VIVA-TECH INTERNATIONAL JOURNAL FOR RESEARCH AND INNOVATION
ANNUAL RESEARCH JOURNAL
ISSN(ONLINE): 2581-7280

Agricultural Fire Protection System

Kalpit Raut[1], Dakshat Patil[2], Priyanka Pawar[3],
Prof. Anojkumar Yadav[4]

[1](*Electrical Department, Viva Institute Of Technology, Virar,401305)*
[2](*Electrical Department, Viva Institute Of Technology, Virar,401305)*
[3](*Electrical Department, Viva Institute Of Technology, Virar,401305)*
[4](*Electrical Department, Viva Institute Of Technology, Virar,401305)*

Abstract : *Fire is an unexpected incident that causes a huge loss for farmers. The proposed system uses a sensors to detect a fire in the field that includes Flame sensor, light sensor, and ESP 32 CAM with alert on mobile.The proposed system is divided into two subsystems named Fire detection system to detect fire and Fire prevention system to extinguish fire. This system runs continuously by using water pump without failure. At the time of fire detection, the default system is ON only if no action is taken by the farmer with a given time stamp. The system continuously scans data from the sensor in the field and stores data in Firebase and then analyzes the data based on the algorithm and stops the fire before it spreads in the crop.*

Keywords : *detect the fire, Firebase, system triggers, FPS using the motor pump., data coming from the sensors, alert on mobile, Flame sensor, Light sensor, and ESP32 CAM*

I. Introduction

Agricultural is one of the most important and essential sources for the farmers and business in India and it considered to be the backbone of country's economy. Climate change and the growing need for food poses significant challenges to modern agriculture. Worldwide the population is predicted to increase significantly and, therefore, food production should increase by 70 percent by 2050. On at the same time, water scarcity and arable land shortages it grows. Therefore, there is a need for adequate elections of plant species, proper adaptation of farming practices, as well sustainability. Fertilizer, crop treatment, pest control, and Most importantly irrigation management must be familiar conditions are constantly changing. Agricultural activities have which will be done in a high-quality way to save shortages resources. To Get this, apart from agriculture and agronomy, research knowledge of many other domains needs to work well combined. Great effort to use scientific success as well novel technology from other domains already exists made. New digital strategies integrated in the agricultural sector that produces the idea of Precision Agriculture. More recently, Internet of Things (IoT) ideas extend Precision Agriculture strategically, widely, and the sensors that interact with the technology available today is well established in other sectors of the industry as well home automation. In recent years, Indian agriculture often affected due to various changes. Mostly by fire incident. Fire is one of unpredicted and unknown events that harm the productivity of farmers. Therefore, we need to invent something to prevent these things before it happens. At the current situation there is need of automation in agricultural sector for protection of crop. So, we can make system to protect crop by using IOT to prevent fire incidents in farm.

II. METHODOLOGY

The following is the design methodology for the project Agricultural Fire Protection System

Block Diagram:

The protection System mainly consists of following blocks. Sensor blocks, Multiplexer block, ESP32 CAM Board Block, Relay & pump blocks, Buzzer blocks, cloud storage & mobile app Block. This is diagrammatically shown in "fig.1"

