ABSTRACT

The explosion due to gas leakage has become a serious problem in our country's daily activities. Now the world is evolving with technology, so it is necessary to use technology if possible in every case. LPG gas to resolve the accident occurred we can prevent it through technology. The system is based on a microcontroller, which uses gas sensors as well as GSM, display and buzzer. It is designed for LPG Gas Leakage Monitoring and Alert System using node mcu sensor. This circuit contains node mcu sensor, microcontroller, buzzer, display and GSM. The sensor will detect the gas leakage and transmit the information to the microcontroller. On the basis of those information, the microcontroller makes a decision and then displays a warning message on the display and the message will be sent to the user via GSM. The uses of the microcontroller provide a suitable platform for implementing an embedded control system and it is possible to modify it to meet our future requirements easily and quickly.

DESIGN THINKING

Design thinking is an approach used for practical and creative problem-solving. It is based heavily on the methods and processes that designers use (hence the name), but it has actually evolved from a range of different fields — including architecture, engineering and business. Design thinking can also be applied to any field; it doesn't necessarily have to be design-specific.

It's important to note that design thinking is different from user-centred design. Learn more about this other approach to design here: Design Thinking vs. User-Centred Design.

Design thinking is extremely user-centric. It focuses on humans first and foremost, seeking to understand people's needs and come up with effective solutions to meet those needs. It is what we call a solution-based approach to problem-solving.

The Four Principles of Design Thinking

The human rule: No matter what the context, all design activity is social in nature, and any social innovation will bring us back to the "human-centric point of view".

The ambiguity rule: Ambiguity is inevitable, and it cannot be removed or oversimplified. Experimenting at the limits of your knowledge and ability is crucial in being able to see things differently.

The redesign rule: All design is redesign. While technology and social circumstances may change and evolve, basic human needs remain unchanged. We essentially only redesign the means of fulfilling these needs or reaching desired outcomes.

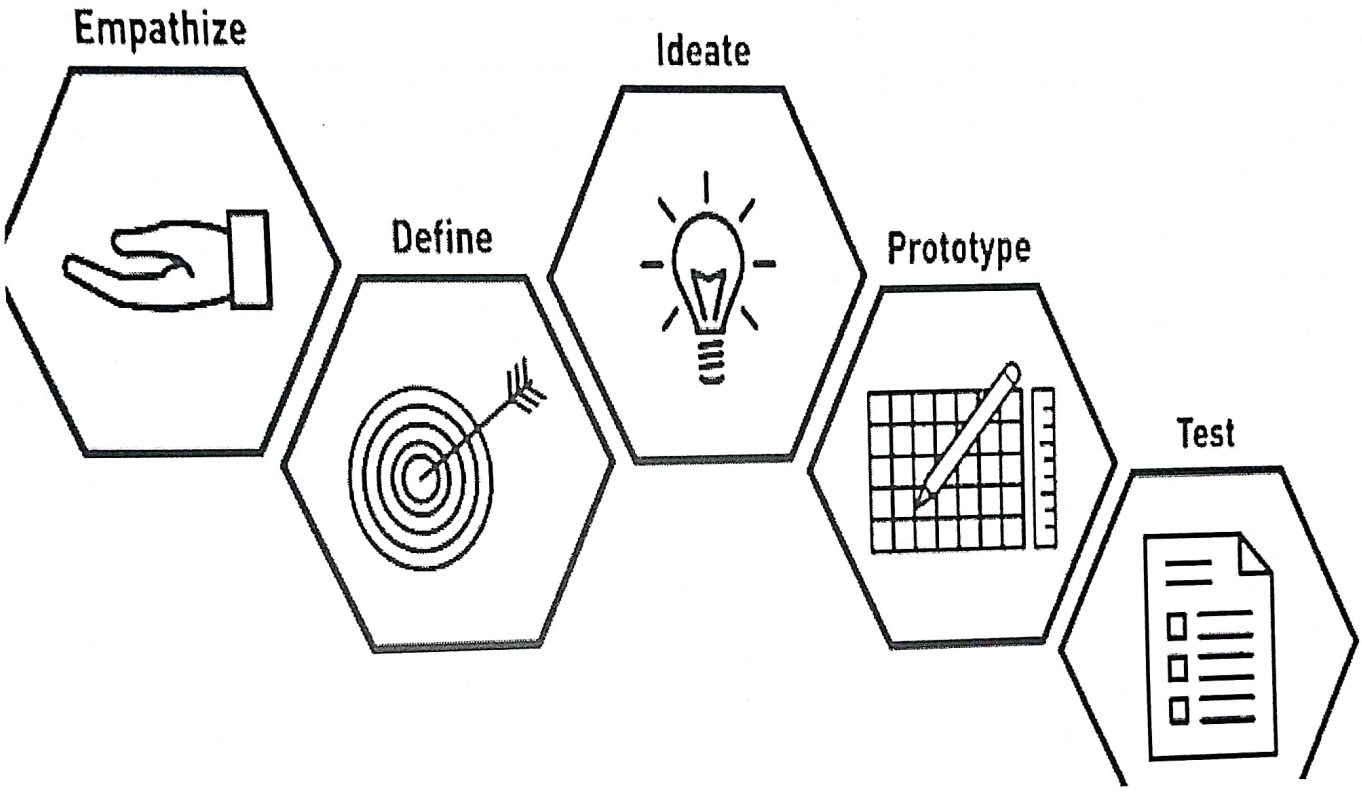
The tangibility rule: Making ideas tangible in the form of prototypes enables designers to communicate them more effectively.

