A

Technical Report

on

FIRE DETECTION AND FIRE CONTROL

Submitted to CMR Institute of Technology in the partial fulfillment of the requirement of

Social Innovation Lab

Of

II B.Tech I- Semester

in

ECE DEPARTMENT

Submitted by

M.RAM SAI	**(20R01A0444)**
K.MADHU KIRAN	**(20R01A0432)**
O.SUPRIYA	**(20R01A0446)**
S.SANDHYA	**(20R01A0454)**
CH.DHEERAJ	**(21R05A0404)**
G.VISHNU	**(21R05A0405)**

Under the esteemed guidance of

Mr. P. Nagaraja Kumar
Assistant Professor

CMR INSTITUTE OF TECHNOLOGY
(UGC-AUTONOMOUS)

(Approved by AICTE, Permanently Affiliated to JNTU Hyderabad, Accredited by NBA, Accredited by NAAC with A Grade)
Kandlakoya (V), Medchal Road, Hyderabad 501 401

2021-2022

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Department of ECE

Certificate

This is to certify that the technical report entitled"**FIRE DETECTION AND FIRE CONTROL"** is the bonafide ,work done and submitted by

M.RAM SAI	**(20R01A0444)**
K.MADHU KIRAN	**(20R01A0432)**
O.SUPRIYA	**(20R01A0446)**
S.SANDHYA	**(20R01A0454)**
CH.DHEERAJ	**(21R05A0404)**
G.VISHNU	**(21R05A0405)**

towards the partial fulfillment of the requirement of Social Innovation (SIL) Laboratory of **II B. Tech I-Semester** in **ECE** is a record of bonafide work carried out by them during the period **Sep 2021 to Jan 2022**

Guide	**Co- Ordinator**	**Head of Department**
Ms.Y.Sushma	***Hr.P.Nagaraja kumar***	***K.Niranjan Reddy***
Assistant professor	***Assistant Professor***	***ECE Department***
CE Department	***ECE Department***	

Kandlakoya (V), Medchal Road,
Hyderabad - 501 401.
Ph : 08418 - 200720, 92479 69996
Telefax : 040-200240
website : cmritonline.org

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1. INTRODUCTION

Cultural property management is entrusted with the responsibility of protecting and preserving an institution's buildings, collections, operations and occupants. Constant attention is required to minimize adverse impact due to climate, pollution, theft, vandalism, insects, mold and fire.

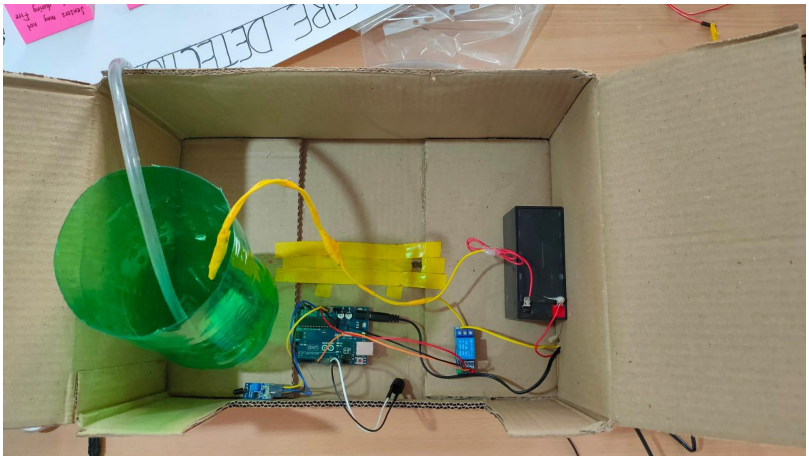
Because of the speed and totality of the destructive forces of fire, it constitutes one of the more serious threats. Vandalized or environmentally damaged structures can be repaired and stolen objects recovered. Items destroyed by fire, however, are gone forever. An uncontrolled fire can obliterate an entire room's contents within a few minutes and completely burn out a building in a couple hours. Actually, our project deals with the fire control .

Fire accidents can result in catastrophic personal injury and devastating damage. Every year, billions of dollars in property damage occurs as a result of fire. Victims of fire accidents can suffer serious harm, including burn injury to their entire body.

The Centers for Disease Control and Prevention note deaths from fires and burns are the fifth most common cause of unintentional injury deaths in the US and third leading cause of fatal home injury. Fire accidents can cause death not only from burns but also from smoke inhalation and toxic gases.To prevent all the damage caused by the fire accidents we cam make use of this project in industries. It controls the fire with motor.

Now a days, every system is automated in order to face new challenges in the present day situation. Automated systems have less manual operations, so that the flexibility, reliabilities are high and accurate. Hence, each and every field prefers automated control system.