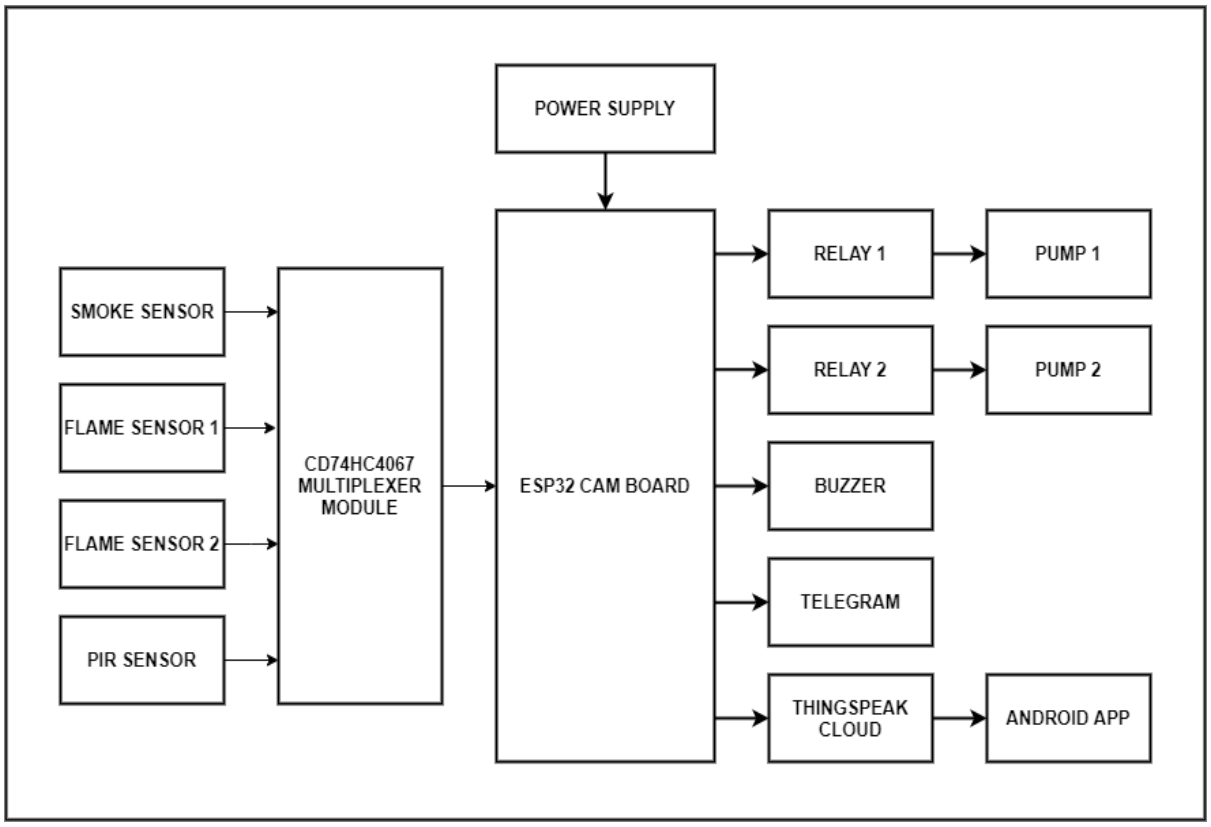

Fig.1 Block Diagram

Working Principle:

The system uses ESP32 Cam as the microcontroller. The ESP32-CAM is a fully integrated microcontroller with integrated video camera and a SD card socket and it is easy to use, and is ideal for IoT devices that require a camera with advanced functions such as image tracking and recognition. The system uses flame sensors, Smoke Sensors, PIR Sensor. This sensor is connected to Multiplexer and the multiplexer is Connected to ESP32 CAM Board. A flame sensor detects fire or flames. In the most extreme cases, fire sensors work to reduce the fire-related risk by providing a signal to the ESP32 CAM.A smoke sensor is used for detection of smoke it's give signal to ESP32 CAM board. If Any signal value that coming from sensor are greater than pre-define value, then the system will activate buzzer and send alert to users mobile. If user is note take action, then automatically system will send signal to relay. After getting signal from system relay are activate the water pumps and sprinkling system is start in fire detected area. In this system all data is stored in IOT server i.e. ThinkSpeak and this data can be access from Android App.

Circuit Diagram:

The circuit diagram of the protection system is shown below.in this circuit diagram all connections of shown with color coded wires.in this all circuit we are use black color for neutral and red color for phase. For Sensors we are use golden wire for Smoke sensors it carries signals from flame sensors, White wire for flame it carries signal from flame sensors, we use yellow wire for PIR motion detector sensor it carries signal from PIR Sensor.

In Multiplexer pink wire in pin1 Carries Digital Output Signal to ESP32 CAM board, Blue wire Used in pin 10 and pin 11 are channel selector pin. Black wire in pin 12 and pin 15 are Ground wire. In ESP32 CAM

Board block wire is used for ground and red wire for 5v Dc supply. Pink wire is sued in GPIO pin 12 it is digital input from Multiplexer. Blue wire used in GPIO pine 13 and pin 15 are select pins. Orange wire is GPIO pin 14 it is output signal for buzzer. sky blue wire is GPIO Pin 2 it carry output signal for relay 1. Purple is GPIO Pin 4 it carry output signal for relay 2.

