements.

Keywords : Arduino, Flame Sensor, Solar Plates, Battery.

I. INTRODUCTION

The most common hazard in forests is forests fire. Forests fires are as old as the forests themselves. They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. During summer, when there is no rain for months, the forests become littered with dry senescent leaves and twinges, which could burst into flames ignited by the slightest spark. The Himalayan forests, particularly, Garhwal Himalayas have been burning regularly during the last few summers, with colossal loss of vegetation cover of that region.

BLOCK DIAGRAM

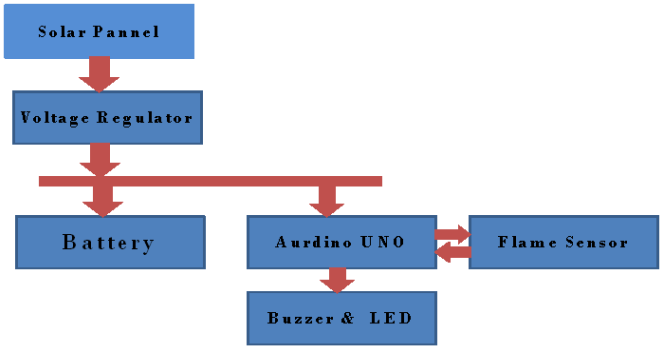

Fig 1. Block diagram of project

II. METHODS AND MATERIAL

MAJOR COMPONENT:

- Solar Pannel
- Battery
- Voltage Regulator
- Capacitor
- Resistor
- Diode
- Aurdino UNO
- Flame Sensor
- Buzzer & LED

1. Solar Pannel :

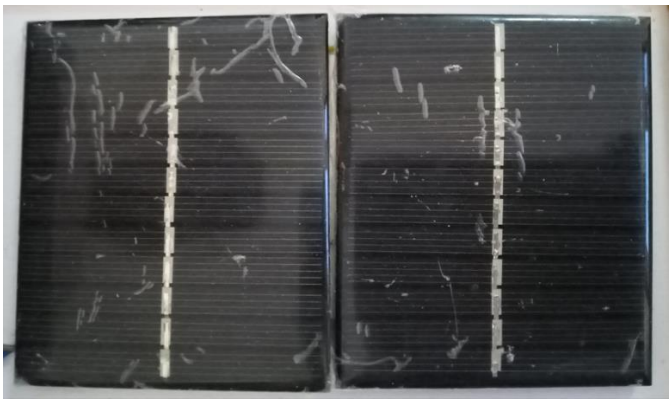

Fig 2. Solar Pannel

A solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon. It is a form of

photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Individual solar cell devices can be combined to form modules, otherwise known as solar panels. In basic terms a single junction silicon solar cell can produce a maximum open-circuit voltage of approximately 0.5 to 0.6 volts.

Description :

- Max output power : 0.72W
- Max working voltage : 6.6 V
- Max charging current : 110 mA
- Min output power :0.6W
- Min working voltage : 6V
- Min charging current : 100 Ma
- Thickness : 3mm

2. Battery

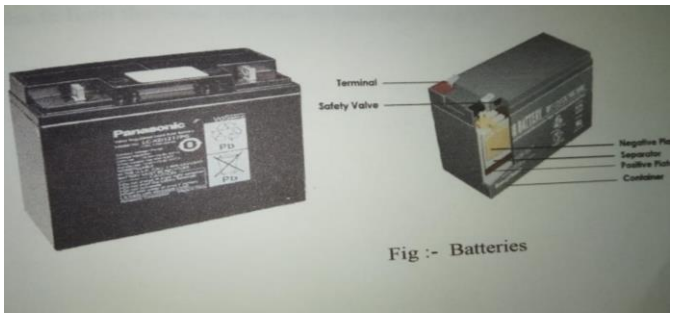

Fig 3. Battery

A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved to include devices composed of a single cell.Specification : 12V 1.3 A.