Design thinking is a process for solving problems by prioritizing the consumer's needs above all else. It relies on observing, how people interact with their environments, and employs an iterative, hands-on approach to creating innovative solutions. It is a human-cantered approach to innovation.

FIVE STAGES OF DESIGN THINKING:

- EMPATHY
- DEFINE
- IDEATE
- PROTOTYE
- TEST

Design Thinking



CHAPTER 1

EMPATHY

Empathize is the first stage in the design thinking process. To empathize is to research. So, you should constantly remind yourself to question everything you observe instead of judging. You should also listen to others open-mindedly rather than focus on points that confirm your biases. Because our biases will naturally creep into how we view the world and the situations we consider, as designers or design thinkers—we must catch and overcome these before they distort our research. You must become fully objective before you can start to see through your users' eyes and interpret their viewpoints optimally. They are the experts. You must understand the users' dimensions of use (e.g., tasks) and their feelings (e.g., motivations) before you can work towards delighting them through your design.

As a design thinker, the problems you are trying to solve are rarely your own—they are those of a particular group of people; in order to design for them, you must gain empathy for who they are and what is important to them. Observing what people do and how they interact with their environment gives you clues about what they think and feel. It also helps you learn about what they need. By watching people, you can capture physical manifestations of their experiences – what they do and speak. This will allow you to infer the intangible meaning of those experiences in order to uncover insights. These insights give you direction to create innovative solutions. The best solutions come out of the best insights into human behaviour. But learning to recognize those insights is harder than you might think. Why? Because our minds automatically filter out a lot of information without our even realizing it.

We need to learn to see things "with a fresh set of eyes," and empathizing is what gives us those new eyes. Engaging with people directly reveals a tremendous amount about the way they think and the values they hold. Sometimes these thoughts and values are not obvious to the people who hold them, and a good conversation can surprise both the designer and the subject by the unanticipated insights that are revealed. The stories that people tell and the things that people say they do even if they are different from what they actually do are strong indicators of their deeply held beliefs about the way the world is. Good designs are built on a solid understanding of these beliefs and values.

Observe. View users and their behaviour in the context of their lives. As much as possible do observations in relevant contexts in addition to interviews. Some of the most powerful

realizations come from noticing a disconnect between what someone says and what he does. Others come from a work-around someone has created which may be very surprising to you as the designer, but she may not even think to mention in conversation. - Engage.

