"IOT BASED FIRE DETECTION AND PREVENTION SYSTEM IN FARMLAND"

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I.Abstract:

Agriculture is the main source for food and helps in economic improvement for many countries.In current scenario farmers are facing various problems in water management. In addition, during summer many agriculture fields suffers from fire accidents both naturally and manmade. This issue is addressed by the design of automatic fire detection system with an automatic sprinkler which is used along with fire detection sensor.

Figure 1: Fire attacked image

Whenever fire detected by sensor then the motor get turns on by automation technology. Internet of Things is rapidly progressing in the present generation and using this technology continuous monitoring agriculture fire status is implemented at unlimited distance range. In this project embedded automation-based agriculture fire detection and water spray system and IOT Monitoring is demonstrated.

II.Introduction:

Agriculture, the backbone of Indian economy, contributes to the overall economic growth of the country and determines the standard of life for more than 70% of the Indian population. Agriculture contributes only about 14% to the overall GDP but its impact is felt in the manufacturing sector as well as the services sector as the rural population has become a significant consumer of goods and services in the last couple of decades. Most of the farming in India is monsoon dependent – if monsoons are good, the entire economy (and not just the agricultural sector) is upbeat and when the monsoon fails, everyone everywhere takes a hit to some extent.

Agriculture fire occurs by nature and manmade. Nowadays protecting agriculture land from fire is very hard. A image of fire attack on farmland is shown in Figure 1. It causes many growth losses and property loss of farmers. Hence we need to implement smart solution for agriculture fire prevention.

Various methods are implemented to increase overall productivity such as recommended systems, expert systems for better results using IoT using methods like schedule irrigation patterns and reuse of water. Although these systems are mostly used by industries for farming and not available for commercial use, which leads to dry fields and improper growth of crops. Even though the majority of the agricultural region of India has reached modern agricultural practice there is still a region where these are unavailable. Internet of Things (IOT) extensively increased in the last 10 years as its ease of implementation and variety of methods that can be used to implement in the agricultural field.

Different sensors can be used for connecting devices and collecting data. It reduces man-power and helps to handle and interact with the data collected. Data collection is a part of an analysis that is extremely required for data processing and data manipulation. Today the flow of data from the sensor is so huge that regular data storage is not enough for faster retrieval of data. Google Firebase is a data storage platform where retrieval of data and storage is easy and faster than the regular data storage platform. IOT devices can easily be connected to firebase and used for data-related operations. Hence, it transmits the information to the user. In this project IOT and embedded automation based agriculture fire detection and prevention system.

III.Problem Statement:

According to the latest news in India and other countries these farm fire accidents are very dangerous. It will burn all the crops and also damage the soil it makes soil erosion. These accidents are man-made accidents like electricity line faults and other kinds of mistakes. There is not any existing system to take immediate action for the prevention from this fire. So, we are building an automation system that is tackling this condition. We use farm water to take action.

IV.Literature survey:

D.Meghanathan[1] In this project,They proposed programmed crop security framework from creatures. This is a microcontroller based framework utilizing PIC family microcontroller. This framework utilizes a movement sensor to recognize wild creatures moving toward close to the field. In such a case the sensor flags the microcontroller to make a move. The microcontroller now sounds a caution to charm the creatures from the field as well as sends sms to the rancher so that he might be awar e of the issue and come to the spot in the event that the creatures don't dismiss by the caution. This guarantees total wellbeing of crops from animals in this way safeguarding the ranchers misfortune.

Adithi A.Kulkarni[2] We built a smart system which is powered by IOT based which will protect our farm from fire. When fire occurs in surrounding farms then our system will sense the fire and start water sprinklers to put out the fire and share this data on IOT to know the status of farm to farmer. They also doing automation using IOT based irrigation system. They achieving this controlling system worldwide by

using IOT based technology.

