IMPLEMENTATION OF Safety Automobile Device For Accident Prevention

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report titled "**Safety Automobile Device for Accident Prevention**" is the bonafide work of "**KARTHIKEYAN.B (211614205032),PRADEEP KUMAR.S.K (211614205054)"** who carried out the project work under my supervision.

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This report is submitted for the University project Viva-Voice held on ………..

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INTERNAL EXAMINER **EXTERNAL EXAMINE**

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ABSTRACT

The Raspberry kit with Ultrasonic sensor is used to detect the distant objects and alert the end user in blurry vision areas. With Ultrasonic Sensor, using ultrasonic waves, it is used to detect the object moving in front of the user. The range of this, unlike sonar, this Ultrasonic sensor can detect the objects up to 300cm. When the object is in the range, it automatically calculates the distance between the user and the object. This can help the user to know the object present in the front and can avoid fatal accidents. Here, when the object is in the critical region with high speed, the user is alerted via the audio message, so that the user can do the necessary steps like using horn to alert the vehicle in the front or stepping away from the lane. This kit can cover a wide range and can help the user to avoid accidents. This device can help the user drive safely in thick mist or foggy areas, highly polluted areas and can even be useful at night times.

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LIST OF SYMBOLS

S.NO.	NOTATION	NOTATION	DESCRIPTION
1	ENTITY		Represents external entities such as keyboard, sensors, users etc.
2	TRANSITION		Represents communication that occurs between processes.
3	DATABASE		Database is used for storing the values.
4	PROCESS/ STATE		A circle in DFD represents a state or process which has been triggered due to some event or action.

CHAPTER 1

INTRODUCTION:

The accident will be defined as preventable when the driver of the vehicle is found to be negligent after a review by the Accident Review Committee of all pertinent information, including the police report. Non-Preventable Accident -The accident will be defined as non-preventable when it is determined that the driver of the vehicle did not contribute to cause the accident. Incident -An event resulting from natural forces, from a non-perceivable object, or while the vehicle is properly parked. Incidents are not considered as accidents under this safety policy. Examples include damage from hail, lightning, flood, road hazards and vandalism. Basically, it is a description that applies to anything that takes your attention away from the primary task of safe driving.

There are so many accidents that occur in our everyday life which cannot be prevented. But, Accidents which occurs due to nature like thick mist and Fog, which reduces the vision of users can be prevented. So, there is a pressing need of a device which prevents this, so that a lot of lives can be saved every day. Safety is the primary concern for humans. When it comes to driving, we need to be extra cautious. So, this project aims at developing an affordable solution to these safety concerns. The proposed system will be mounted on a car, in front of the driver's seat, which will continuously focus on the vehicle or object moving in front of the user, thereby monitoring the object’s actions and give voice messages to the driver, instructing him about the distance and speed every time the vehicle is detected. In future, it should be enforced by law for every car to have such a safety system installed for driver protection. Hence the system is a complete solution which prevents accidents, so that a lot of lives can be saved every day.

LIMITATION’S OF EXISTING SYSTEM:

They are using Arduino uno-micro controller which is one of the basic and earlier models. But, now there are advanced kits like Raspberry Pi. Also in the Existing Model, only Ultrasonic Sensors for the distance calculation is so less that it is not a Compatible sensor in the latest model and alert message is shown in the monitor only. They are inaudible.

MOTIVATION FOR PROPOSED SYSTEM:

There are vehicle accidents that occur day to day due to various seasons, But, the accidents that occur when people drive through foggy and misty areas can be made avoidable. In order to prevent the accidents there should be a device that monitors weather there is a vehicle moving in front or not when they drive through foggy and misty areas.

When the vehicle moving in front enter’s the critical Region of the users vehicle, there is an alert audio message to the user about the distance between the moving car and user. By the alert message, we can make sure that the user slows down in order to prevent the accident in foggy and misty areas.