Sometimes we call this technique 'interviewing' but it should really feel more like a conversation. Prepare some questions you'd like to ask, but expect to let the conversation deviate from them. Keep the conversation only loosely bounded. Elicit stories from the people you talk to, and always ask "Why?" to uncover deeper meaning. Engagement can come through both short 'intercept' encounters and longer scheduled conversations. Watch and listen. Certainly, you can, and should, combine observation and engagement. Ask someone to show you how they complete a task.

Have them physically go through the steps, and talk you through why they are doing what they do. Ask them to vocalize what's going through their mind as they perform a task or interact with an object. Have a conversation in the context of someone's home or workplace so many stories are embodied in artifacts. Use the environment to prompt deeper questions.

1.1 PEOPLES

LPG Gas leaks have been increased from 0.72% of all kitchen accidents to 10.74% of all the kitchen accidents The small LPG cylinder of weight 5kg in which the burner is located immediately over the cylinder without using a rubber tube is seen to be safer than the one which uses a rubber pipe as this subway has the hazards of getting cracked which in turn can make way to leakage. A computer program to run online to detect the leakage locations has been originated and it functions as the automatic supervisor of the pipelines in remote areas Simple Gas leak detector is a simple device which is used to detect the leakage of gas and if the gas leak occurs, an equivalent message is conveyed by the means of an LCD screen and a buzzer and with the help of the GSM module it is capable to broadcast messages to the stakeholders about the LPG leakage.

Chapter 2

DEFINE

The Define mode of the design process is all about bringing clarity and focus to the design space. It is your chance, and responsibility, as a design thinker to define the challenge you are taking on, based on what you have learned about your user and about the context. After becoming an instant-expert on the subject and gaining invaluable empathy for the person you are designing for, this stage is about making sense of the widespread information you have gathered. The goal of the Define mode is to craft a meaningful and actionable problem statement – this is what we call a point-of-view. This should be a guiding statement that focuses on insights and needs of a particular user, or composite character. Insights don't often just jump in your lap; rather they emerge from a process of synthesizing information to discover connections and patterns. In a word, the Define mode is sensemaking

The Define mode is critical to the design process because it results in your point-of-view (POV): the explicit expression of the problem you are striving to address. More importantly, your POV defines the right challenge to address, based on your new understanding of people and the problem space. It may seem counterintuitive but crafting a more narrowly focused problem statement tends to yield both greater quantity and higher quality solutions when you are generating ideas. The Define mode is also an endeavour to synthesize your scattered findings into powerful insights. It is this synthesis of your empathy work that gives you the advantage that no one else has: discoveries that you can leverage to tackle the design challenge; that is, INSIGHT

Consider what stood out to you when talking and observing people. What patterns emerge when you look at the set? If you noticed something interesting ask yourself (and your team) why that might be. In asking why someone had a certain behaviour or feeling you are making connections from that person to the larger context. Develop an understanding of the type of person you are designing for – your USER. Synthesize and select a limited set of NEEDS that you think are important to fulfil; you may in fact express a just one single salient need to address. Work to express INSIGHTS you developed through the synthesis of information you have gathered through empathy and research work. Then articulate a point-of-view by

combining these three elements – user, need, and insight – as an actionable problem statement that will drive the rest of your design work.

2.1. GAS LEAKAGE DETECTOR

Microcontroller Based LPG Gas Leakage Detector Using GSM Module, in this system where used gas sensor, GSM module, microcontroller, if the gas concentration is increases the gas sensors will sense the leakage of the gas and then send to the microcontroller. Then the GSM module is connected to the microcontroller which will gives the command to stop the main supply. The system is highly reliable, tamper-proof and secure. In the long run the maintenance cost is efficient. It is highly accurate.