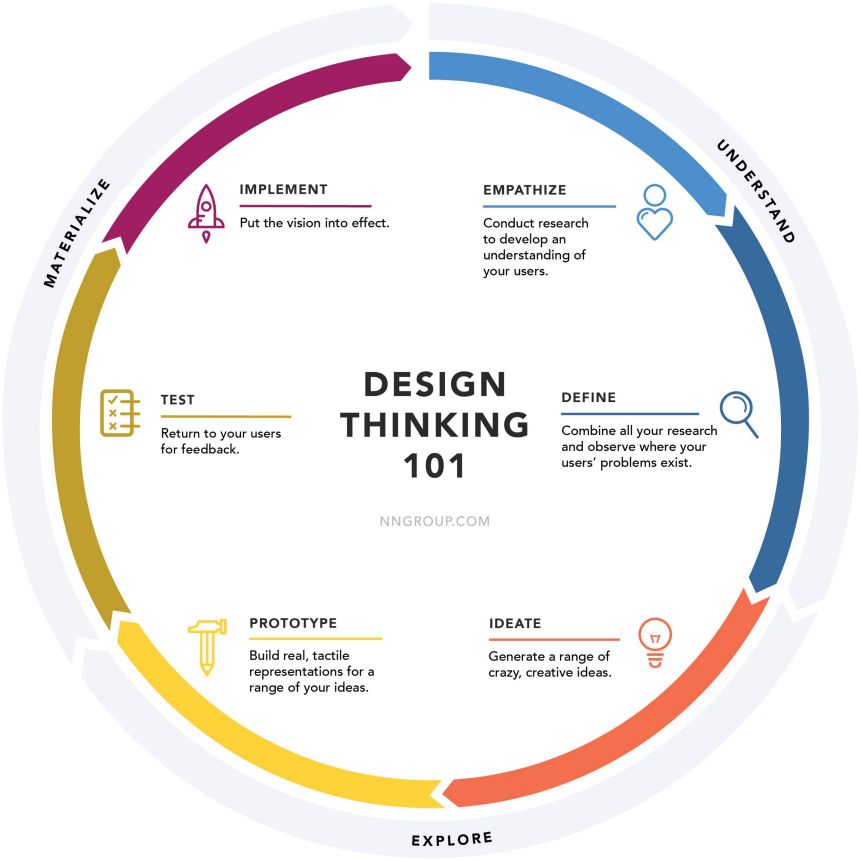
Especially in the field of electronics automated systems are doing better performance increasingly.The project itself indicates that the system checks the fire in the industry, based on that we get a message alert and a call alert to the registered mobile number and automatically motor star pumping water to stop the fire. Here we use one fire sensor.When fire is detected by the flame sensor then it gives high signal to Arduino input. Arduino is programmed in such a way that turn on the DC pump and allows the water to stop fire .



Design Thinking Process:

Design Thinking process is a design methodology that provides a solution-based approach to solving problems. It's extremely useful in tackling complex problems that are ill-defined or unknown, by understanding the human needs involved, by re-framing the problem in human-centric ways, by creating many ideas in brain strome sessions, and by adopting a hands-on approach in prototyping and testing. Understanding these five stages of Design Thinking will empower anyone to apply the Design Thinking methods in order to solve complex problems that occur around us in our companies, in our countries, and even on the scale of our planet.

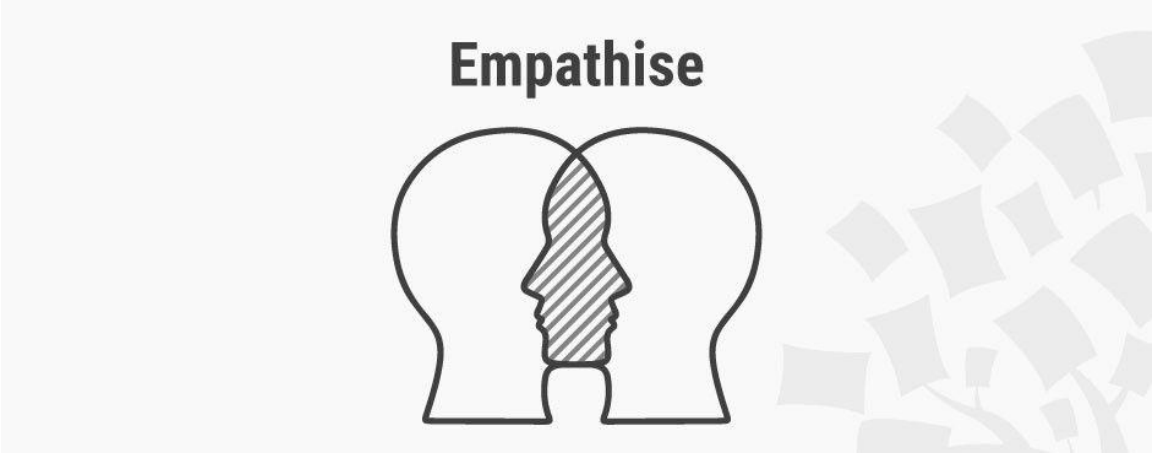
We will focus on the five-stage Design Thinking model proposed by the Hasso-Plattner Institute of Design at Stanford (d.school). d.school is the leading university when it comes to teaching Design Thinking. The five stages of Design Thinking, according to d.school, are as follows: Empathise, Define (the problem), Ideate, Prototype, and test. Let's take a closer look at the five different stages of Design Thinking.



2.1 Empathize

The first stage of the Design Thinking process is to gain an empathic understanding of the problem you are trying to solve. This involves consulting experts to find out more about the area of concern through observing, engaging and empathizing with people to understand their experiences and motivations, as well as immersing yourself in the physical environment so you can gain a deeper personal understanding of the issues involved. Empathy is crucial to a human-centered design procrss such as Design Thinking, and empathy allows design thinkers to set aside their own assusptions about the world in order to gain insight into users and their needs.

Depending on time constraints, a substantial amount of information is gathered at this stage to use during the next stage and to develop the best possible understanding of the users, their needs, and the problems that underlie the development of that particular product.



