



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 5, May 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

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Automatic Fire Detection and Control Using Solar Panel

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ABSTRACT:All agricultural farms are at risk of fire and each year there are over one thousand fires in agricultural buildings, many of them housing livestock. Most fires on farms can be prevented by providing the farmers and stockpersons a timely alert and a mechanism to recognize and remedy any hazards which do occur. This project examines the fire dangers which are commonly found on farms and proposes a simple sensor based system in which risks can be reduced by timely alert and taking sensible measures. Although principally concerned with farm animal welfare, such measures are equally important to human safety. In this project basically a low cost fire detection and control system based on heat detection is proposed. It is comprised of a combination of electrical/electronic devices/equipment working together to detect the presence of fire and alert people through audio or visual medium after detection. The whole system is powered by using solar panels. These system may be activated from heat detectors which, when detects fire. Then, it automatically operates a relay which can be used to send Short Message Service (SMS) to the registered mobile numbers and switch on a motor pump to spray water using sprinkler irrigation system. Fire outbreak is a major concern at homes, offices, industries etc. It is dangerous and requires high security and control to avoid destruction of lives and property. One of the preventive measures to avoid the danger is to install an automatic fire detector at vulnerable locations, hence the Arduino based fire alarm detection and control system was proposed. It is capable of automatically detecting heat in a given environment, displaying on LCD, and switch on the motor pump automatically and also spray water to reduce the intensity of fire.

KEYWORDS: Multi Sensor, fire detection, Audio or Visual Medium, Relay, Short Message Service (SMS), Pump.

I. INTRODUCTION

Now a day's automatic fire detection and control is becoming very essential to reduce the fire in the Agriculture lands and storage areas. Automatic fire alarm system provides real time surveillance, monitoring and automatic alarm. A key aspect of fire protection is to identify a developing fire emergency in a timely manner, and to alert the building's occupants and fire emergency organizations. This is the role of fire detection and alarm systems. Generally fire detectors are designed to respond at an early stage to one more of the four major characteristics of combustion, heat, smoke, flame or gas. No single type of detector is suitable for all types of premises or fires. Heat detectors respond to the temperature rise associated with a fire and smoke detector respond to the smoke or gas generated due to fire. Although agricultural fire hazards have been present in farming scenario from a long time, we still have not developed effective way of dealing with them, and because of that the early detection of agricultural fire hazards is still quite important task. Traditional methods based on human observers are mostly used, but they have shown ineffective because of a human observer's subjectivity. Modern technologies, especially sensors technology provide tools for new techniques of agricultural fire hazard early detection. The multi-sensor system is one of the most important technologies currently being investigated by scientist all around the world for agricultural fire detection. The sensors could be deployed in nature on places where it was not possible to put sensors before, particularly because of today's development of wireless communication and miniature autonomous power supplies. In this paper proposed system has two tasks i.e. collecting data from sensors and another one is sensor network data utilization for timely alerting farmer. The goal of sensor data interpretation, particularly using data fusion techniques, is to increase the reliability and reduce the chances of false alarm. In this paper farm fire is detected by the fusion of data from two sensors. Combining sensors for collecting data and advanced algorithms for data processing and interpretation, more advanced object called the observer could be designed. Combining several sensors an observer network could be established, capable for better understanding what is going on in sensors surroundings.



II. RELATED WORK

In the review on IOT based Fire detection by M. Trinath Basu, J.Mahitha, Ragupati Karthik, V. Lokesh Reddy belongs to Department of Electronics and Computer Engineering, Andhra Pradesh, India published on April 2006, It has been found in a survey that 80% losses caused due to fire would have been kept away from if the fire was identified promptly. In this tasks fire caution can likewise be activated be-cause of little smoke from candlelight or oil lights utilized as a part of a family. Likewise, at whatever point warm force is high then additionally the alert goes on. Bell or alert is killed at whatever point the temperature goes to ordinary room temperature and smoke level decreases. We have additionally interface show to the Node Mcu board. The assistance of IOT innovation .Node MCU fire checking serves formed and also for family unit reason.[1] In the review on Fire detection using sensor by Miroslav Bistrovic, Danko Domingo Komorcec from University of Split published on January 2009, Early fire detection has a crucial role in fire spreading and extinguishing. Development of fire detection technology was introduced as a result of series of great fire incidents, which have caused heavy material losses with even greater casualties.