Liquefied Petroleum Gas commonly known as LPG consists of a mixture of Commercial Propane and Commercial Butane having saturated as well as unsaturated hydrocarbons. It is an odourless gas due to which Ethyl Herceptin is added as powerful odorant so that leakage can easily be detected. LPG is commonly used in homes for heating and cooking. This energy source is primarily composed of propane and butane which are highly flammable chemical compounds. LPG was first produced in 1910 by Walter Snelling (Didpaye1, 2015)and is classified as a hazardous material because of its flammable properties and explosive potential when stored under pressure. Before the development of electronic household gas detectors in the 1980s and 90s, gas presence was detected with a chemically infused paper that changed its color when exposed to the gas (Didpaye1, 2015). Since then, many technologies and devices have been developed to detect, monitor, and alert the leakage of a wide array of gases. Hence the requirement of an efficient system to detect leakage of LPG is inevitable, which may be used for domestic and commercial purpose.

A system that provided security issues against thieves, leakage and fire accidents. In those cases, this system sends SMS to the emergency number provided to it. In the proposed system we have designed "LPG gas monitoring and automatic cylinder booking with alert system". These report focus on detection of economic fuels like petroleum, liquid petroleum gas, in the

proposed system we have designed "LPG gas monitoring and automatic cylinder booking with alert system". These report focus on detection of economic fuels like petroleum, liquid petroleum gas, and alert system". These report focus on detection of economic fuels like petroleum, liquid petroleum gas ,alcohol etc. Liquefied petroleum gas (LPG) is a highly flammable chemical. The mixture of hydrocarbon gas (LPG) is used as fuel for burning, at home and in the industry. LPG is used as a domestic fuel, industrial, heating and so on. A heater and gas sensitive resistor are some of the internal components of the sensor used to avoid failure leading to a false alarm indication. The alarm gets triggered when a certain concentration of gas is exceeded by steam. This device is used to indicate early warning of a problem to ensure public safety. LPG and gas sensors are used in the field of safety, health and materials. This embedded system is used to detect hazardous gas and to alert uses by sending an SMS.

2.2. HARDWARE REQUIRED

- Node MCU
- 12V DC Power Supply
- Buzzer
- LPG Gas Leakage Sensor
- Connecting Wires
- Project Base

CHAPTER 3

IDEATE

Ideate is the mode of the design process in which you concentrate on idea generation.

Mentally it represents a process of "going wide" in terms of concepts and outcomes. Ideation provides both the fuel and also the source material for building prototypes and getting innovative solutions into the hands of your users. You ideate in order to transition from identifying problems to creating solutions for your users. Ideation is your chance to combine the understanding you have of the problem space and people you are designing for with your imagination to generate solution concepts.

Particularly early in a design project, ideation is about pushing for a widest possible range of ideas from which you can select, not simply finding a single, best solution. The determination of the best solution will be discovered later, through user testing and feedback. Various forms of ideation are leveraged to: - Step beyond obvious solutions and thus increase the innovation potential of your solution set - Harness the collective perspectives and strengths of your teams - Uncover unexpected areas of exploration - Create fluency (volume) and flexibility (variety) in your innovation options - Get obvious solutions out of your heads, and drive your team beyond them .You ideate by combining your conscious and unconscious mind, and rational thoughts with imagination. For example, in a brainstorm you leverage the synergy of the group to reach new ideas by building on others' ideas.

Adding constraints, surrounding yourself with inspiring related materials, and embracing misunderstanding all allow you to reach further than you could by simply thinking about a problem. Another ideation technique is building – that is, prototyping itself can be an ideation technique. In physically making something you come to points where decisions need to be made; this encourages new ideas to come forward.

There are other ideation techniques such as bodystorming, mind mapping, and sketching. But one theme throughout all of them is deferring judgment – that is, separating the generation of ideas from the evaluation of ideas. In doing so, you give your imagination and creativity a voice, while placating your rational side in knowing that your will get to the examination of merits later.