Ibtisam Ehsan[3] This project is to develop and review a Fire alarm navigation system and application that uses the internet of things. Fire alarm systems are designed to warn people about fires in advance so that they can evacuate the fire-affected area and take immediate action to control the fire. GPS module, a flame sensor, a smoke sensor, buzzers, LEDs, and a GSM module to ensure early notification to authorities and fire stations. The aim is to reduce the loss of lives and property. A questionnaire was designed to conduct a brief survey in a multinational sports production company in Sialkot, Pakistan, regarding the IoT fire alarm navigation system. Besides installing the system in the factory, we compare the results with ‹re incident response time with and without this system at rescue 1122 fire head station.

Hamood Alqourabah[4] This paper employs different integrated detectors, such as heat, smoke, and flame. The signals from those detectors go through the system algorithm to check the fire's potentiality and then broadcast the predicted result to various parties using GSM modem associated with the system. To get real-life data without putting human lives in danger, an IoT technology has been implemented to provide the fire department with the necessary data. Finally, the main feature of the proposed system is to minimize false alarms, which, in turn, makes thissystem more reliable. The experimental results showed the superiority of our model in terms of affordability, effectiveness, and responsiveness as the system uses the Ubidots platform, which makes the data exchange faster and reliable.

Varshini B M,Sushma AV [14]: There are numerous escape clauses in such thoughts thus ad libbing horticultural security has turned into a significant issue nowadays. Hence, this paper centers around proposing a framework which identifies the interlopers, screens any suspicious action and afterward reports to the proprietor of the field. It goes about as a versatile framework which gives a practicable framework to the ranchers for guaranteeing complete security of their farmlands from any assaults or intruding exercises.

Krunal Mahajan,Riya Parate,Ekta Zade,Shubam Khante,Shishir Begal [15]: This paper describes overview of various researches on smart crop protection system. We have a lot of technology that can protect the farm 24x7 those systems and technique we are discussing in this paper. We have different types of technology that can help to secure the farm. We have seen Arduino and raspberry pi based Farm protection system. But those Systems have different mythology and platform for that and the cost of those projects also increased so that those are not affordable with the farmer. Our main aim to design a system that can help to farmer to protect his farm from, animals with getting harm to them.

Shashi Kiran V,Manoj N, Hemanth Kumar M,Namitha M N,Surekha Manoj [16]: Birds and creature is having a particular scope of hearing recurrence. There aggravating recurrence is assessed by a particular rationale at right on time morning and night time birds falling on the yields and eating rice seeds, ragi crops corns furthermore, wheat...etc. So we can make aggravating sound for birds and the excoriate beyond the field by utilizing this thought we can lessen most impacted issue in horticulture. This circuit utilizes the movement finder is an electrical gadget that uses a sensor to identify close by movement. such a gadget is frequently incorporated as a part of a framework that consequently plays out an undertaking or cautions a client movement in an region. The circuit predominantly utilizes pir sensor, power source, bell, resistor, transistor.

V.Objective of the proposed work:

- To develop smart automation system to detect fire and develop fire alarm system
- To develop the system for fire incident area by connecting water sprinkler
- To design smart IOT monitoring system on smart phone for monitoring fire status and water sprinkler status.

VI.Methodology followed:

- During summer many agricultural field suffers from fire accidents both naturally and man made. This issue is addressed by the design of automatic fire detection system with an automatic sprinkler which is used along with fire detection sensor.
- Whenever fire occurs ,the fire sensors of the system will sense it and sends those signals to node MCU and notify the owner of the farm using IOT cloud.
- Simultaneously alarm circuit will detect the fire and activates the siren sound or buzzer,then the system starts the water pump,this water pump sprinkles the water to the farm land to stop the fire attack.
- This fire detection and prevention system will frequently sends the status of fire,location of fire attacked area and water pump status to the owner of the farm.

Figure 2: Image of Android

VII.Block Diagram

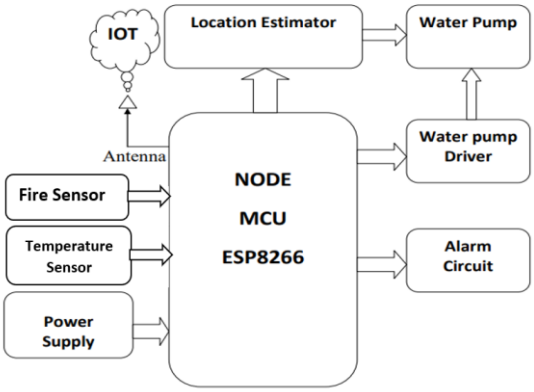

Figure 3: Block Diagram of fire detection and prevention system

Node MCU ESP8266: It connects object and let data transfer using the wifi protocol.Node MCU ESP8266 is programmed to turn on water pump with location estimator whenever fire occur and at the same time alarm is turn on for alerting people.