2. LITREATURE SURVEY:

2.1 Cost effective road accident prevention system

So, this system has the capability of ensuring the driver's safety along with the co-passengers and can easily be integrated with the existing safety systems in the car. This will also enhance overall road safety, by reporting any kind of reckless driving to the nearest control room. In future, it can be enforced by law for every car to have such a safety system installed for driver and passenger protection. Hence the system is a complete solution which prevents accidents, so that a lot of lives can be saved every day. **J Mohan Kumar** 14-17 Dec. 2016

2.2 A method for preventing accidents due to human action slip utilizing HMM-based Dempster-Shafer theory

We propose a method for preventing hazardous accidents due to operator's action slip in their use of skill-assist, which has been already introduced as a power assist device in automobile assembly processes. First, we show that hidden Markov model (HMM) can be used to detect human erroneous operation from data sequences of an operator's hand motion trajectory, but that a problem arises in direct application of HMM to human error detection when trajectory is not in alignment with any of pretaught trajectories. However, HMM-based Dempster-Shafer theory proposed in the study allows the system to select their safety- or productivity- oriented robot control policy, solves the detection problem, and performs secure accident prevention, Second, a workability improvement process which comprises a state-policy and a teach data renewal sub-processes allows for optimal reconstruction of the policy determinant state space and HMMs. Finally, experimental results verify our overall proposal, and demonstrate the effectiveness of the workability improvement process. 14-19 Sept. 2003 **Y. Yoji**

2.3 Computer vision based gaze tracking for accident prevention

Distracted driving is one of the main causes of vehicle collisions in India. Passively monitoring a driver's activities constitutes the basis of an automobile safety system that can potentially reduce the number of accidents by estimating the driver's focus of attention. Automotive vehicles are increasingly being equipped with accident avoidance and warning systems for avoiding the potential collision with an external object, such as another vehicle or a pedestrian. Upon detecting a potential factor, such systems typically initiate an action to avoid the collision and/or provide a warning to the vehicle operator. In this paper a complete accident avoidance system is proposed by determining the driver's behavior. As the main causes of vehicle accident were related to human factors, they could be labeled in one of the two main driver's distraction categories (Alcohol Consumption, Drowsiness and distracted vision).

2.4 Blind vehicle's sound detecting technique for advanced safety-driving system

Automobile makers have been developed and commercialized safety-driving systems to reduce the number of traffic accidents, especially with cameras or radars. This paper presents a new vehicle detecting system in a blind spot, which identifies the diffracted sound emitted from the blind vehicles behind obstacle. We show that our system works efficiently in a noisy real environment **Shinichi Yoshizawa** 10-14 Jan. 2009

2.5 Sonic Sensor Based Blind Spot Accident Prevention System

A blind spot detection device for protection against misshapenness such as automobiles collisions, obstacles, and accident that leads to great loss of human lives and can have disastrous results.Technology used for this purpose worked by detecting the other automobiles, obstacles and bystanders. Upon detecting, the device triggers a timer that delays the activation of alarm circuitry for a brief period of time.This time delay is instituted to minimize the triggers of nuisance alarm by a momentary intrusion in the hazard zone. If the obstacle’s presence is still detected after the delay time, LED's and audible alarms are triggered to alert the system operator of the dangerous situation. The alarms remain activated for a time period, allowing the operator to clear the hazard zone. **R. P. Mahapatra**

20-22 Dec. 2008

3. REQUIREMENTS

3.1 HARDWARE REQUIREMENTS :

You Will Need the Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. RPi operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply. It also requires ‘mass-storage’, but a hard disk drive of the type found in a typical PC is not really in keeping with the miniature size of RPi. Instead we will use an SD Flash memory card normally used in digital cameras, configured in such a way to ‘look like’ a hard drive to RPi’s processor. RPi will ‘boot’ (load the Operating System into RAM) from this card in the same way as a PC ‘boots up’ into Windows from its hard disk.

The following are essential to get started:

1. SD card containing Linux Operating system
2. USB keyboard
3. TV or monitor (with HDMI, DVI, Composite or SCART input)
4. Power supply (see Section 1.6 below)
5. Video cable to suit the TV or monitor used recommended optional extras include:
6. USB mouse
7. Internet connection, Model A or B: USB WiFi adaptor
8. Internet connection, Model B only: LAN (Ethernet) cable
9. Powered USB hub

3.2 SOFTWARE REQUIREMENTS

The software requirements document may serve as the specification of the system. It should include both a definition and specification of the requirements. It is a set of what the system should rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the team's progress throughout the development activity.

1. RASPBIAN JESSIE OS
2. PYTHON 2.7

4. EMBEDDED SYSTEMS

4.1.1 Overview of embedded systems

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically, embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure. In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems — such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected.