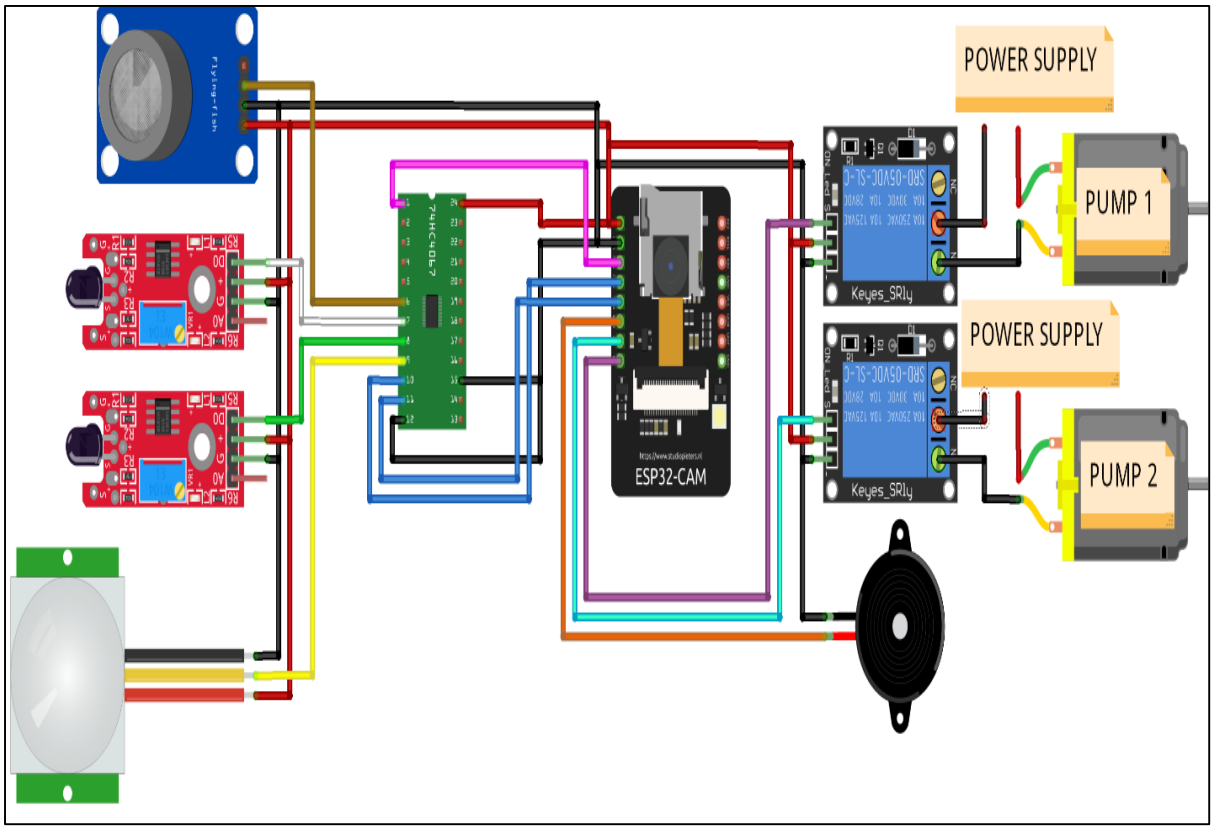

Fig.2 Circuit Diagram

Components And Specifications:

Table.1 Components and Specifications

Sr No	Component	Specifications
1	Esp32 cam board	Input Voltage= 5, SPI Flash Memory= 32mbit, Ram= 520kb SRAM Mb + 4mb PSRAM, Bluetooth 4.2 Br, WIFI= 802.11 B/G/N/, Image Output Format= JPEG(Ov2640 Support Only), Bmp, Grayscale