Fire sensor: It is used for detection of fire and it is analog sensor.fire sensor output is given to node MCU ESP8266 board.

Alarm circuit: It used for producing sound to alert for people.

Water pump: It is controlled through the water pump driver board. Location estimator: It is used for controlling water pump movement in left-right directions whenever fire occurs.

The Embedded C code is written with Arduino OS is open-source software using Node MCU ESP8266. A smart blynk app is used for monitoring fire status and water pump status.

A.Hardware Components

1. NodeMCU ESP8266

NodeMCU Development Kit/Board consist of ESP8266 wifi chip. ESP8266 chip has GPIO pins, serial communication protocol, etc. features on it.**ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer **ESP8266 WiFi Module.**The features of ESP8266 are extracted on NodeMCU Development board shown in Figure 4. NodeMCU (LUA based firmware) with Development board/kit that consist of ESP8266 (wifi enabled chip) chip combines NodeMCU Development board which make it stand-alone device in IoT applications.

Figure 4:NodeMCU ESP8266

NodeMCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT project

Pin Detail of NodeMCU Board:

General-purpose input/output (GPIO) is a pin on an IC (Integrated Circuit). It can be either an input pin or output pin, whose behavior can be controlled at the run time.

NodeMCU Development kit provides access to these GPIOs of ESP8266. The only thing to take care of is that NodeMCU Devkit pins are numbered differently than internal GPIO notations of ESP8266 as shown in the below figure 5 and table. For example, the D0 pin on the NodeMCU Devkit is mapped to the internal GPIO pin 16 of ESP8266.

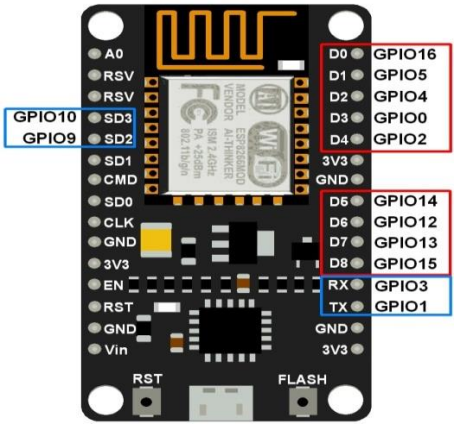

Figure 5: NodeMCU DevKit GPIOs

2.Fire sensor:

It is used for detection of fire and it is analog sensor.fire sensor output is given to node MCU ESP8266 board.

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection as shown in below Figure 6. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is working properly; in these cases they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

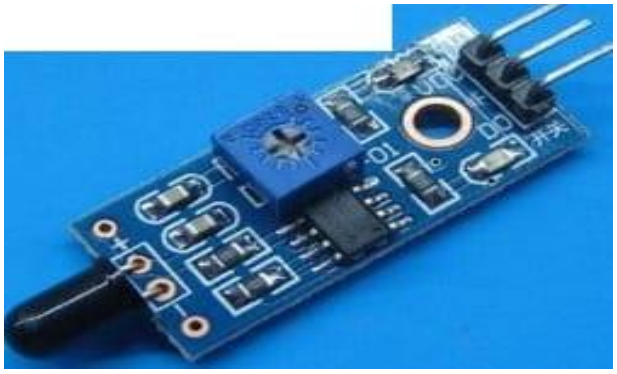

Figure 6: IR Fire sensor

This fire sensor in the circuit exploits the temperature sensing property of an ordinary signal diode IN 34 to detect heat from fire. At the moment it senses heat, a loud alarm simulating that of Fire brigade will be produced. The circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity

.Circuit diagram:

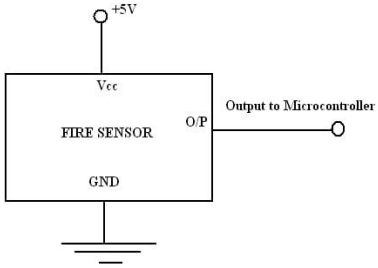

Figure 7:Circuit diagram of fire sensor

3.Alarm Circuit

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Figure 8: Buzzer

It used for producing sound alert for people .A buzzer or alarm is an audio signalling device shown in Figure 8, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Buzzer circuit

A **buzzer** or **beeper** is a signaling device, generally electronic, commonly utilized in autos, home devices like a microwave, or game shows. It most commonly comprises of various switches or sensors associated with a control unit that decides whether and which button was pushed or a preset time has passed, and as a rule enlightens a light on the suitable button or control board, and sounds an warning in the type of a constant or irregular humming or on the other hand blaring sound the circuit graph of signal is displayed in Figure 9. At first this gadget was in view of an electromechanical framework which was indistinguishable from an electric ringer without the metal gong (which makes the ringing sound).

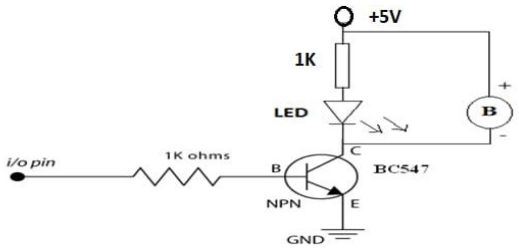

Figure 9: Circuit diagram of buzzer

Frequently these units were secured to a wall or on the other hand roof and involved the roof or wall as a sounding board. One more execution with some Air conditioner associated gadgets was to carry out a circuit to make the air conditioner current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. These days, it is more well known to utilize a clay based piezoelectric sounder like a Sonalert which makes a sharp tone.Typically these were connected to "driver" circuits which shifted the pitch of the sound or beat the sound on and off.

4.Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensors shown in Figure 10 and 11, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air.

The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

Features

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee able (at +25°C)
- Rated for full −55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 μA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1⁄4°C typical
- Low impedance output, 0.1 □□for 1 mA load

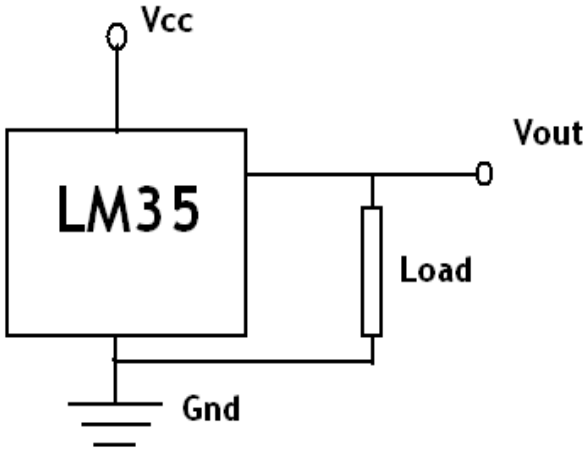

Figure 10: Circuit Diagram Of Temperature Sensor

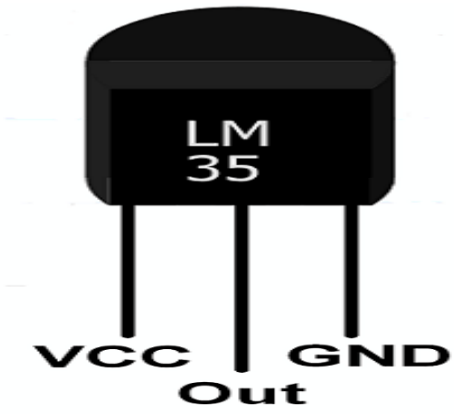

Figure 11:Temperature Sensor

5.Water Pump

12v dc water pump is used here which is shown in Figure 12. A pump in general is a machine which imparts energy to anything flowing through it. This can be any fluid, heat or even electrons. The devices pumping heat are called as heat pumps and electrical batteries can pump electrons. The spontaneous tendency of anything is to flow from high potential to low potential and this natural tendency is harnessed in many applications. But the pump does exactly

the reverse; it forces something to move from low potential to high potential. For this purpose pumps use energy and by their functioning transfer that energy to the substance flowing through them.