Fire is among the major sources of danger to the ship, and therefore special attention must be paid to preventing and extinguishing fires on board. The recent development of fire detection sensors and their integration into the fire alarm system can be traced through the development of four extinguishing fires on board. Integration of fire detection technology with microelectronics and information technologies, a high level of system autonomy is achieved, allowing wireless networking of fire alarm sensor while increasing system reliability and availability. [2] Review on Identification of Fire Emergency using BIM tool by Gajanand S. Birajdar, Rajesh Singh, Anita Gehlot from Department of Electronics Engineering, Lovely Professional University, India on August 2012 Building Information Modeling (BIM) tools can be used to create a virtual environment for fire emergency evacuation. A rescue operation during fire emergency can be fastened using cloud-based Rescue Worker Interface (RWI) which assists rescue warden by proving real-time information of building fire, the flow of fire, people density, and position of remaining warden. In the author proposed a system which formulates real-time evacuation path based on real-time data acquisition and calculations of risk distributions. In case of fire events system provides directional guidance concerning the time and location of fire accidents. GIS and IOT technology is used to obtain information about the building. Further, the evacuation path has been estimated using Mat lab. ZigBee based fire alarming and prevention system is proposed in.[3]

In the review on Monitoring Fire using CCD Camera by Osman Gunay, Kevin Kose, Kevin Ashton, from University of Belgium on 1999 Belkin. The fire searching method is realized based on computer vision .theory via one CCD camera fixed at the end of a fire monitor chamber. While the fire monitor is pivoting, continuous images are taken from the CCD camera and transmitted into a computer. Then the images are processed with an image fire detection method to determine whether a fire occurs in the vision field. Once a fire is detected, it will be automatically located through an image processing algorithm. Displacement and pivot angle of the CCD camera in searching process are the essential parameters to calculate the space coordinates of a fire. When the coordinates of the fire are obtained, the fire monitor can be adjusted to the appropriate direction and elevation to spray according to water pressure. One of the disadvantages of this system is that fire detection method depends on CCD camera without fire detection sensors, and the advantage is the fire searching method is realized based on computer vision theory via one CCD camera without human interfering.[4]

III. METHODOLOGY

Temperature sensor is used for detect the field temperature. If the temperature exceeds the normal temperature (i.e., 50 degrees Celsius) then the sensor provide the information to the Arduino board which is already programmed. The current temperature is displayed in the LCD display. Then the motor automatically switched on and then the water stored in the water tank is sprayed to the field. As well as the information received from the Arduino is conveyed to GSM module which transmit the information to the farmer through the SMS. At a temperature less than 50 degrees Celsius, the LCD displays the current room temperature in both simulation and breadboard, while at a temperature equal to or greater than 50°C which is the threshold degrees Celsius, the LCD displays “ High temperature detect”.