3.1 DESIGN AND DEVELOPMENT

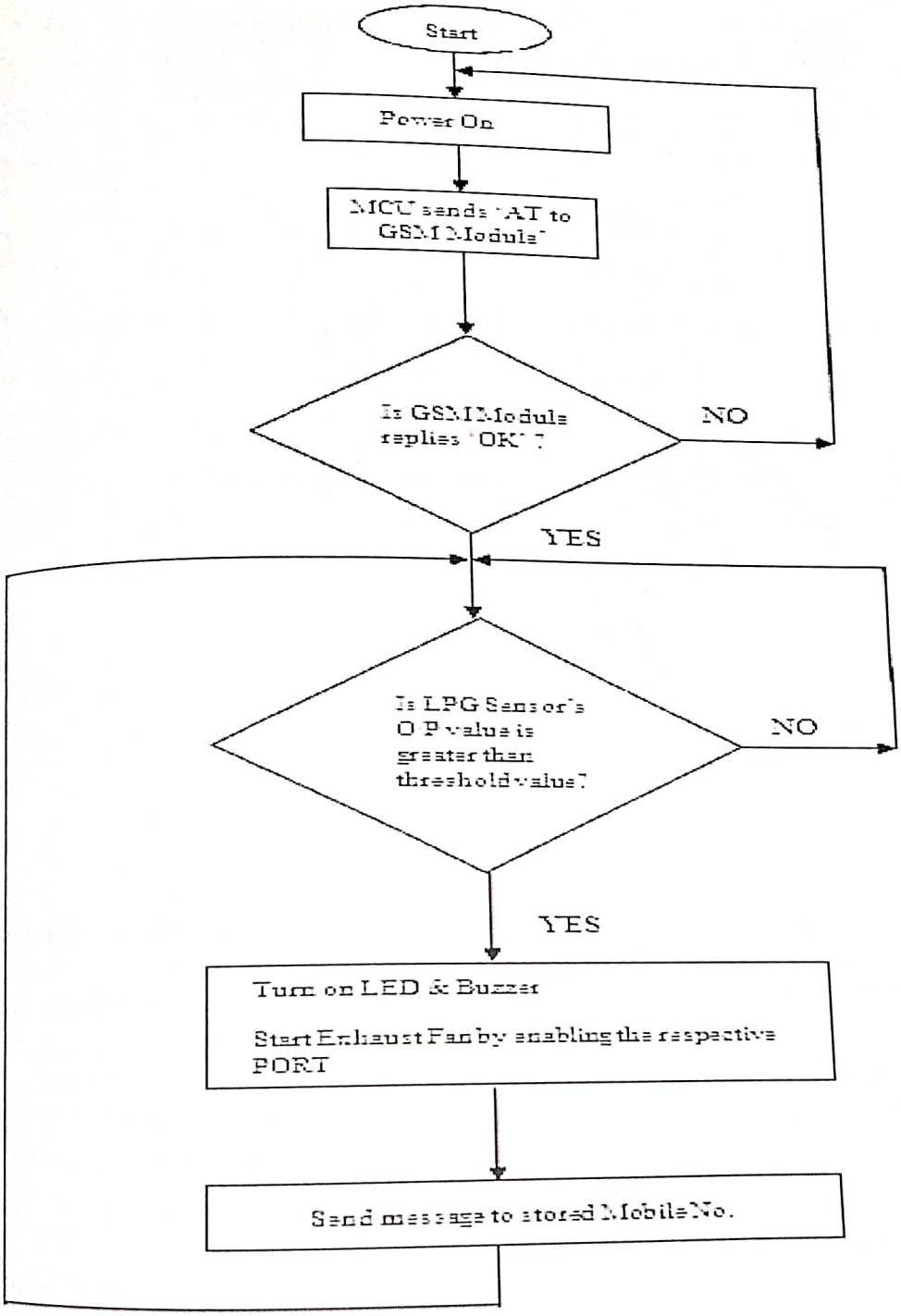
The main objective of our project is to ensure the LPG gas leakage and provide a signal at that time, as well as through SMS and signal to the specified mobile number. Once we are integrated with the various functions of architecture and GPS system, it is time to design the hardware and develop our concept. The system we want to make is consisting of node mcu , GSM module , buzzer , LCD. The node mcu will control the signal as well as process the information received from the GSM.