Fluid pumps or Hydraulic pumps move fluids and displace them from one position to another and in course energizes them. In fluids this energy is manifested as its pressure and velocity. Similarly, heat pumps move heat from low temperature to high temperature against its natural tendency to flow from high temperature to low temperature. An electrical battery is also a type of pump; it pumps electrons in a circuit from low electrical potential to high electrical potential which is against the spontaneous tendency of electrons to move from high electrical potential to low electrical potential. Hence, an electrical battery can be called as an Electron Pump.

Specification:

- Operating Voltage: 3 ~ 6V
- Operating Current: 130 ~ 220mA
- Flow Rate: 80 ~ 120 L/H
- Maximum Lift: 40 ~ 110 mm
- Continuous Working Life: 500 hours
- Driving Mode: DC, Magnetic Driving
- Material: Engineering Plastic
- Outlet Outside Diameter: 7.5 mm
- Outlet Inside Diameter: 5 mm

Figure 12 : Water Pump

Circuit Diagram of Water Pump Driver:

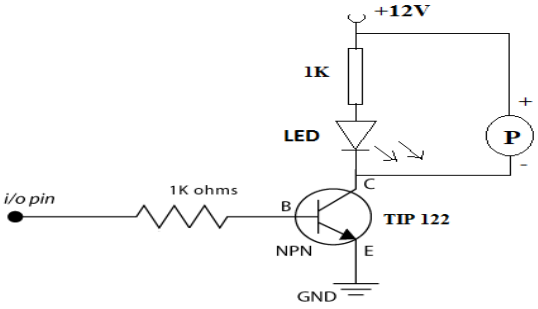

Figure 13:Circuit Diagram Of Water Pump Driver

A Darlington TIP 122 transistor becomes the main active sensing device in the circuit. The device being a Darlington is very sensitive and thus becomes specifically suited to the application. The TIP120 is a very robust item. It can handle lots of power (see specs) but the Arduino can't. So we must protect the Arduino from potential party crashers. For starters, we use a 1K Ohm resistor between the Arduino pins and the TIP120 Base pin. This is insurance against electric shorts. The TIP120 can handle 60V and 5A but I assure you the Arduino won't. Whenever Input True by NodeMCU then Water Pump will be turn on through the TIP122. LED with 1k resister circuit is used to ensure circuit working.

6.Relay board

Relay board is used here to run water pump and location estimator. A relay is an electromagnetic switch shown in Figure 14, operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it). You can think of a relay as a kind of electric lever: switch it on with a tiny current and it switches on ("leverages") another appliance using a much bigger current. Why is that useful? As the name suggests, many sensors are incredibly *sensitive* pieces of electronic equipment and produce only small electric currents. But often we need them to drive bigger pieces of apparatus that use bigger currents. Relays bridge the gap, making it possible for small currents to activate larger ones. That means relays can work either as switches (turning things on and off) or as amplifiers (converting small currents into larger ones).

Figure 14:Relay

7.DC Gear Motor

Dc gear motor is used for location estimator designing part shown in below Figure 15.

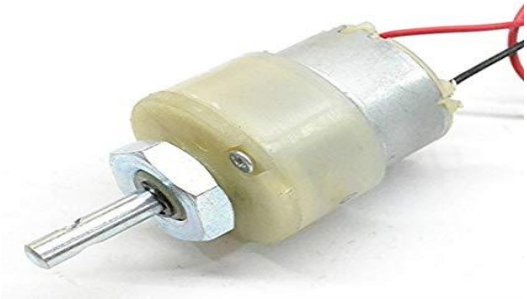

Figure 15: DC Gear Motor

Product description

30 Rpm dc geared motors for robotics applications. Very easy to use and available in standard size. Nut and threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel. Features 30rpm 12v dc motors with gearbox 6mm shaft diameter with internal hole 125gm weight stall torque = 2kgcm torque no-load current = 60 ma(max), load current = 300 ma(max).