Through empathy, we are able to put ourselves in other people's shoes and connect with how they might be feeling about their problem, circumstance, or situation. Some questions to consider:

- What is the person feeling?
- What actions or words indicate this feeling?
- Can you identify their feelings through words?
- What words would you use to describe their feelings?

These are just some of the guided questions that students can reflect on to identify the problem and how others are feeling about it.

2.2 Empathize of Fire detection and Fire control

Then the teams were formed of each team of 6 members . Then they had made a list out 8 problems from each team . Each member in team has given their problem and all are listened. We reached out each team and asked their opinion on our problem . The process continued to all problems and other teams had also done this process.

We had choosen the problem which is faced and consider by majority of members . Other kind of information is collected to our problem so that we can use more about the problem and can be able to find any solution of it .

The ability to empathize starts with understanding the problem and stringing together all the interactions with the customer to know how to respond.

Empathize is the first stage of the design thinking process. Design teams conduct research to get personal grasps of their users' needs. They set aside assumptions to obtain insights into the users' world by observing and consulting with users. This way, they can understand users' experiences, motivations and problems.

Design thinking is a concept that centers around applying creativity and innovation to our actions, decision making, and problem solving as human beings. More significantly, it focuses on the impact that this creative and innovative thinking has on individuals. As a concept, design thinking can be used pedagogically to enhance our teaching practices. As a tool, it can be used to foster and teach empathy in the classroom.

The core principles of design thinking are to empathize, define, ideate, prototype, and test. Teaching design thinking can be a powerful way of teaching students empathy in that it teaches them how to solve another person’s problems by providing creative and innovative solutions that relate to his or her needs.

These are just some of the guided questions that students can reflect on to identify the problem and how others are feeling about it.

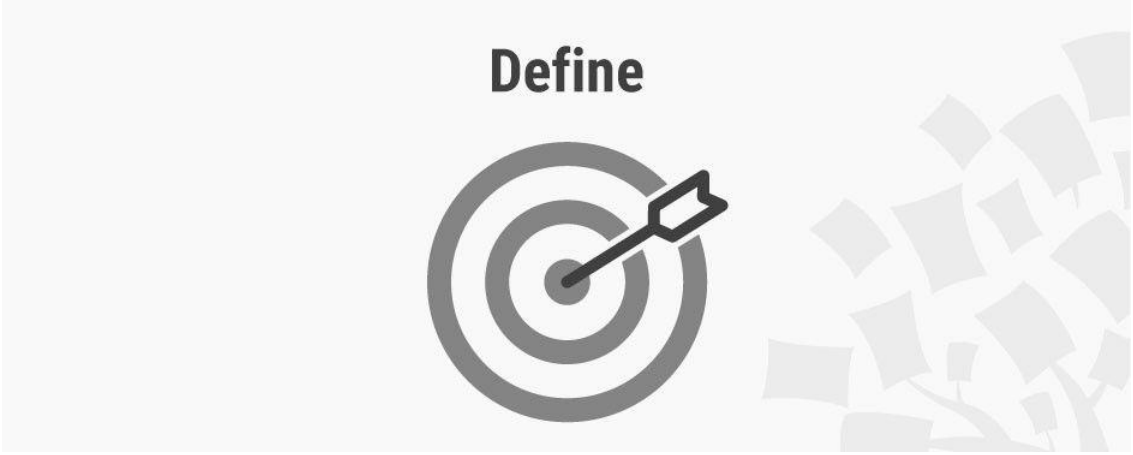
3.1 Define

During the Define stage, you put together the information you have created and gathered during the Empathise stage. This is where you will analyse your observations and synthesise them in order to define the core problems that you and your team have identified up to this point. You should seek to define the problem as a problem statement in a human-centred manner.

To illustrate, instead of defining the problem as your own wish or a need of the company such as, “We need to increase our food-product market share among young teenage girls by 5%,” a much better way to define the problem would be, “Teenage girls need to eat nutritious food in order to thrive, be healthy and grow.”

The Define stage will help the designers in your team gather great ideas to establish features, functions, and any other elements that will allow them to solve the problems or, at the very least, allow users to resolve issues themselves with the minimum of difficulty. In the Define stage you will start to progress to the third stage, Ideate, by asking questions which can help you look for ideas for solutions by asking: “how might be.. encourage teenage girls to perform an action that benefits them and also involves your company’s food-product or service?

Then we finalized the probem and shown to our lectures .The next step is to define the above feelings and identify the main problem to be solved. It's important that, throughout this process, students use language .



3.2 Define of Fire detection and Fire control

From the data collected on the problem and we had made a note of it and we had said to define a statement to our problem .

The problem statement must be defined in a way that it should clearly present the issuse of our problem .we had made our problem statement and conclusion of the problem as all teams has given to finialize the problem.

Then we finalized the probem and shown to our lectures .The next step is to define the above feelings and identify the main problem to be solved. It's important that, throughout this process, students use language that is identifiable, positive, meaningful, and actionable. Instead of focusing on the negative side of the problem and the lack of options, steer students to using language that is positive, empathetic, and will direct them toward solution-based thinking. Defining the problem is part of the process of shaping a point of view -- our own and others' -- about the problem. Therefore, the framing should inspire the group, the student, or the entire class to find solutions.