3.2 FLOWCHART

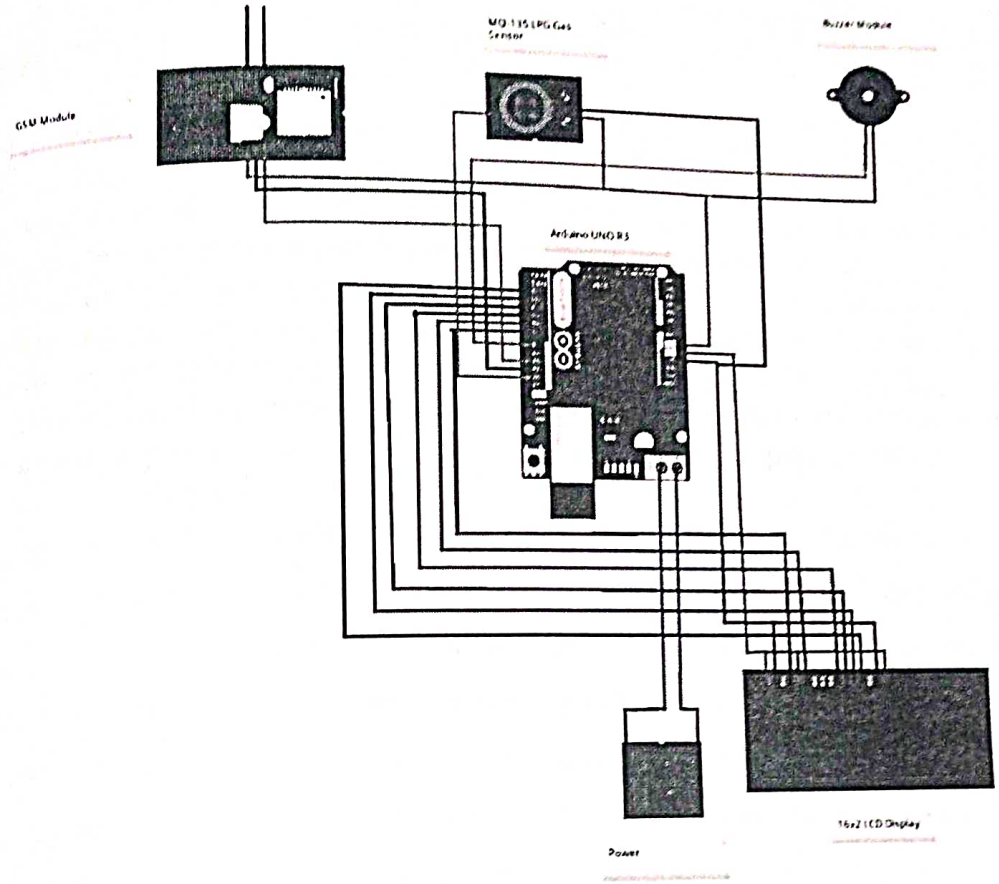
Flowchart in a logical sequence, or structure is a graphical representation of a production process. The purpose of a flow chart of the process of working with a project or a common language or reference point is provided.

Initially, the microcontroller send signal to the GSM module and if the GSM module is connected properly with the microcontroller it sends an acknowledgement signal back to the microcontroller. Then if there is any gas leakage in the MO sphere it is detected by the gas sensor unit using MQ-6sensor. After the sensor unit detects the gas leakage, a signal is sent to the ADC unit of the microcontroller which then sends activation signal to other external devices connected to it such as buzzer, GSM module and LCD display.