Product information

Brand	VTM004
Verve	Additional Features
Model	30RPM 12V DC motors with Gearbox, 6mm
VTM004	shaft diameter with internal hole, 125gm weight,
Item model number	Stall Torque = 2kgcm torque, No-load
	current = 60 mA(Max),
	Load current = 300 mA(Max)

Motor:

Motor is use to drive the Location Estimator when water pump turn on.

8.Location Estimator

- Circuit diagram of Location Estimator Circuit is shown in the figure 16.
- Relay is nothing but it is a electromagnetic switch.
- It receives the signal from Switching Circuit.
- Relay Convert one energy level to another energy level.
- Whenever current flow across the relay, motor will be run.

In this project two relays are used to create motor bride circuit to operates motor in forward and reverse movement.

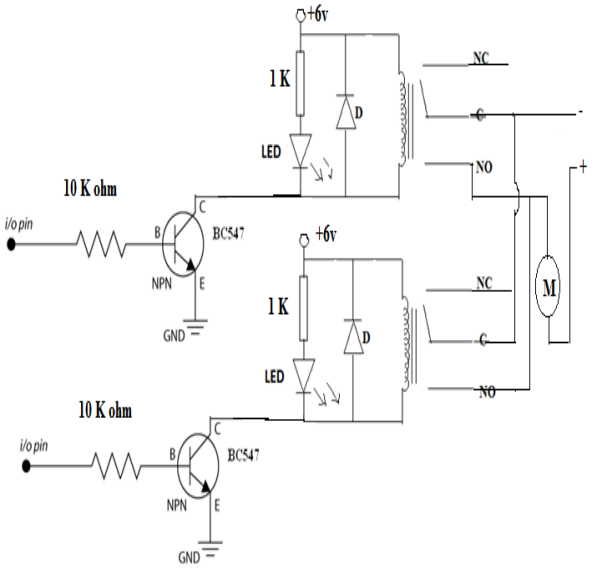

Figure 16: Circuit diagram of Location Estimator

Basic Motor Control and Relay Logic

Many machine functions involve turning motors on and off and/or reversing their direction. While there are many electronic motor controllers of all types on the market, if all one needs is to power a motor or other load on and off, an electromechanical relay is often all that is needed.

In order to understand and use relays in our designs, we must first understand the basics of switch logic. We all know that a switch is a device that opens and closes a circuit. "Off" is open, and "On" is closed. We also might be aware that in logic terminology, a closed switch represents a logic "1", and an open switch represents logic "0".

Switches are designated by the amount of poles and throws they have. The throws are the fixed contacts, while the poles are the contacts that move when the switch is activated or "thrown". Depending on how the switch is built it can have throws that are normally closed, meaning that they are in contact with the pole, closing the circuit; normally open, meaning the opposite, that the contacts are normally not in contact, or open; or the switch can have just about any number and configuration of poles and throws.

The typical nomenclature for switches abbreviates a "P" for poles and a "T" for throws, with the number of each also being abbreviated by a single letter. A common limit switch configuration, for example, would be "SPDT" for Single Pole, Double Throw shown in Figure 17.

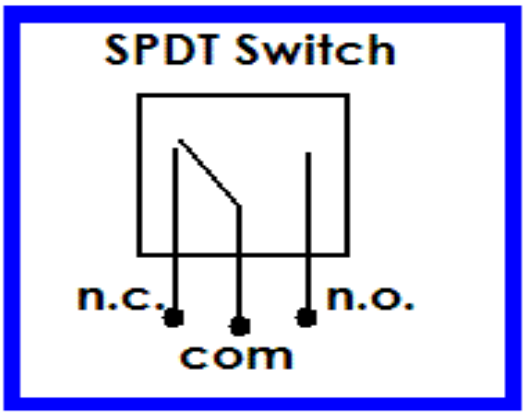

Figure 17: Single Pole Double Throw

Relays are nothing more than electrically operated switches. Relays use an electromagnetic coil to pull the poles of the switch into position. Most relays return to the normally closed position by a spring when the coil is deenergized, so relay contacts are usually identified in the same way as those of a momentary contact switch.

