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Design & Implementation of A System Which Provide Safe Geurd from Forest Fire

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Abstract- Electric vehicles are a new and upcoming technology in the transportation and power sector that have many benefits in terms of economic and environmental. In this project we will implement a charging station, which will charge the EV battery through solar system. The main aim to our project is to design the charger such that to charge EV battery quickly or fast. For fast charging of battery we will use CC/CV method. In charging process we utilize a microcontroller based dynamic charging algorithm.

Keywords:- Forest fire, thermal sensor, water sprinkler, Arduino UNO microcontroller, LCD.

I. INTRODUCTION

Australian bushfires continue in the new year with 20 dead thus far, including three volunteer firefighters. Around 6 million hectares (14.8 million acres) are left burned at the beginning of 2020. Wildfires can have immediate and long term effects on the quality of rivers, lakes, and streams.

The most noticeable impact of wildfires is storm water run off. After the loss of vegetation, the ground's soil becomes hydrophobic and prevents the absorption of water. This inability to absorb water promotes the transportation of debris and sediment into larger bodies of water, further polluting valuable and essential resources.

Post-fire flash floods become a threat and allow the introduction of heavy metals from ash and soil to infiltrate waterways. Filtering these water sources can be costly as well as time consuming. Depending on the temperature and time of year a wildfire occurs, vegetation can be significantly impacted. Plants on the forest floor or smaller trees are often destroyed by wildfires, while larger trees are able to survive as long as the fire does not spread into the tree canopy.

The flames from these fires destroy the food source and homes of many animals, threatening their survival. For plants and trees that can survive the flames, they are susceptible to disease, fungus, and insects due to their decreased resistance following burn injuries. Wildfires have both immediate and long-term impacts on air quality. As a forest burns, large amounts of smoke are released into the atmosphere. These smoke particles are typically small and made up of gases and water vapor.

Air pollution from fires have the potential to travel great distances and oftentimes may pose a threat to human health. These small particles can become lodged deep within our lungs, making it difficult to breath as well as placing additional stress on our hearts.

Additionally, wildfires produce an increased amount of carbon monoxide, which too can lead to a variety of health implications. As we know forest fire is very wild thing no one can control that deserter. Till now no other systems can tackle that.

In our project we will design a system which will control the forest fire and restricting some amount of damage. In this project we will built a powerful water jets as a fire fighter in forest. It will operate by thermal sensors. And whole system will run on solar panels which is installed separately to each water pumps. If we put advancement in that project then we will monitor exact area of fire affected area by radio signal

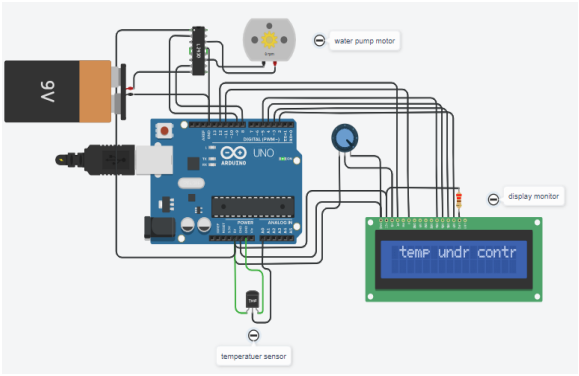

Fig 1. Scenario: For temperature under control.

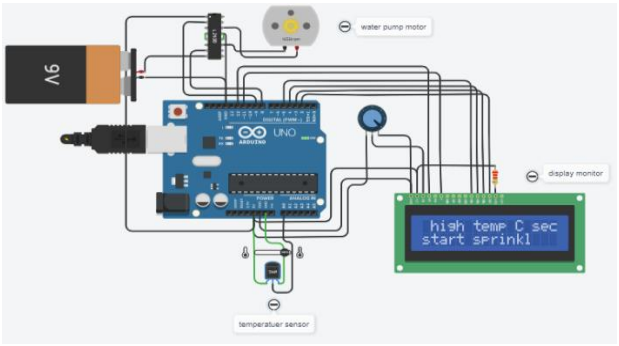

Fig 2. Scenario: For high temperature start sprinkler.

II. LITERATURE REVIEW

Knapp, Eric E.; Estes, Becky L.; Skinner, Carl N. 2009. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 80 p. Prescribed burning may be conducted at times of the year when fires were infrequent historically, leading to concerns about potential adverse effects on vegetation and wildlife. Historical and prescribed fire regimes for different regions in the continental United States were compared and literature on season of prescribed burning synthesized.

In regions and vegetation types where considerable differences in fuel consumption exist among burning seasons, the effects of prescribed fire season appears, for many ecological variables, to be driv en more by fire-intensity differences among seasons than by phenology or growth stage of organisms at the time of fire. Where fuel consumption differs little among burning seasons, the effect of phenology or growth stage of organisms is often more apparent, presumably because it is not overwhelmed by fire-intensity differences.

Most species in ecosystems that evolved with fire appear to be resilient to one or few out-of-season prescribed burn(s). However, a variable fire regime including prescribed burns at different times of the year may alleviate the potential for undesired changes and maximize biodiversity. Fire cause disturbances which is inherent, unavoidable and affects in all levels of an ecosystem" (White and Jentsch, 2001).