Accidents caused by fire can result in serious injury and damage to personal property. Fire hazards are not always obvious in and around the home, so accidents involving fire are often unexpected and sudden. These accidents can occur from faulty wiring, defective products, discarded cigarettes left on flammable materials, and smoke detectors that fail to activate. Car fires can trap victims inside a vehicle. A major concern for anyone involved in a fire accident is the damage smoke inhalation can cause to the lungs. Liss & Marion can help you to determine if the injuries and losses you've suffered are recoverable. Contact our offices for your free consultation right away.

Every 23 seconds, a fire department in the United States responds to a fire somewhere in the nation. Although the number of fires and fire deaths have decreased significantly since the 1970's, some statistics are more troubling. We continue to analyze fire data to better understand the fire problem and its trends.

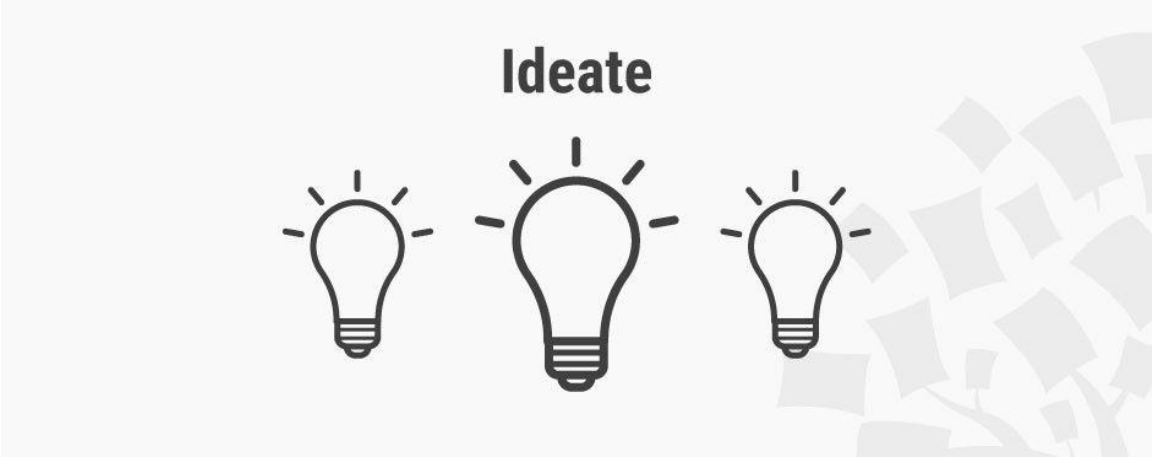
An estimated 19,500 fires started by fireworks were reported to local US fire departments in 2018. These fires caused five civilian deaths, 46 civilian injuries, and $105 million in direct property damage.

Based on 2014-2018 annual averages:

- Brush, grass, or forest fires accounted for three of every five (59 percent) of fireworks fires.
- Only nine percent of the fireworks fireswere structure fires; but, these incidents accounted for almost all of the fire deaths, three-quarters (74 percent) of the fire injuries, and 45 percent of the fire property damage.
- More than one-quarter (28 percent) of fires started by fireworks in 2014–2018 were reported on the Fourth of July.

4.1 Ideate

During the third stage of the Design Thinking process, designers are ready to start generating ideas. You've grown to understand your users and their needs in the Empathise stage, and you've analysed and synthesised your observations in the Define stage, and ended up with a human-centered problem statement. With this solid background, you and your team members can start to "think outside the box" to identify new solutions to the problem statement you've created, and you can start to look for alternative ways of viewing the problem. There are hundreds of identificaton techniques such as Brainstorm, Brainwrite, , and Brainstorm and Worst Possible Idea sessions are typically used to stimulate free thinking and to expand the problem space. It is important to get as many ideas or problem solutions as possible at the beginning of the Ideation phase. You should pick some other Ideation techniques by the end of the Ideation phase to help you investigate and test your ideas so you can find the best way to either solve a problem or provide the elements required to circumvent it.



3 Ways You Can Prevent a Fire Today

1. Blow out candles before leaving a room or going to bed.
2. When cooking, keep towels, pot holders and curtains away from flames. 3. Keep matches, lighters and other ignitable substances in a secured location out of the reach of children, and only use lighters with child-resistant features.
3. Hire a certified professional to inspect your chimney and heating equipment annually