Embedded systems provide several functions

1. Monitor the environment; embedded systems read data from input sensors. This data is then processed and the results displayed in some format to a user or users
2. Control the environment; embedded systems generate and transmit commands for actuators.
3. Transform the information; embedded systems transform the data collected in some meaningful way, such as data compression/decompression

Although interaction with the external world via sensors and actuators is an important aspect of embedded systems, these systems also provide functionality specific to their applications. Embedded systems typically execute applications such as control laws, finite state machines, and signal processing algorithms. These systems must also detect and react to faults in both the internal computing environment as well as the surrounding electromechanical systems.

There are many categories of embedded systems, from communication devices to home appliances to control systems. Examples include;

1. Communication devices

e.g.: modems, cellular phones

2. Home Appliances

4.1.2 Block diagram of an embedded system:

An embedded system usually contains an embedded processor. Many appliances that have a digital interface -- microwaves, VCRs, cars -- utilize embedded systems. Some embedded systems include an operating system. Others are very specialized resulting in the entire logic being implemented as a single program. These systems are embedded into some device for some specific purpose other than to provide general purpose computing . A typical embedded system is shown in Fig 5.1

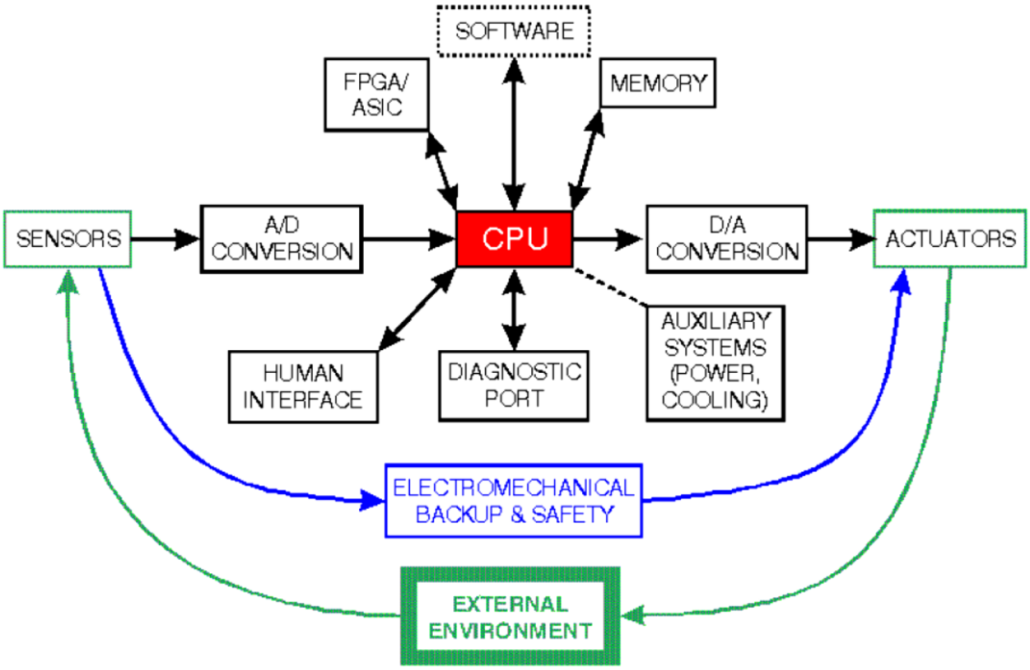


Fig 4.1.2 Block diagram of a typical embedded system

4.2 DESIGN OF EMBEDDED SYSTEM: Like every other system development design cycle embedded system too have a design cycle. The flow of the system will be like as given below. For any design cycle these will be the implementation steps.