The disturbances caused by the fire cannot be avoided and it can occur in the young recently established vegetation as well as in a fully grown natural forest. Fire has concentrated effects on vegetation development since fire wipe out unwanted vegetation and thus creating emergent space for other species to occupy (Oliver, 1990).

The skillful burning of the vegetation cover has affected water and vegetation composition of the disturbed areas and eventually adapted to the new conditions. Besides the influential effect on water moisture content and vegetation composition, fire also increases the frequency of sheet flow and rill formation (Naveh, 1984).

The government and the forest department of Mississippi State in USA had learned from their practical experiment, the effects and benefits of prescribed burning. Before acquiring all these knowledge, they have lost most of their natural forest to fire. They learned that fire is created with a set of goals and in a controlled manner will be the best tool for forest management, but it castoond regarding the creation of public nuisance due to this activities. Ten Southern states of Minpp State in USA have passed laws to define prescribed burning as a legal activity h ecological and social benefits (Braiber, 1992).

Using fire as a forest management tools in a controlled method improves wildlife habitat, reduces perilous fuels, prepare sites for seeding and plantation, and manage competing vegetation and controls pests and diseases. Unwanted species, under storey trees and shrubs with dead needles and leaves act as a stepladder fuels, allowing fire to climb up the over storey crowns and ultimately maximizes the level of devastation by uncontrolled fire. In this case, prescribed fire in advance serves as a management tool where the competing vegetation is controlled.

"Since the earliest times, fire has patently been one of the agent where the habitats of plants and animals are modified and changed" (Walter Hough, 1926).

A fungal infection called Brown spot can be eliminated along the diseased needles without killing the terminal bud by implementing prescribed burning as a practical method.

This type of method also reduces problems of root rot where the environment of the forest floor is rehabilitated. In the southern Appalachians, fire is being used in white pine seed orchards to destroy hibernating white pine cone beetles

1. General Block Diagram:

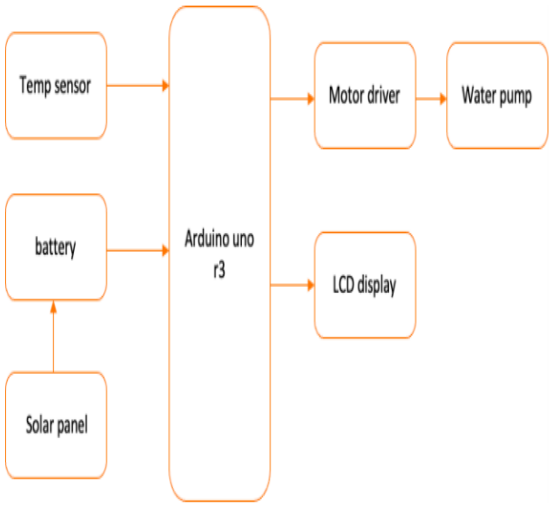

Fig 3. General Block Diagram.

Above block diagram we are using Arduino uno R3 microcontroller for controlling all the aspects. At input section we are used temperature sensor. This temperature sensor highly sensitive. At output section we connected motor driver and water pump is connected to motor driver.

Another output application is LCD Display this show us status of field. as block titled temperature sensor. It is sense temperatures of surrounding and act like wise. If temperature is increased that means their fire took place then it starts acting and providing signal to M/C for further process.

In this unit incoming signal of temperature sensor is processed. When signal come that means it is high signal M/C run some program for run the motor and its output apply to motor driver unit. incoming signal from M/C is to run the motor. Then motor processed that signal and give command to motor for run and our water jets will turn one.

2. Proteus Design:

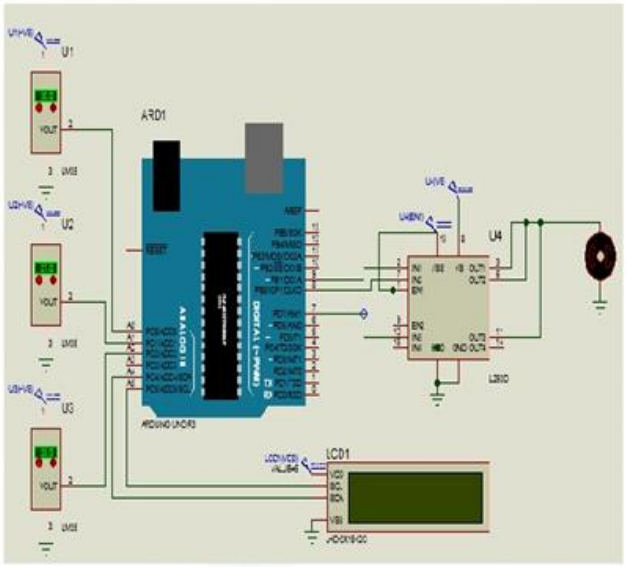

Fig 4. Proteus Design.

III. COMPONENT DETAILS

1. Solar Panel:

Fig 5. Solar Panel.