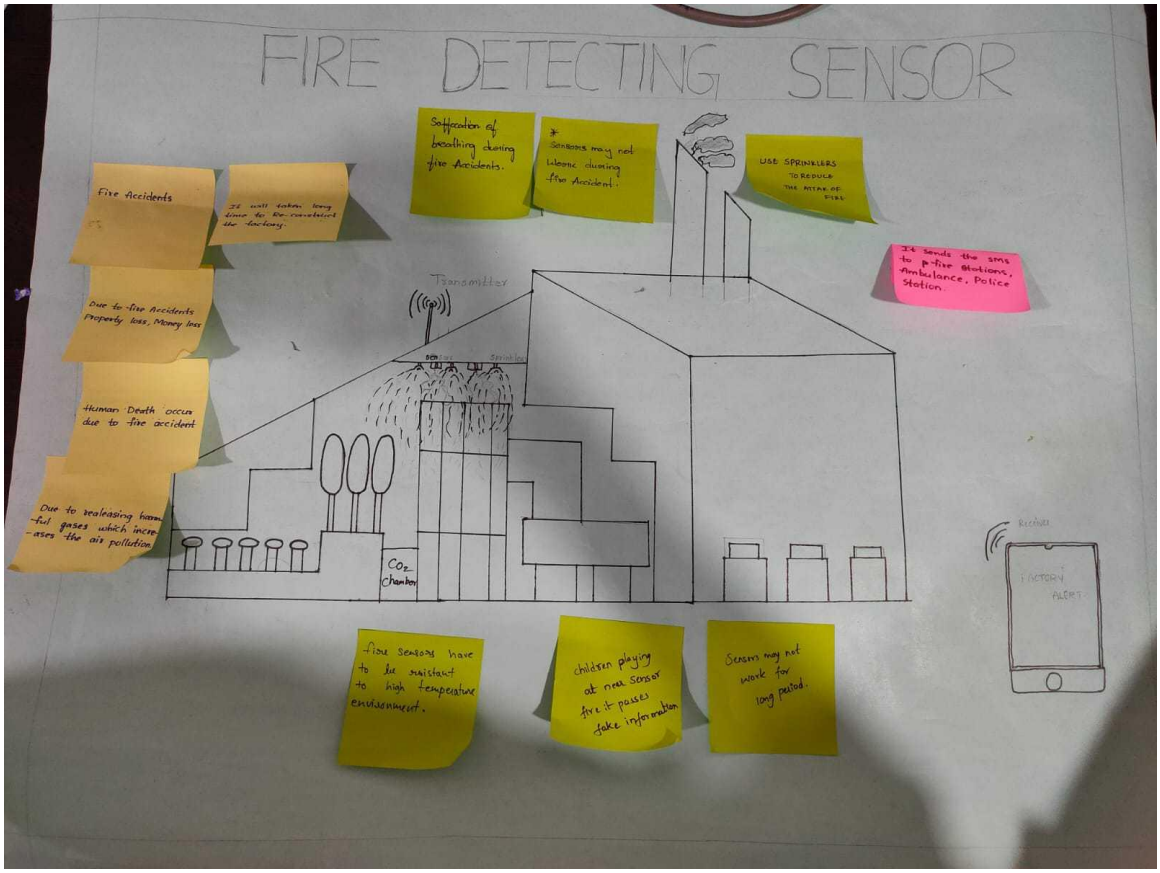
Keep fire in your fireplace by using a glass or metal fire screen large enough to catch sparks and rolling logs.Have wood and coal stoves, fireplaces, chimneys, and furnaces professionally inspected and cleaned once a year.

4.2 Ideate of Fire detection and Fire control

We collected all other information above the problem and made a note of it we prepare a charts on our problems .

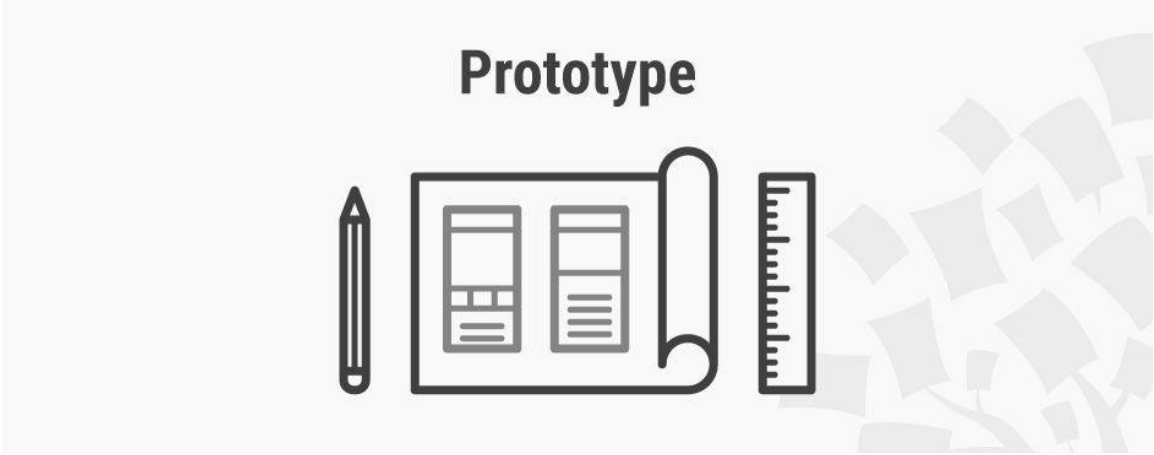
We have to represent our problem senario in the chat .we had divided this chat in to 3 parts .At the middle we have make our problem senario. At first and last part is for qutions and answers for the presented problems .

The required information is represented in the chart like problem statement ,pictures and some sentences with heading team work done to be complete the chart .



5.1 Prototype

The design team will now produce a number of inexpensive, scaled down versions of the product or specific features found within the product, so they can investigate the problem solutions generated in the previous stage. Prototypes may be shared and tested within the team itself, in other departments, or on a small group of people outside the design team. This is an experimental phase, and the aim is to identify the best possible solution for each of the problems identified during the first three stages. The solutions are implemented within the prototypes, and, one by one, they are investigated and either accepted, improved and re-examined, or rejected on the basis of the users' experiences. By the end of this stage, the design team will have a better idea of the constraints inherent to the product and the problems that are present, and have a clearer view of how real users would behave, think, and feel when interacting with the end product.