Note that in the diagram the coil polarity is indicated. Relays will generally operate just as well regardless of coil polarity, however it does come into play for one important reason. Since a relay is an electromagnetic device, the coil generates what is known as flyback when it deenergizes. This is a phenomenon common to all inductive devices (which an electromagnet is). When the coil is deenergized the magnetic field surrounding it collapses. This collapsing field cuts through the coil windings and induces a current in the opposite direction from that which charged the coil. This reverse current travels back through the wiring to the current source. If that source happens to be a logic gate, a microcontroller output, or some other sensitive device it can damage the device or otherwise cause it to malfunction.

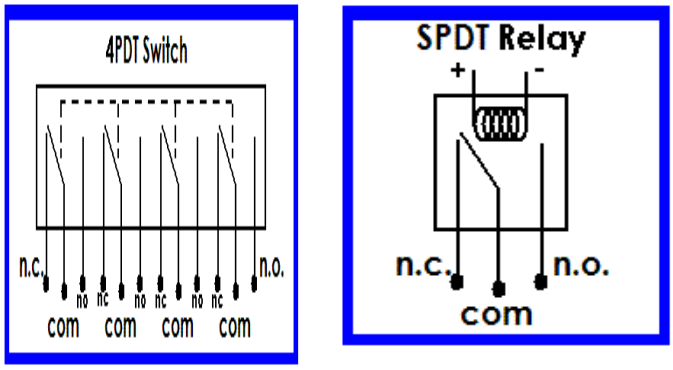

Figure 18: Relays

For this reason, it is common practice to place an ordinary diode across the coil terminals. Any normal diode will work.

The diode allows current to charge the coil, yet it will block any reverse current. I have found that the easiest way to determine the proper polarity of the diode is to simply clip it onto the coil terminals and energize the relay. If it energizes, then the diode is aligned properly. If it does not, simply flip the diode around.

VIII.Internet Of Things(IoT):

The Internet of Things(IoT) can be defined as a network of physical objects or people called "things" that are embedded with software, electronics, network, and sensors which allows these objects to collect and exchange data briefly shown in Figure 19.

The goal of IoT is to extend to internet connectivity from standard devices like computer, mobile, tablet to relatively dumb devices like a toaster. IoT makes virtually everything "smart," by improving aspects of our life with the power of data collection, AI algorithm, and networks. The thing in IoT can also be a person with a diabetes monitor implant, an animal with tracking devices, etc.

Figure 19: IOT Key Features

How IOT works?

The entire IOT process starts with the devices themselves like smartphones, smartwatches, electronic appliances like TV, Washing Machine which helps you to communicate with the IOT platform.

Here, are four fundamental components of an IoT system:

1) Sensors/Devices: Sensors or devices are a key component that helps you to collect live data from the surrounding environment. All this data may have various levels of complexities. It could be a simple temperature monitoring sensor, or it may be in the form of the video feed.

A device may have various types of sensors which performs multiple tasks apart from sensing. Example, A mobile phone is a device which has multiple sensors like GPS, camera but your smartphone is not able to sense these things.

2) Connectivity: All the collected data is sent to a cloud infrastructure. The sensors should be connected to the cloud using various mediums of communications. These communication mediums include mobile or satellite networks, Bluetooth, WI-FI, WAN, etc.

3) Data Processing: Once that data is collected, and it gets to the cloud, the software performs processing on the gathered data. This process can be just checking the temperature, reading on devices like AC or heaters. However, it can sometimes also be very complex like identifying objects, using computer vision on video.

4)User Interface: The information needs to be available to the end-user in some way which can be achieved by triggering alarms on their phones or sending them notification through email or text message. The user sometimes might need an interface which actively checks their IOT system. For example, the user has a camera installed in his home. He wants to access video recording and all the feeds with the help of a web server.

However, it's not always one-way communication. Depending on the IoT application and complexity of the system, the user may also be able to perform an action which may create cascading effects.