4. Aurdino UNO :

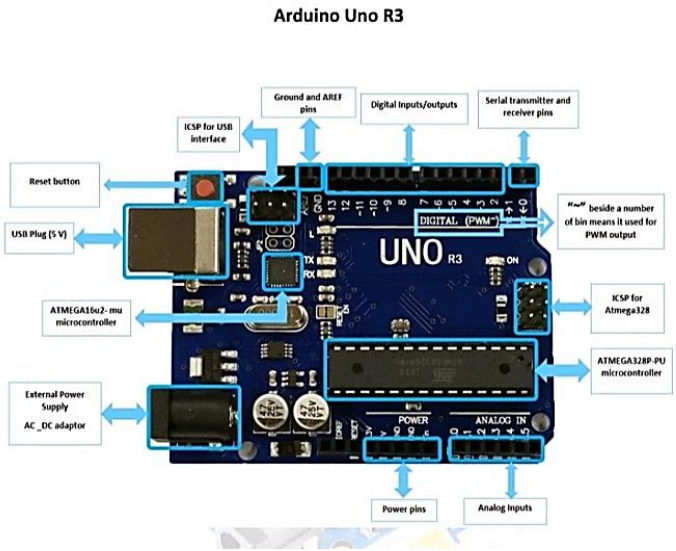

Fig 4. Arduino UNO

Types of Aurdino

There are different Arduino boards which are following :

- Arduino UNO (R3)
- LilyPad Arduino
- Red Board
- Arduino Mega (R3)
- Arduino Leonardo

Flame Sensor

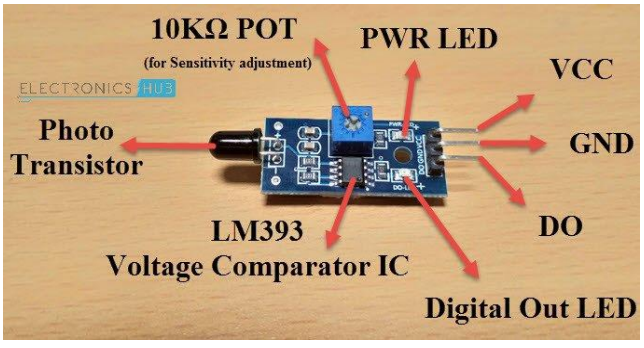

Fig 5. Flame sensor

General Description:

Flame sensor is the most sensitive to ordinary light that is why its reaction is generally used as flame alarm purposes. This module can detect flame or wavelength in 760 nm to 1100 nm range of light source. Small plate output interface can and single-chip can be directly connected to the microcomputer IO port. The sensor and flame should keep a certain distance to avoid high temperature damage to the sensor. The shortest test distance is 80 cm, if the flame is bigger, test it with farther distance. The detection angle is 60 degrees so the flame spectrum is especially sensitive.

Schematic Diagram

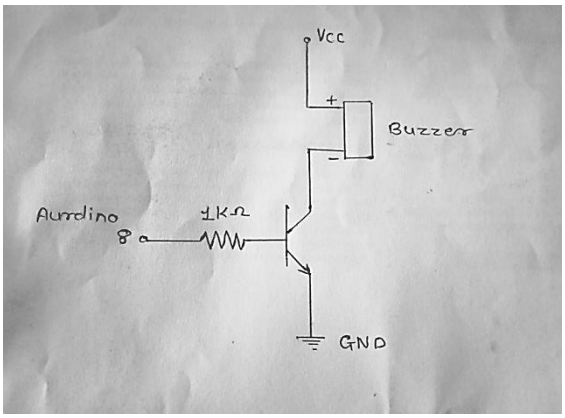

Fig 6. Circuit diagram of buzzer

III. RESULTS AND DISCUSSION

Testing Results:

The sample sketch above is a blink which is also applicable for LEDs. The output is the turning on and off of the buzzer every other second. The picture below shows the setup of your module and Arduino.

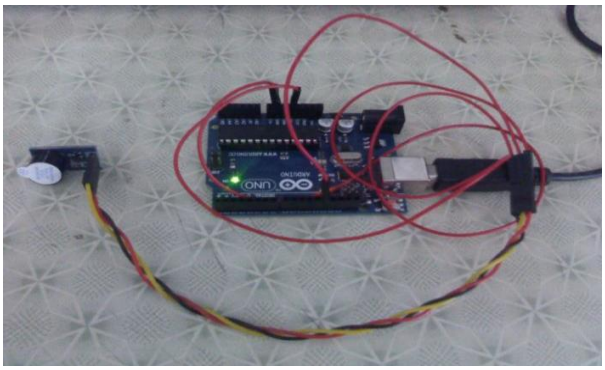

Fig 5.