When a fire breaks out, time is of the essence. Prompt measures need to be taken to evacuate the trapped people and contain the fire before it spreads out of hand. However, to accomplish this we need a system that can detect fires before it is too late.

This fully automated Fire Detection and Alarm System is equipped with a temperature sensor and a 555 timer IC. This fire detection can sense changes in temperature and sound an alarm in case of fires.

5.2 Prototype of Fire detection and Fire control

We divided our project model in to software or hardware parts . so our model is hardware come software .

And we collected required components for our model . We made a research on our project to prepare a prototype by the help of leatures and internet we listed requried componets for our model .

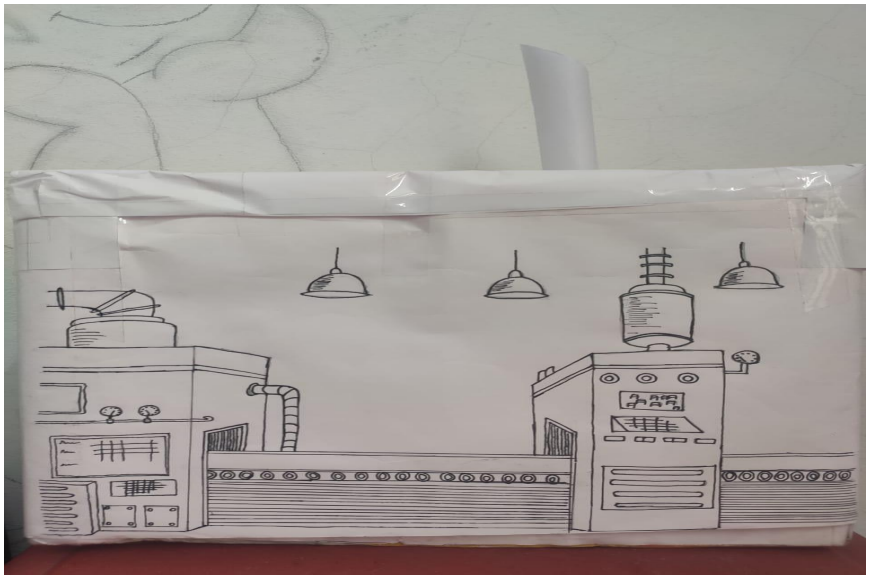
Listed components are :

- Ardino UNO
- Flame sensor LM363
- PCB Board
- Jumper wires
- DC motor pump
- 12v Adapater
- LED

So we updated our chart with all requriments like problem statement , solutions , senario and conclusion .

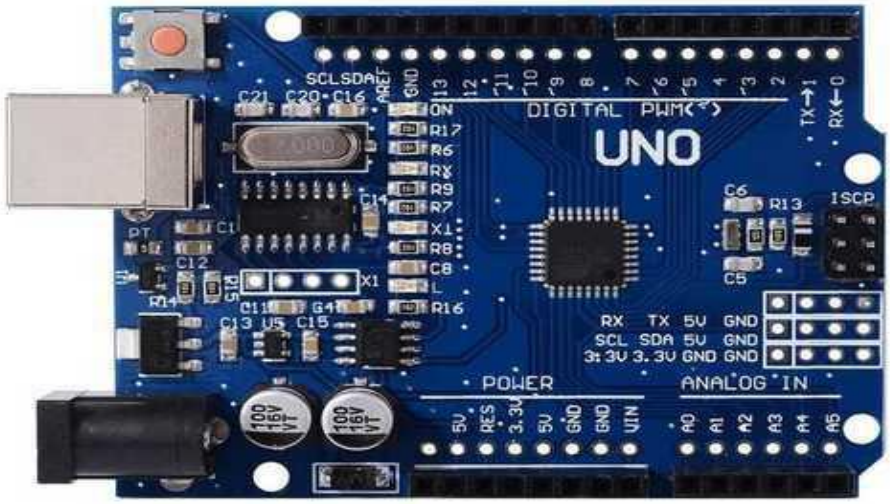
Then we connected all components according to the circuit diagram .

We made a senario like factory using cardboards to make pratically it works in the situation and we fix this motor to the model and flame sensor to detect the fire.



ARDUINO :

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.



The word “uno” means “one” in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based

Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The Atmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

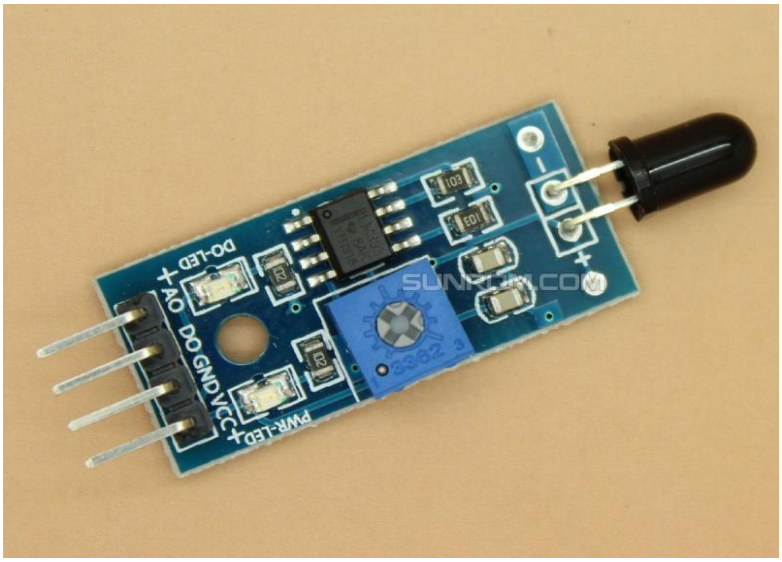
General pin functions:

5V: This pin outputs a regulated 5V from the regulator on the board. The board

can be supplied with power either from the DC power jack (7 – 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 Ma.