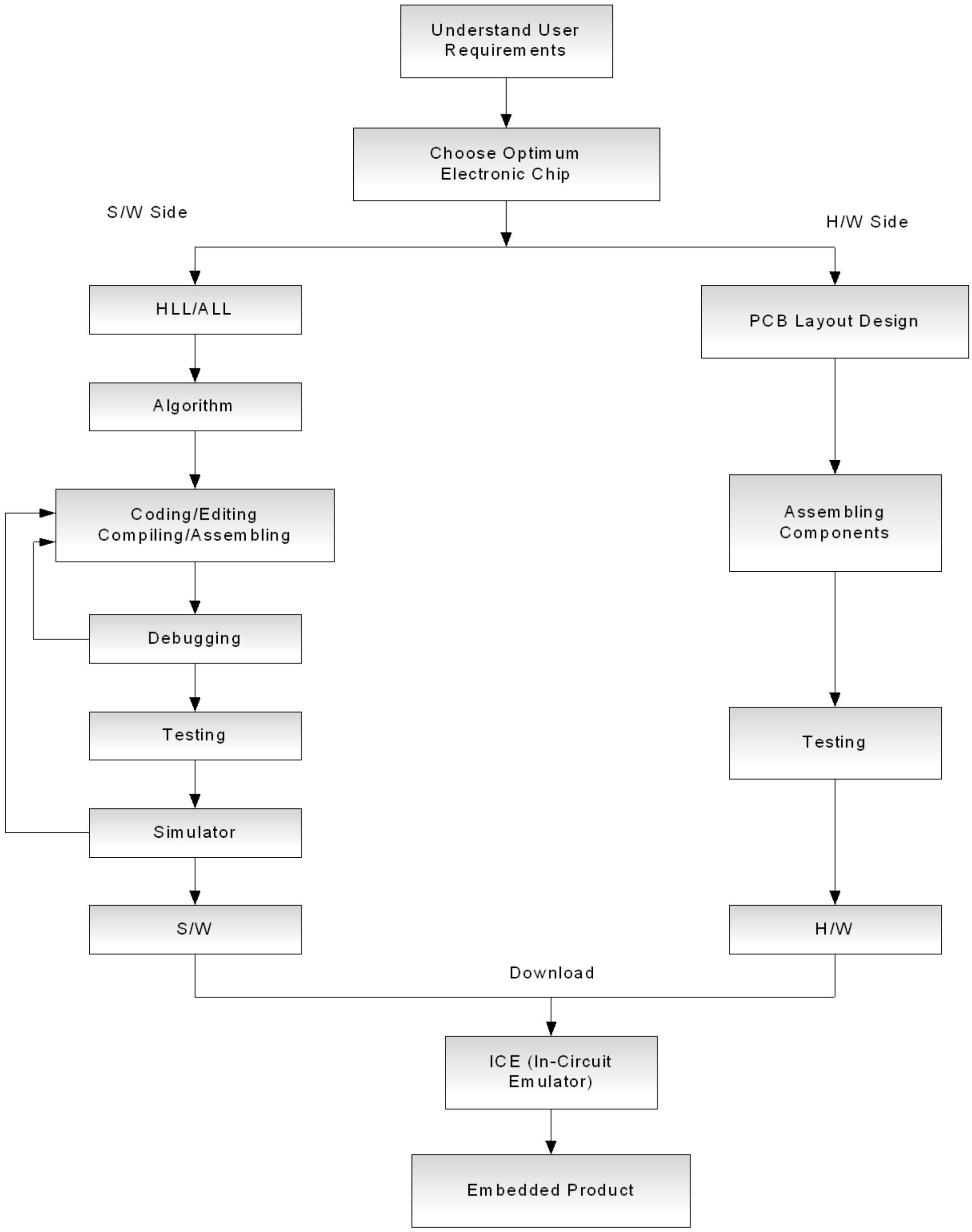


Figure 5.2 – Embedded Product Development Life Cycle

From the initial state of the project to the final fabrication the design considerations will be taken like the software consideration and the hardware components, sensor, input and output. The electronics usually uses either a microprocessor or a microcontroller. Some large or old systems use general-purpose mainframe computers or minicomputers.

4.3 Characteristics of embedded systems

Embedded systems are characterized by a unique set of characteristics. Each of these characteristics imposed a specific set of design constraints on embedded systems designers. The challenge to designing embedded systems is to conform to the specific set of constraints for the application.

Application Specific Systems:

Embedded systems are not general-purpose computers. Embedded system designs are optimized for a specific application. Many of the job characteristics are known before the hardware is designed. This allows the designer to focus on the specific design constraints of a well-defined application. As such, there is limited user re-programmability. Some embedded systems, however, require the flexibility of re-programmability. Programmable DSPs are common for such applications.

Reactive Systems

As mentioned earlier, a typical embedded systems model responds to the environment via sensors and control the environment using actuators. This requires embedded systems to run at the speed of the environment. This characteristic of embedded system is called “reactive”. Reactive computation means that the system (primarily the software component) executes in response to external events. External events can be either periodic or aperiodic. Periodic events make it easier to schedule processing to guarantee performance.