LED :

This is a very basic 5mm LED with a red lens. It has a typical forward voltage of 2.0V and a rated forward current of 20mA

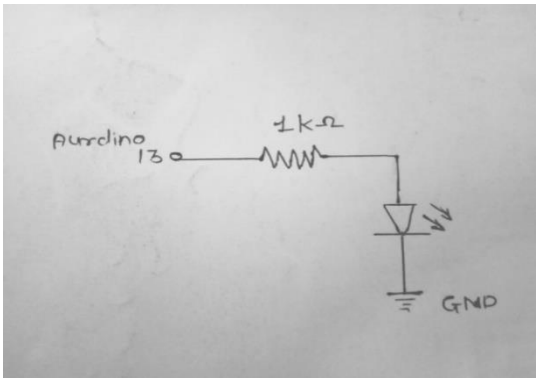

Fig 6. Circuit diagram of LED

Design of Hardware :

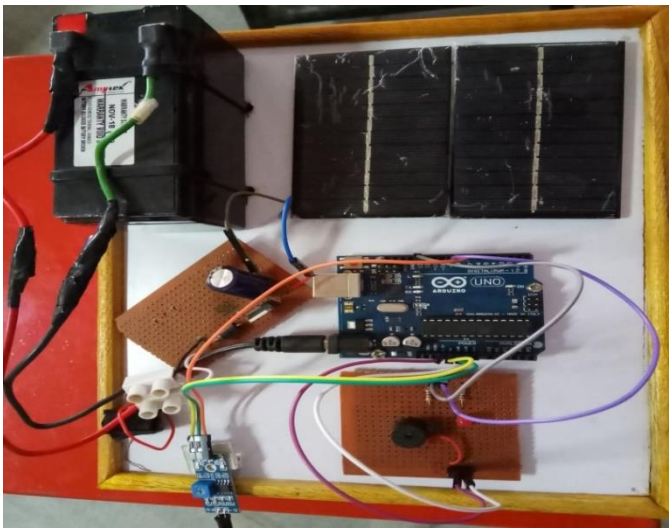

Fig 7. Design of Hardware

Advantages and Disadvantages :

Advantages :

- ✓ No need of Electricity.
- ✓ Long battery life.
- ✓ Solar charging system.
- ✓ Battery automatic charging system available.
- ✓ 1V Dc voltage regulator used to reduce voltage fluctuation due to solar panel.
- ✓ Due to Arduino we can connect multiple input or output.
- ✓ It helps to reduce pollution.
- ✓ Less costly.
- ✓ Size and weight of project is also less.
- ✓ We can install if ON any place. (Easy to move)

Disadvantages :

- ✓ We can not use this system in sunlight areas. (Dark place)
- ✓ System will damage it over voltage occurs.
- ✓ IR Sensor is used in project which is operates on sunlight (Ultravoilet Light)
- ✓ Solar panel gives variable voltage output due to fluctuation in sunlight.

Application :

- ✓ In Forest areas.
- ✓ In Animal Zoo.
- ✓ In remote location, where there is no electricity.
- ✓ Small villages where load shading happers.
- ✓ In agriculture.
- ✓ In Green house.
- ✓ In various places where continuous light (Electricity) fluctuation occurs.

Testing :

Sr.No	Testing	Voltage (V)	Current (mA)
1.	No load test (with battery connected)	12.21	0.04
2.	No Load Test (Without battery connected)	12.03	0.04
3.	On load test (without battery connected)	5.85	0.73
4.	On load test (with battery connected)	12.13	0.04
5.	Reading for Buzzer circuit	3.3	0.03
6.	Reading for LED circuit	3.3	0.03

Result :

When there is Flame the LED and Buzzer automatically ON & when there is NO flame amount Arduino automatically turns off LED & Buzzer.

When we place Flame near flame sensor Arduino automatically turns On the LED & Buzzer. When we remove flame from the flame sensor Arduino automatically turns off LED & Buzzer.

IV. CONCLUSION

This system presented the development of a fire alarm system using the Arduino UNO. This system undoes the need of a person to continuously monitor the area. The monitoring will be done with the help of sensors. Buzzer and LED are used to required authorities. This system is a low cost, power efficient and based on the instruments that reliable as well as durable. Many future works are also possible in this system design. Detection system for forest fire is proposed. When fire occurs, the system senses the flame and turn on LED & Buzzer.

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