GND: Ground pins.IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.Reset: Typically used to add a reset button to shields that block the one on the board.

LM393 FLAME SENSOR:



Flame Sensor Working and Its ApplicationsA sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged to high temperature. So this sensor can be placed at a certain distance from the flame. The flame detection can be done from a 100cm distance and the detection angle will be 600. The output of this sensor is an analog signal or digital signal. These sensors are used in fire fighting robots like as a flame alarm.What is a Flame Sensor?

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting the flame.Working PrincipleThis sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, otherwise ice.Flame Sensor ModuleThe pin configuration of this sensor is shown below. It includes four pins which include the following. When this module works with a microcontroller unit then the pins are

Pin1 (VCC pin): Voltage supply rages from 3.3V to 5.3V

Pin2 (GND): This is a ground pin

Pin3 (AOUT): This is an analog output pin (MCU.IO)

Pin4 (DOUT): This is a digital output pin (MCU.IO)

Water motor :Here we use water motor for fire control in the industry

SOFTWARE IMPLEMENTATION

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware. By default, avrdude is used as the uploading tool to flash the user code onto official Arduino boards.

Arduino IDE is a derivative of the Processing IDE,[10] however as of version 2.0, the Processing IDE will be replaced with the Visual Studio Code-based

Eclipse Theia IDE framework.

Written in C, C++

Operating system Windows, macOS, Linux

Platform IA-32, x86-64, ARM

Type Integrated development environment

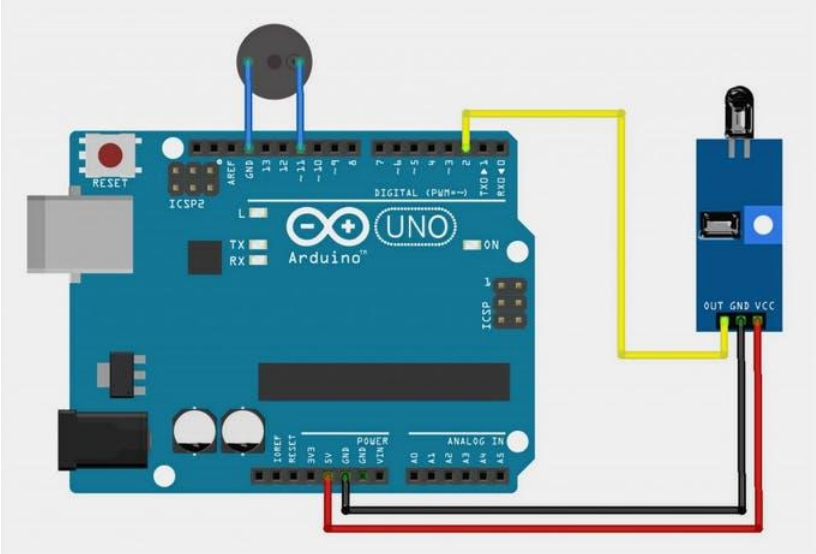
License LGPL or GPL license

Website blog.arduino.cc/2020/08/24/cli-and-ide-get-better-together/

With the rising popularity of Arduino as a software platform, other vendors started to implement custom open source compilers and tools (cores) that can build and upload sketches to other microcontrollers that are not supported by Arduino's official line of microcontrollers.

In October 2019 the Arduino organization began providing early access to a new Arduino Pro IDE with debugging and other advanced features.

SCHEMATIC DIAGRAM:

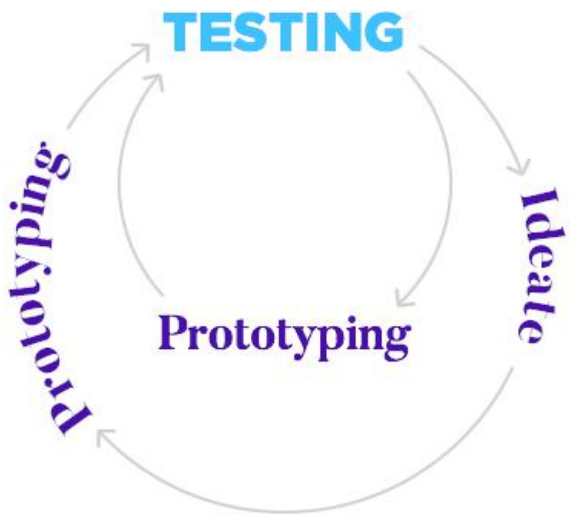


6.1 Test

Designers or evaluators rigorously test the complete product using the best solutions identified during the prototyping phase. This is the final stage of the 5 stage-model, but in an iterative process, the results generated during the testing phase are often used to redefine one or more problems and inform the understanding of the users, the conditions of use, how people think, behave, and feel, and to empathise. Even during this phase, alterations and refinements are made in order to rule out problem solutions and derive as deep an understanding of the product and its users as possible.