Aperiodic events are harder to schedule. The maximum event arrival rate must be estimated in order to accommodate worst case situations. Most embedded systems have a significant reactive component. One of the biggest challenges for embedded system designers is performing an accurate worst case design analysis on systems with statistical performance characteristics (e.g., cache memory on a DSP or another embedded processor). Real time system operation means that the correctness of a computation depends, in part, on the time at which it is delivered. Systems with this requirement must often design to worst case performance. But accurately predicting the worst case may be difficult on complicated architectures. This often leads to overly pessimistic estimates erring on the side of caution. Many embedded systems have a significant requirement for real time operation in order to meet external I/O and control stability requirements. Many real-time systems are also reactive systems.

Distributed Systems

A common characteristic of an embedded system is one that consists of communicating processes executing on several CPUs or ASICs which are connected by communication links. The reason for this is economy. Economical 4 8-bit microcontrollers may be cheaper than a 32-bit processors. Even after adding the cost of the communication links, this approach may be preferable. In this approach, multiple processors are usually required to handle multiple time-critical tasks. Devices under control of embedded systems may also be physically distributed.

Heterogeneous Architectures

Embedded systems often are composed of heterogeneous architectures (Fig 4.3). They may contain different processors in the same system solution. They may also be mixed signal systems. The combination of I/O interfaces, local and remote memories, and sensors and actuators makes embedded system design truly unique. Embedded systems also have tight design constraints, and heterogeneity provides better design flexibility.

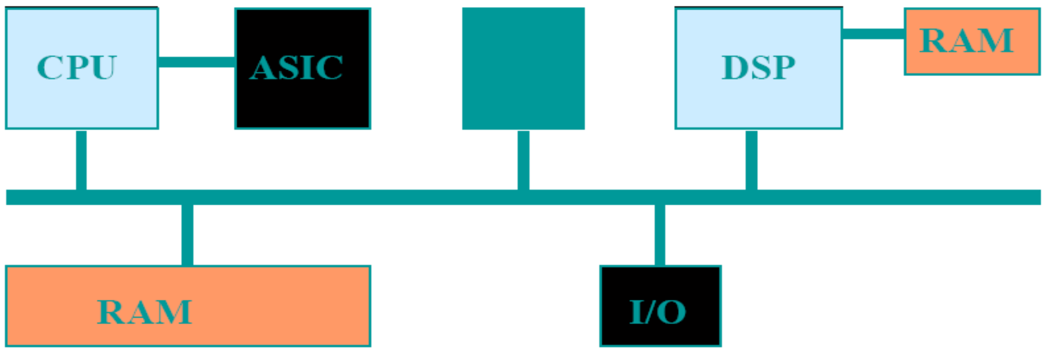


Fig 4.3 Embedded Systems having Heterogeneous Architectures

Harsh environment

Many embedded systems do not operate in a controlled environment. Excessive heat is often a problem, especially in applications involving combustion (e.g., many transportation applications). Additional problems can be caused for embedded computing by a need for protection from vibration, shock, lightning, power supply fluctuations, water, corrosion, fire, and general physical abuse.

System safety and reliability

As embedded system complexity and computing power continue to grow, they are starting to control more and more of the safety aspects of the overall system. These safety measures may be in the form of software as well as hardware control. Mechanical safety backups are normally activated when the computer system loses control in order to safely shut down system operation.

Software safety and reliability is a bigger issue. Software doesn't normally "break" in the sense of hardware. However, software may be so complex that a set of unexpected circumstances can cause software failures leading to unsafe situations. Discussion of this topic is outside the scope of this book, but the challenges for embedded designers include designing reliable software and building cheap, available systems using unreliable components. The main challenge for embedded system designers is to obtain low-cost reliability with minimal redundancy.

Control of physical systems

One of the main reasons for embedding a computer is to interact with the environment. This is often done by monitoring and controlling external machinery. Embedded computers transform the analog signals from sensors into digital form for processing. Outputs must be transformed back to analog signal levels. When controlling physical equipment, large current loads may need to be switched in order to operate motors and other actuators. To meet these needs, embedded systems may need large computer circuit boards with many non-digital components. Embedded system designers must carefully balance system tradeoffs among analog components, power, mechanical, network, and digital hardware with corresponding software.