APV module is an assembly of photo-voltaic cells mounted in a framework for installation. Photo-voltaic cells use sun light as a source of energy and generate direct current electricity. A collection of PV modules is called a PV Panel, and a system of Panels is an Array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

I. Arduino UNO R3:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB

connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button.

Fig 6. ArduinoUNO R3.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with ac to dc adapter or battery to get started.

3.Motor Driver Circuit:

Fig 7. Motor Driver Circuit.

The L293D is designed to provide bidirectional drive currents of up to 600mA at voltages from 4.5 V to 36 V. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H reversible drive suitable for solenoid or motor applications.

4. DC Motor:

Fig 8. DC Motor.

This "545" motor is designed for 9-12V DC. At 12V the shaft speed is around 5000 RPM, so for most applications, a gearbox or reduction pulley system would be desired. The motor measures 38mm in diameter and 58mm long excluding the output shaft, which extends a further 12.5mm and measures 3.175mm in diameter.

6.Temperature sensor:

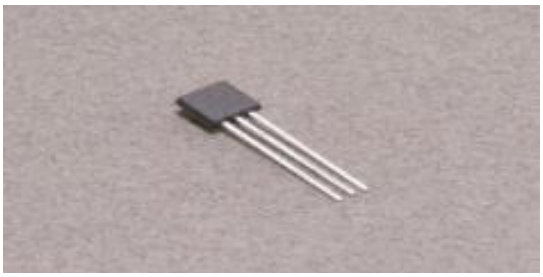

Fig 9. Temperature sensor.

The TMP36 is an easy-to-use temperature sensor– an excellent choice for anyone getting started with sensors and microcontrollers! Simply connect pin 1 to a power source ranging between 2.7 and 5.5 VDC, pin 2 into an Analog input in your microcontroller or Analog to digital converter, and connect pin 3 into a ground. The sensor works by setting a voltage on pin 2 ranging between 0 and 1.75V depending on the temperature. -50°C will result in 0V being output, while at the other end of the range, 125°C will result in 1.75V being output.

7.Voltage Regulator LM7805:

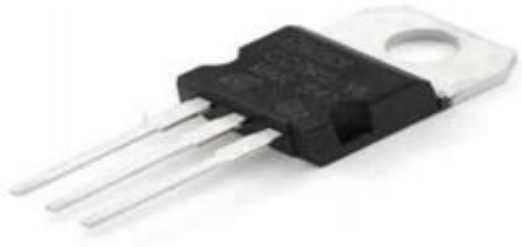

Fig 10. Voltage Regulator LM7805.

IC 7805 is a 5V Voltage Regulator that restricts the output voltage to 5V output for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry. It is in expensive, easily available and very much commonly used. With few capacitors and this IC you can build pretty solid and reliable voltage regulator in no time.

The maximum value for input to the voltage regulator is 35V. It can provide a constant steady voltage flow of 5V for higher voltage input till the threshold limit of 35V. If the input voltage is near to 7.2V to 12V then it does not produce any heat and hence no need of heat sink.

7. Battery:

Fig 11. Battery.

A battery is a device consisting of one or more electrochemical cell with external connections provided to power electrical device such as flash light, mobile phone sand electric cars. When a battery is supplying electric power, its positive terminal is cathode and its negative terminal. This article is about rechargeable lithium-ion batteries. For disposable primary lithium batteries, see.

IV. WORKING

In our progressive work we are presenting a simulation work done by our group regarding our project. I progressive process we have designed our project operation on an Arduino Uno R3 micro controller in Tinker cad Simulator Software as shown in below figure. For control unit we used ATmega328P microcontroller.

These microcontrollers are familiar of Atmel8-bit AVR microcontroller. In this microcontroller 14 digital I/O pins, 6 analog pins which is also use I/O pins, 2 UART pins are present. In this simulation we used 10 pins for perform action. Pin 2,3, 4, 5, 11, 12 are connected with 16x2 LCD display in input section we used pin A0 and temperature sensor connected at this side. When temperature increased sensor will sense this and give signal to microcontroller.

At the output section we used two application as output. One is a motor driver IC and second is display. Motor driver IC is connected to the pin 8 and 9 of microcontroller. LCD display is connected to pin of 2, 3, 4, 5, 11 and 12.

When temperature sensor send signal to microcontroller then is run a respected program to control this temperature. Microcontroller give that time HIGH pulse to pin 9 and LOW pulse to pin 9 forgive order to motor driver IC to run the Water pump. When motor driver gets input signal from microcontroller then it allows to pass high voltage to water pump. And water pump will start pumping water at that time. Connection diagram of above system is in the below fig.

At LCD section when any kind of high temperature sense by the sensor microcontroller send a massage to display warning massage like “high temp” etc. when temperature under set value then it displays “temp under control”.

V. CONCLUSION

Work presents a low-rate wireless personal area network-based sensor network for early detection and monitoring of forest fires. This system has been designed to perform different parameter measurements at different tree height, depending on the relief. Measures of power consumption confirm the feasibility of the implementation of this sensor network. Thus, we conclude that the inbuilt water jets are very useful for controlling and combating forest fire. And all system is self-powered then it is not required any outer This power supply. This project we are designing robust water jets which is ecofriendly.

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