For example, if a user detects any changes in the temperature of the refrigerator, with the help of IOT technology the user should able to adjust the temperature with the help of their mobile phone.

Challenges of IoT

At present IoT is faced with many challenges, such as:

- Insufficient testing and updating
- Concern regarding data security and privacy
- Software complexity
- Data volumes and interpretation
- Integration with AI and automation
- Devices require a constant power supply which is difficult
- Interaction and short-range communication

Advantages Of IOT

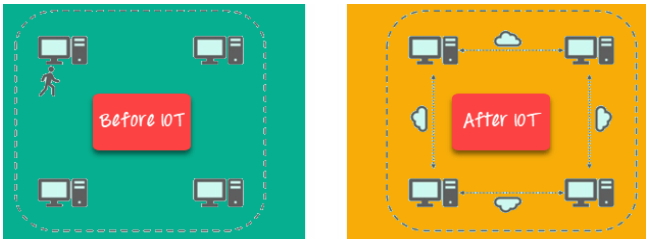

Figure 21: Advantages Of IoT

Key benefits of IoT technology are as follows:

Technical Optimization: IoT technology helps a lot in improving technologies and making them better. Example, with IoT, a manufacturer is able to collect data from various car sensors. The manufacturer analyzes them to improve its design and make them more efficient.

Improved Data Collection: Traditional data collection has its limitations and its design for passive use. IoT facilitates immediate action on data.

Reduced Waste: IoT offers real-time information leading to effective decision making & management of resources. For example, if a manufacturer finds an issue in multiple car engines, he can track the manufacturing plan of those engines and solves this issue with the manufacturing belt.

Improved Customer Engagement: IoT allows you to improve customer experience by detecting problems and improving the process.

IoT Applications

:

Figure 20: IoT Applications

Application type	Description
Smart Thermostats	Helps you to save resource on heating bills by knowing your usage patterns.
Connected Cars	IOT helps automobile companies handle billing, parking, insurance, and other related stuff automatically.
Activity Trackers	Helps you to capture heart rate pattern, calorie expenditure, activity levels, and skin temperature on your wrist.
Smart Outlets	Remotely turn any device on or off. It also allows you to track a device's energy level and get custom notifications directly into your smartphone.
Parking Sensors	IOT technology helps users to identify the real-time availability of parking spaces on their phone.
Connect Health	The concept of a connected health care system facilitates real-time health monitoring and patient care. It helps in improved medical decision-making based on patient data.
Smart City	Smart city offers all types of use cases which include traffic management to water distribution, waste management, etc.
Smart home	Smart home encapsulates the connectivity inside your homes. It includes smoke detectors, home appliances, light bulbs, windows, door locks, etc.
Smart supply chain	Helps you in real time tracking of goods while they are on the road, or getting suppliers to exchange inventory information.

IX. System Requirements:

A.Hardware Requirement:

SI.NO	HARDWARE	QUANTITY
1	Node MCU ESP8266	1
2	Fire Sensor	1
3	Temperature Sensor	1
4	Water Pump Driver	1
5	Water Pump	1
6	Location Estimator	1
7	Alarm Circuit Board	1
8	Power Supply	1
9	Smart Phone	1

B.Software Requirement:

SI.NO	Software
1	Arduino Software (Arduino OS)
2	Embedded C
3	Blynk App

X.Expected Outcome:

Automatic fire detection sensors & controlling system for Agriculture fire detection application has been designed and demonstrated. The fire detection sensor detects the fire which is received by master or heart of the project the Node MCU ESP8266. Fire sensor output is given to Node MCU ESP8266 board. Water pump is controlled through the water pump driver board. Location estimator is used for controlling water pump movement in left-right directions whenever fire occurs. Alarm board is used for producing sound alert for people. Node MCU ESP8266 is programmed to turn on water pump with location estimator whenever fire occur and at the same time alarm is turn on for alerting people. The Embedded C code is written with Arduino OS is open-source software using Node MCU ESP8266. A smart blynk app is used for monitoring fire status and water pump status.

XI.References:

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