The Non-Linear Nature of Design Thinking

We may have outlined a direct and linear Design Thinking process in which one stage seemingly leads to the next with a logical conclusion at . However, in practice, the process is carried out in a more flexible and non-linear fashion. For example, different groups within the design team may conduct more than one stage concurrently, or the designers may collect information and prototype during the entire project so as to enable them to bring their ideas to life and visualise the problem solutions. Also, results from the testing phase may reveal some insights about users, which in turn may lead to another brainstorming session (Ideate) or the development of new prototypes (Prototype).



6.2Test of Fire detection and Fire control

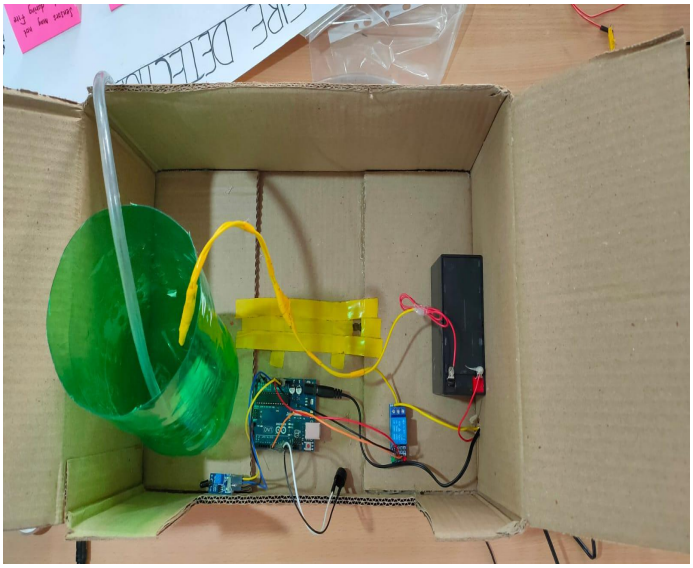
IMPLEMENTATION OF THE PROJECT :

We had connected the Flame sensor to the Arduino and the flame sensor given as input the Arduino. We have also connected buzzer for local alert and also connected a water motor for fire control.

When the fire is detected a buzzer sound is produced. Then we dumped program to ArdinoUNO using ArdinoIDE software and connected to DC pump.

Now when the fire occurs the flame sensor detects the fire and automatically starts the water pump to control fire .

So after designing the prototype we tested this pratically infront of faculty and remaining students.



When a fire breaks out, time is of the essence. Prompt measures need to be taken to evacuate the trapped people and contain the fire before it spreads out of hand. However, to accomplish this we need a system that can detect fires before it is too late.

This fully automated Fire Detection and Alarm System is equipped with a temperature sensor and a flame sensor . This fire detection can sense changes in temperature and sound an alarm in case of fires.

Conclusion

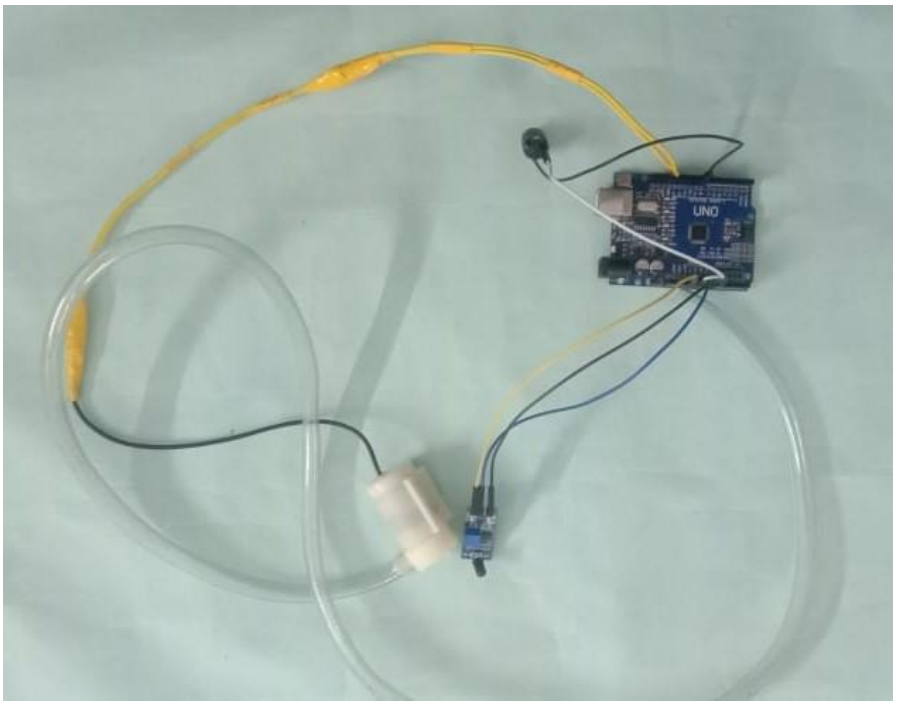
The prototype of the proposed system was implemented and it proved to be efficient fire detection and controlling the fire also alerting the owner.

This prototype will monitor the industry 24/7 and alerts the user when fire is detected it turn on the water pump and stops the fire.

This project hass number of advantages such as

- Low cost
- High efficient
- Accurate response
- Low power consumption
- Portable
- Small in size
- Eco - friendly
- High Reliable

This project is implemented and tested and successfully working



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• https://www.electronicsforu.com/

Journals & other books:

1. Arduino technical reference
2. Arduino hand book by Mark jeddes
3. Arduino work shop book by John boxall.