3.3 BLOCK DIAGRAM



3.4 CIRCUIT DIAGRAM



LPG gas sensor module's DO pin is directly connected to pin 12 of node mcu and Vcc and GND are connected to Vcc and GND of node mcu. LPG gas sensor module consist a MQ3 sensor which detects LPG gas. A comparator circuit is used for converting Analog output of MQ3 in digital. A 16x2 LCD is connected with node mcu in 4-bit mode. Control pin RS, RW and directly connected to node mcu pin 2, GND and 3. And data pin D0-D7 are connected to 4, 5, 6, 7 of node mcu. A buzzer is connected with node mcu pin number 8 through a NPN BC547 transistor having a 4.7 kilo ohm resistor at its base.

CHAPTER 4

PROTOTYPE

The Prototype mode is the iterative generation of artifacts intended to answer questions that get you closer to your final solution. In the early stages of a project that question may be broad – such as "do my users enjoy cooking in a competitive manner?" In these early stages, you should create low-resolution prototypes that are quick and cheap to make (think minutes and cents) but can elicit useful feedback from users and colleagues. In later stages both your prototype and question may get a little more refined. For example, you may create a later stage prototype for the cooking project that aims to find out: "do my users enjoy cooking with voice commands or visual commands". A prototype can be anything that a user can interact with – be it a wall of post-it notes, a gadget you put together, a role-playing activity, or even a storyboard. Ideally you bias toward something a user can experience.

Walking someone through a scenario with a storyboard is good, but having them role-play through a physical environment that you have created will likely bring out more emotions and responses from that person. To ideate and problem-solve. Build to think. To communicate. If a picture is worth a thousand words, a prototype is worth a thousand pictures. To start a conversation. Your interactions with users are often richer when centred around a conversation piece. A prototype is an opportunity to have another, directed conversation with a user. To fail quickly and cheaply. Committing as few resources as possible to each idea means less time and money invested up front. To test possibilities. Staying low-res allows you to pursue many different ideas without committing to a direction too early on. To manage the solution-building process. Identifying a variable also encourages you to break a large problem down into smaller, testable chunks.

Even if you aren't sure what you're doing, the act of picking up some materials (post-its, tape, and found objects are a good way to start!) will be enough to get you going. Don't spend too long on one prototype. Let go before you find yourself getting too emotionally attached to any one prototype. ID a variable. Identify what's being tested with each prototype.

A prototype should answer a particular question when tested. That said, don't be blind to the other tangential understanding you can gain as someone responds to a prototype. Build with the user in mind. What do you hope to test with the user? What sorts of behaviour do you expect? Answering these questions will help focus your prototyping and help you receive meaningful feedback in the testing phase.