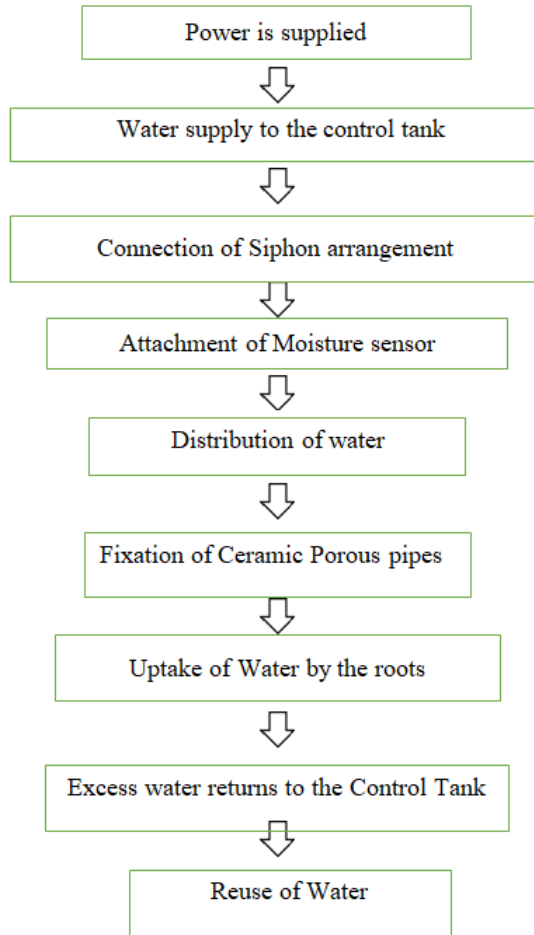


Figure.1 Methodology

IV. EXPERIMENTAL RESULTS

Detection of fire in the farm field can be done by the fire detection system. The faster the detection of fire can reduce the loss of property and the crops. The working principle of the project is the current produced from the solar panel cannot be directly given to the concerned circuit system. So the current produced by the solar panel can be saved to the 6V battery which can provide the current to the circuit system. From the battery the current is supplied to the transformer. The transformer supplies the current of 230V. The transformer converts the current from High Voltage current to Low Voltage current. Rectifier converts the AC current to DC current. The capacitor is provided, which supply the current which is to be needed for each components working. The capacitor converts the 230V to 5V. The Relay which provide 5V to each sensor which is needed for their working. An LCD (Liquid crystal Display) Display is provided in the circuit. When fire occurs in the field the temperature automatically increases. In accordance with temperature sensor, an LDR (Light Dependent Resistor) sensor and Flame sensor is provided. An ATMEGA326P Arduino board is provided. The Arduino is programmed as; when the temperature exceeds 50°C the system automatically operates. The information provided from Arduino to the RF Encoder Transmitter. It transmits the information to the RF Decoder Receiver. Then the Motor Pump automatically operates when the information is received. The pump is operated and the water supplied to the field in the form of sprinkler system where the fire is occurring. In addition to this a flame sensor is also provided, which detects the fire by seeing the flame, so the same process is again repeated to stop the fire occurrence

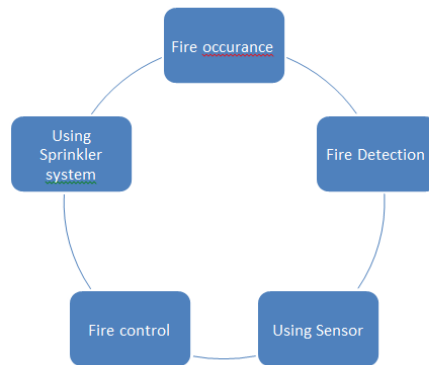


Figure.2 Working Cycle

V. CONCLUSION

Proposed designs have been successfully tested for agricultural fire detection. The proposed design was implemented using multi-sensor technology to improve reliability and reduce chances of false alarm. A special multi-sensor system was designed for this purpose having software system desirable features like modularity and flexibility. The system was simulated successfully using multiuse. The proposed system can find a wide application in different areas, especially where it is needed to monitor and provide alert for fire hazards agricultural and nonagricultural applications. The main sphere of using multisensory fire alert system is in agriculture farms, forest fire detection as well as at livestock farms. In future additional sensors can be attached to the system to improve the reliability of the system. One such sensor suggested is smoke sensor this will help in better detection of smoldering fire. Further actual hardware of the design can be implemented and tested in the real scenario.

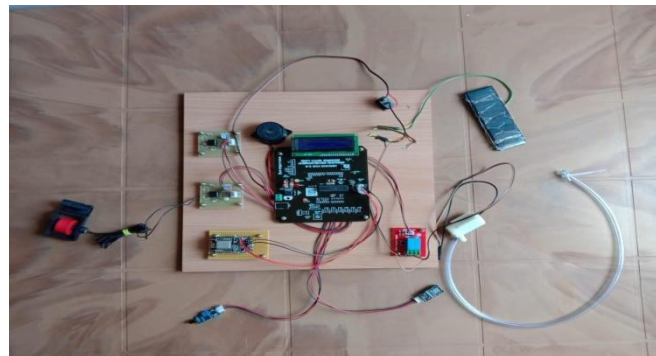


Figure.3Prototype

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