Small and low weight

Many embedded computers are physically located within some larger system. The form factor for the embedded system may be dictated by aesthetics. For example, the form factor for a missile may have to fit inside the nose of the missile. One of the challenges for embedded systems designers is to develop non-rectangular geometries for certain solutions. Weight can also be a critical constraint. Embedded automobile control systems, for example, must be light weight for fuel economy. Portable CD players must be light weight for portability purposes.

Cost sensitivity

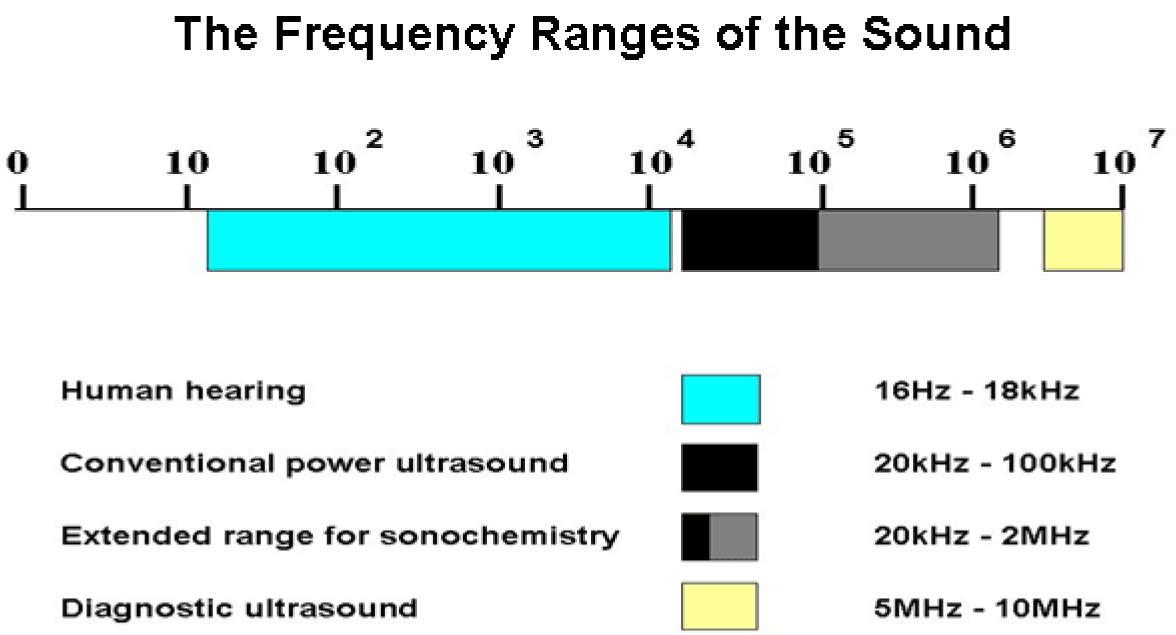
Cost is an issue in most systems, but the sensitivity to cost changes can vary dramatically in embedded systems. This is mainly due to the effect of computer costs have on profitability and is more a function of the proportion of cost changes compared to the total system cost.

Power management

Embedded systems have strict constraints on power. Given the portability requirements of many embedded systems, the need to conserve power is important to maintain battery life as long as possible. Minimization of heat production is another obvious concern for embedded systems.

4.4 WORKING

Ultrasonic sensors are devices that use electrical–mechanical energy transformation, the mechanical energy being in the form of ultrasonic waves, to measure distance from the sensor to the target object. Ultrasonic waves are longitudinal mechanical waves which travel as a succession of compressions and rarefactions along the direction of wave propagation through the medium. Any sound wave above the human auditory range of 20,000 Hz is called ultrasound. Depending on the type of application, the range of frequencies has been broadly categorized as shown in the figure below:



When ultrasonic waves are incident on an object, diffused reflection of the energy takes place over a wide solid angle which might be as high as 180 degrees. Thus some fraction of the incident energy is reflected back to the transducer in the form of echoes and is detected. The distance to the object (L) can then be calculated through the speed of ultrasonic waves (v) in the medium by the relation

$$L = \frac{v\, t \cos\theta}{2}$$

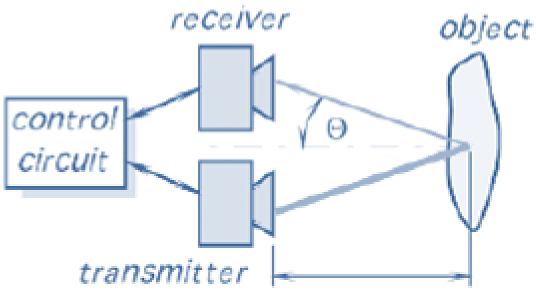


Fig 4.4 WORKING

Where‘t’ is the time taken by the wave to reach back to the sensor and ‘ ’ is the angle between the horizontal and the path taken as shown in the figure. If the object is in motion, instruments based on Doppler shift are used. Get all the details about internal structure and working of an ultrsound sensor at Insight-How Ultrasonic Sensors Work.