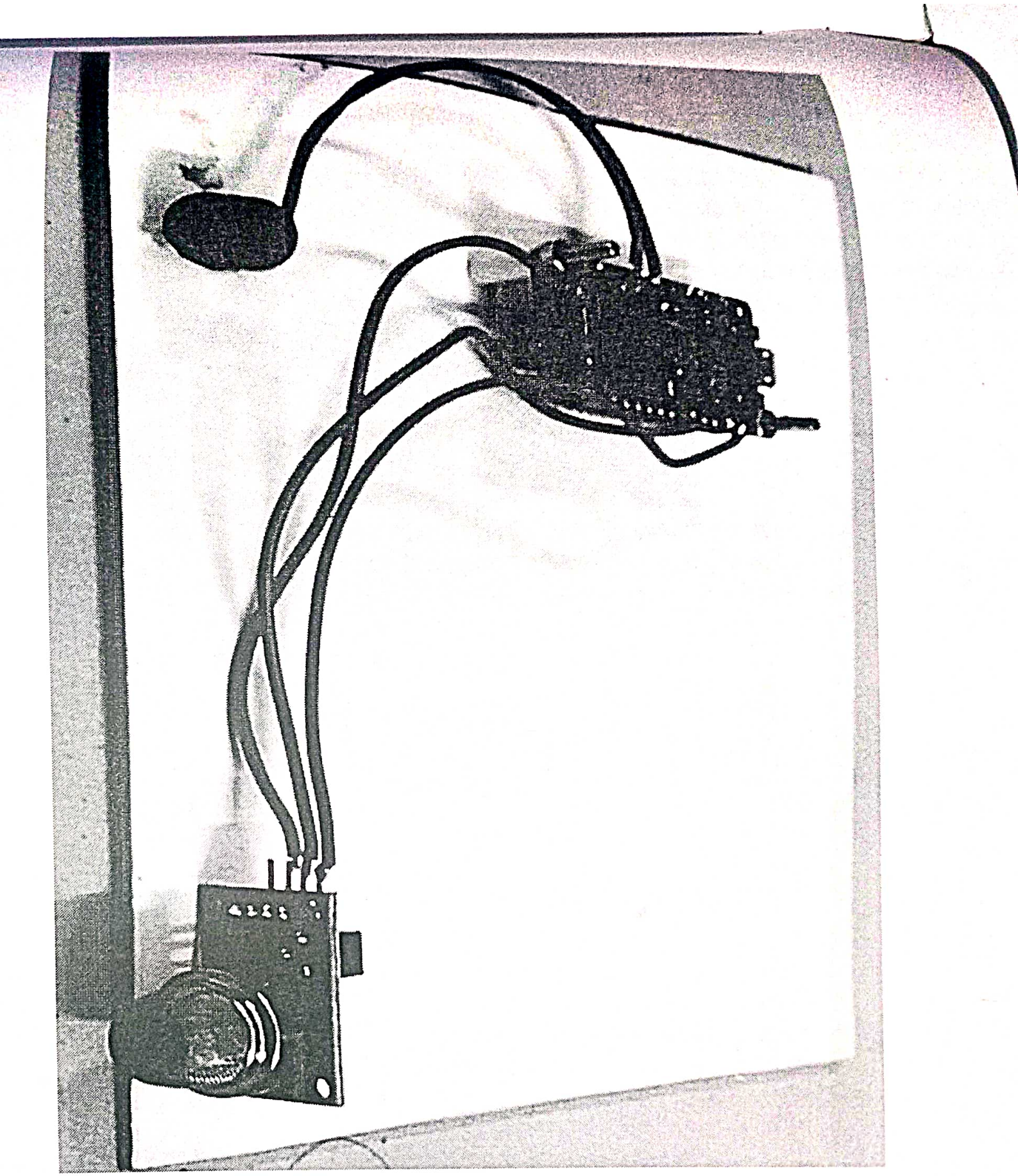
4.1 WORKING MODEL

Arduino will be active with 5 volts" power supply. The sensor will detect gas leakage once the system is launched, if there is no gas leakage, it will display "Normal Condition Air Cleaning" on the display. If the gas is leaked otherwise, the following three steps will follow

- *A signal from the microcontroller will go to the display and show gas leakage message.*
- *The signal from the buzzer will signal when the first step is completed.*
- *Lastly, through GSM, there will be a signal message that the gas has been leaked to a specific number or multiple.*

Its ability to warn its stakeholders about the leakage of the LPG gas. The future aspects of this detector include the GSM module and a tripper circuit which increases the efficiency of the system and provides more safety to the users. This detector is implemented successfully and is easy to use and also a low cost product. Another advantage of this device is that even though if no one is there in the house and then gas leaks occurs, GSM module is there to send immediate messages to the stakeholders regarding the gas leak and thus it lowers the intensity of accidents. GSM module in this device ensures better safety regarding the gas leaks.

A mobile gas sensing robot can be constructed to sense the leakage of gas through pipelines as the robot can move on a track which is situated along the length of pipeline.



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