2	CD74HC4067 Multiplexer	Operating voltage= 2 to 6 volt Dc,
3	Smoke Sensor	Operating voltage= +5 volt, detecting rating= 300~ 10000ppm, sensor type= semiconductor
4	Flame Sensor	Operating voltage= 3.3~5 volt, operating temp.= -25 to 85, Operating Angle= 0 to 60 degree
5	PIR Sensor	Operating voltage= 3.3 volt, max operating current= 0.0095 Ma
6	Single Channel Relay Module	Trigger Voltage-volt, Trigger current= 20 ma, Switching voltage= 250@30A(VAC)Switching voltage= 30@30A (VDC)
7	Pump Motor	Operating voltage= 2.5~6 v, operating current= 130~220ma, Flow rate= 80~120 L/H, Maximum lift= 40~110Mm
8	Zero PCB	4*4 ,35 Micron copper
9	Connecting Wires	Material= Copper , insulation; plastic
10	Jumper Wires	Material= copper, insulation; plastic
11	Male Headers (Burg Strips)	Connector type= pin Male header, no of pins = 40,contact pitch= 2.4mm
12	Female Headers (Burg Strips)	Connector type= pin female header, no of pins = 40,contact pitch= 2.4mm
13	USB	Power supply pin= 5v@500Marx , Rx pin= 3.3v, Tx pin= 3.3v
14	Adapter	Input Voltage (V)= 100 ~ 280 VAC @50 ~ 60Hz,Input current (mA)= 100,Output Power= 5V,Load regulation (%)= ±5.
15	Buzzer	Operating voltage= 5v dc
16	Final Model Mounting Board	3ft * 4ft board

Model Photos And Mobile Application Interface:

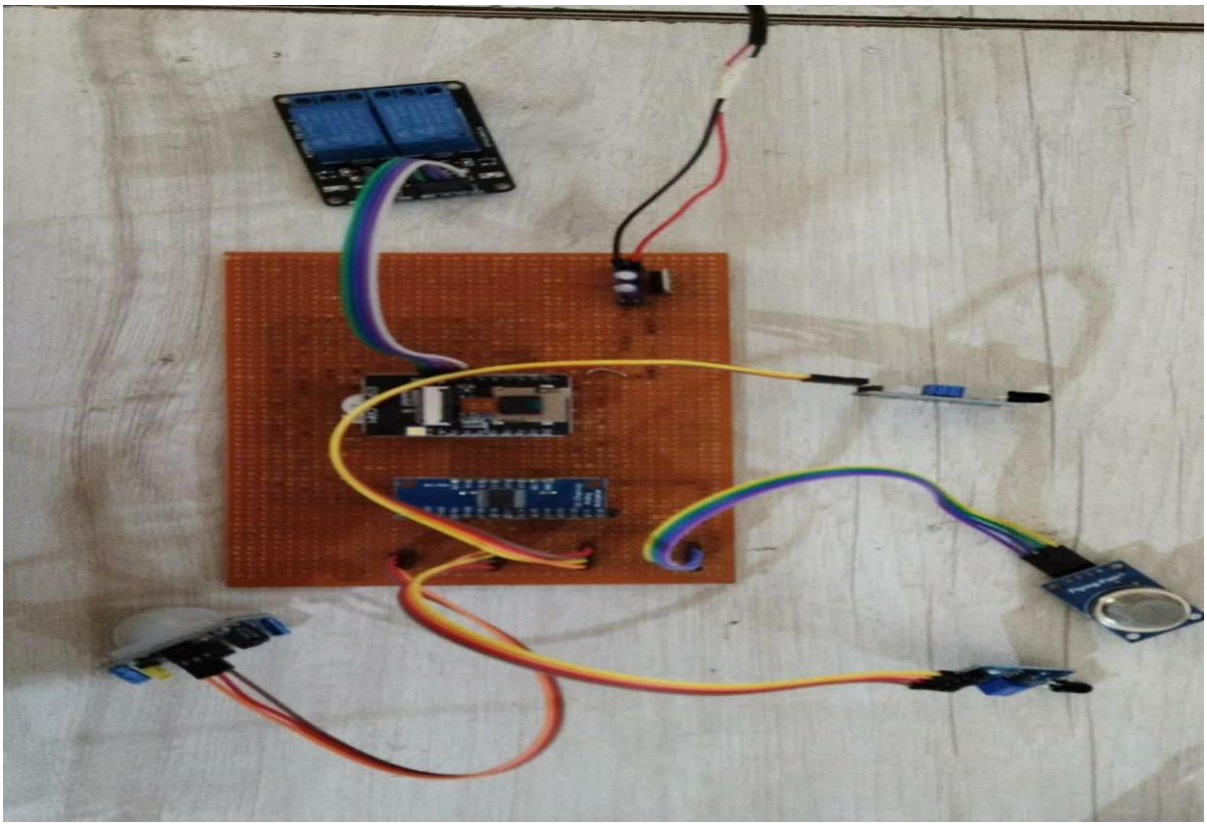

Fig.3 Model Photo

Fig.4
Application Interface

Fig.4 Application Interface

III. CONCLUSION

This project has explained an agriculture fire protection system model where the Internet of Things and embedded automation are applied for the early detection of flames in the field. This agriculture system is made very smart and fully automatic with the implementation of IOT devices using sensors. Any technique that detects the flame will ON the buzzer and activate the water sprinkling system to extinguish the flames. This system is running automatically without human involvement which decreases the loss that occurs due to the field fire. A PIR Sensor is also used to detect animals entering into farms. Monitoring of farm using Android App through ESP32 camera is also possible in this system.

Future Scope

- Image processing for animal intrusion and fire detection can be added to the system.
- GSM Module can be added for alerts in the absence of internet.

REFERENCES

[1] Praveen Singh, Pratik Pawar, Pratiksha Takwale, Dr. Deepak Karia, "*Agriculture Monitoring System*"Sardar Patel Institute of Technology, International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS-2017) 2017 IEEE.

[2] M. H. Almarshadi and S. M. Ismail, "*A Review of Wireless Sensors and Networks' Applications in Agriculture*" Journal of Applied Sciences Research, vol. 7, no. 3, pp. 299–308, 2011.

[3] Darshini.B,E.EsakkiVigneswaran ," *Industrial Process Monitoring and Control Using Raspberry P*i",ARPN journal of Engineering and applied science, volume 11,No 2,January 2016,ISSN 1819-6608.

[4] Prathibha S R, Anupama Hongal , Jyothi M P, "*IOT based Monitoring System in smart Agriculture* "Sambhram Institute of Technology, 2017 International Conference on Recent Advances in Electronics and Communication Technology,2017 IEEE.

[5] Boobalan. J, Jacintha. V,J. Nagarajan, K. Thangayogesh and S. Tamilarasu. "*An IOT based Agriculture Monitoring System*", International Conference on Communication and Signal Processing, April 3-5, 2018, India,IEE 2018.

[6] Anushree G,Juturu Maneesha, Badagowni Swapna ,Nallagatla Swathi,RaviKumarr V G. "*Smart Agriculture System to Detect Flames using IoT and DIP*", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181,Published by, www.ijert.org ,NCRACES - 2019 Conference.

[7] M. Mridha, B.-E. Erlandsson, M. A. Hashem, M. S. Nadir, P. Barklund, and M. S. Islam, "*Applications of e-agriculture using existing ict tools to empower the farmers in bangladesh*," Asian Journal of Agricultural Extension, Economics & Sociology, vol. 18, no. 4, pp. 1–11, 2017.

[8] Iftekharul, Md & Abid-Ar-Rafi, Md & Neamul, Md. (2016). "*An Intelligent Fire Detection and Mitigation System Safe from Fire (SFF)*". International Journal of Computer Applications. 133. 1-7. 10.5120/ijca2016907858.

[9] Singh, Digvijay, Neetika Sharma, Mehak Gupta, and Shubham Sharma. "*Development of System for Early Fire Detection using Arduino UNO*." (2017).

[10] A. Imteaj, T. Rahman, M. K. Hossain, M. S. Alam, and S. A. Rahat, "*An IoT based fire alarming and authentication system for workhouse using Raspberry Pi 3*," 2017 International

[11] Conference on Electrical, Computer and Communication Engineering (ECCE), Cox's Bazar, 2017, pp. 899-904.

[12] Akhil Pillai, Vineet Jacob David, Rohan Shibu, Jaslin Fernandes, Mrs. Archana Shirke 2018 "*f-detect: early detection of forest fires using wireless sensor networks*".

[13] I. Mohanraj, Kirthika Ashokumar, J. Naren, "*Field Monitoring and Automation Using IOT in Agriculture Domain*", Procedia Computer Science, Volume 93,2016, Pages 931-939, ISSN 1877-0509.

[14] Ashmi, V. K., et al. "*Fire detection and Irrigation automation based on IOT*." international journal of electronics, electrical and computational system (2018).

[15] Rajalakshmi, P., & Mahalakshmi, S. D. (2016, January). "*IoT based crop-field monitoring and irrigation automation*". In 2016 10th International Conference on Intelligent Systems and Control (ISCO) (pp. 1-6). IEEE.