4.4.1 Generating Ultrasonic Waves

For the generation of such mechanical waves, movement of some surface like a diaphragm is required which can then induce the motion to the medium in front of it in the form of compression and rarefaction. Piezoelectric materials operating in the motor mode and magnetostrictive materials have been widely employed in the generation of ultrasonic waves at frequency ranges of 1-20 MHz and 20-40 kHz respectively. The sensors employ piezoelectric ceramic transducers which flex when an electric signal is applied to them. These are connected to an electronic oscillator whose output generates the oscillating voltages at the required frequency. Materials like Lead Zirconate Titanate are popular piezoelectric materials used in medical ultrasound imaging. For best results, the frequency of the applied oscillations must be equal to the natural frequency of the ceramic, which produces oscillations readily through resonance. It offers maximum sensitivity and efficiency when operated at resonance.

Piezoelectricity being a reversible phenomenon produces electrical voltages when ultrasonic waves reflect back from the target and impinge upon the ceramic structure. In this way, a transducer may work both as a transmitter and a receiver in pulsed mode. When continuous measurement of distances is required, separate transducers may be used for transmission and reception. The sensors when used in industry are generally employed in arrays which may be mechanical arrays consisting of oscillating or rotating sensors, or electronic arrays which may be linear, curved or phased. To visualize the output of an ultrasonic sensor, displays of different kind are used whose shape depends on the type of transducer array used and the function. A sectored Field of View is produced by mechanical arrays and curved and phased electronic arrays, while a linear field is generated by linear arrays. The display modes may be linear graphical plotting with amplitude on y-axis and time on x-axis called Amplitude mode or A-mode, or intensity modulated B-scans where the brightness of a spot indicates the amplitude of reflected waves. Other modes include M-mode, Doppler (D) Mode etc.

The parameterization of these sensors is generally done by monitoring the reflected and transmitted signals from the lateral an axial motion of transducer while keeping the target fixed in a specific medium (water in general). The sound beam diverges rapidly, hence care is taken that the transducer produces the smallest possible beams. The narrower the beam pattern, the more sensitive the sensor is. However, the angle possible between the transducer and the surface increases with the beam width. The beam patterns of the kind shown below are observed:

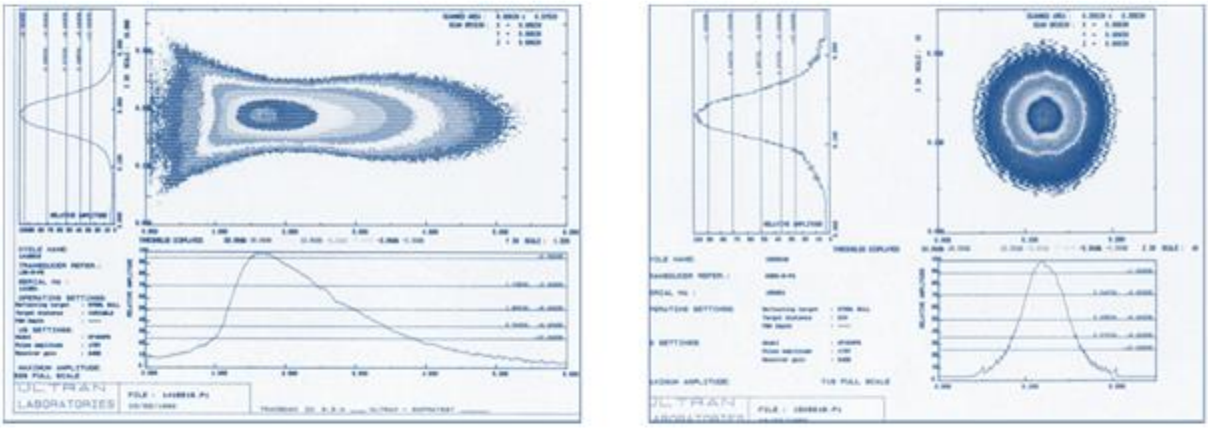


Fig 4.4.1Axial and Cross Sectional beam profiles

The parameters on which the performance of an ultrasonic sensor is measured include bandwidth, attenuation, dynamic range and resolution like grayscale, axial and lateral resolution. Other parameters are Nominal Frequency, Peak Frequency, Bandwidth center Frequency, Pulse Width, sensitivity and Signal to Noise Ratio (SNR).

Importance of Ultrasonic Sensors

There are a variety of sensors based on other physical transduction principles like the optical range finding sensors and the microwave based devices too. Then why should one use ultrasonic transducers in the first place, given that the speed of sound is very slow than the speed of electromagnetic waves? The answer lies in the question itself. Because the EM waves based devices are too fast. Being slower that the EM waves, the time taken by ultrasonic waves is much longer than that taken by the latter and hence its measurement can be done more easily and less expensively. Because these are based on sound waves rather than EM waves, these would work in places where the latter would not.

For example, in the case of clear object detection and measurement of liquid levels or high glare environments, light based sensors would suffer greatly because of the transmittance of the target or the translucence of the propagating media. Ultrasonic devices being based upon sound propagation would remain practically unaffected. These also function well in wet environments where optical beams may suffer from refraction from the water droplets in the environment. On account of range and accuracy, the ultrasonic sensors may lie in between two EM wave based sensors, the Infrared rangefinders on the lower end and the LIDARs on the upper end. Not as accurate or long distance as the LIDARs, the Ultrasonic rangefinders fare better than the IR rangefinders which are highly susceptible to ambient conditions and require recalibration when environment changes. Further these devices offer advantage in medical imaging as compared to MRI or X-Ray scans due to inexpensiveness and portability. No harmful effects of ultrasonic waves at the intensity levels used have been detected in contrast to X-rays or radioactivity based methods and is particularly suited for imaging soft tissues.

Problems & Concerns

However, Ultrasonic sensors too aren’t free of all the problems. The speed of sound in a medium increases as the temperature of the medium increases. Thus even when the target has remained in the same place, it may now seem that it has shifted to a place closer to the sensor. Air currents due to varied reasons may disturb the path of the wave which could lead to ‘Missed Detection’ or a wrong measurement. Acoustic noise like high pitched sounds created due to whistling or hissing of valves and pneumatic devices at the frequency close to the operating frequency may interfere with the output of the sensor. Electrical noise also affects the performance of the sensor. These may generate artifacts which are not a true representation of the imaged object. Just like the vision starts to blur when the distance of the object from the eye gets too small for the eyes to see it, ultrasonic devices also have a ‘dead zone’ where the sensor cannot reliably make measurements. This happens due to a phenomenon called ringing which is the continuous vibration of the transducer after emitting the pulse. Thus when the distance is too small, the transducer has not yet come to rest to be able to differentiate between the vibration due to the incident radiation or the oscillation from the electrical excitation. The dangers of Ultrasonic waves are also well founded. If the intensity is too high, it can cause human tissues to heat and may cause ruptures in people exposed to it.

4.5 RASPBERRY PI

4.5.1. Raspberry Pi Basic Hardware Setup

4.5.1.2. Connecting Everything Together

1. Plug the preloaded SD Card into the RPi.

2. Plug the USB keyboard and mouse into the RPi, perhaps via a USB hub. Connect the Hub to power, if necessary.

3. Plug a video cable into the screen (TV or monitor) and into the RPi.

4. Plug your extras into the RPi (USB WiFi, Ethernet cable, external hard drive etc.). This is where you may really need a USB hub.

5. Ensure that your USB hub (if any) and screen are working.

6. Plug the power supply into the mains socket.

7. With your screen on, plug the power supply into the RPi microUSB socket.

8. The RPi should boot up and display messages on the screen. It is always recommended to connect the MicroUSB power to the unit last (while most

connections can be made live, it is best practice to connect items such as displays with the power turned off). The RPi may take a long time to boot when powered-on for the first time, so be patient!

4.5.1.3. Operating System SD Card:

As the RPi has no internal mass storage or built-in operating system it requires an SD card preloaded with a version of the Linux Operating System. • You can create your own preloaded card using any suitable SD card (4GBytes or above) you have to hand. We suggest you use a new blank card to avoid arguments over lost pictures. • Preloaded SD cards will be available from the RPi Shop.

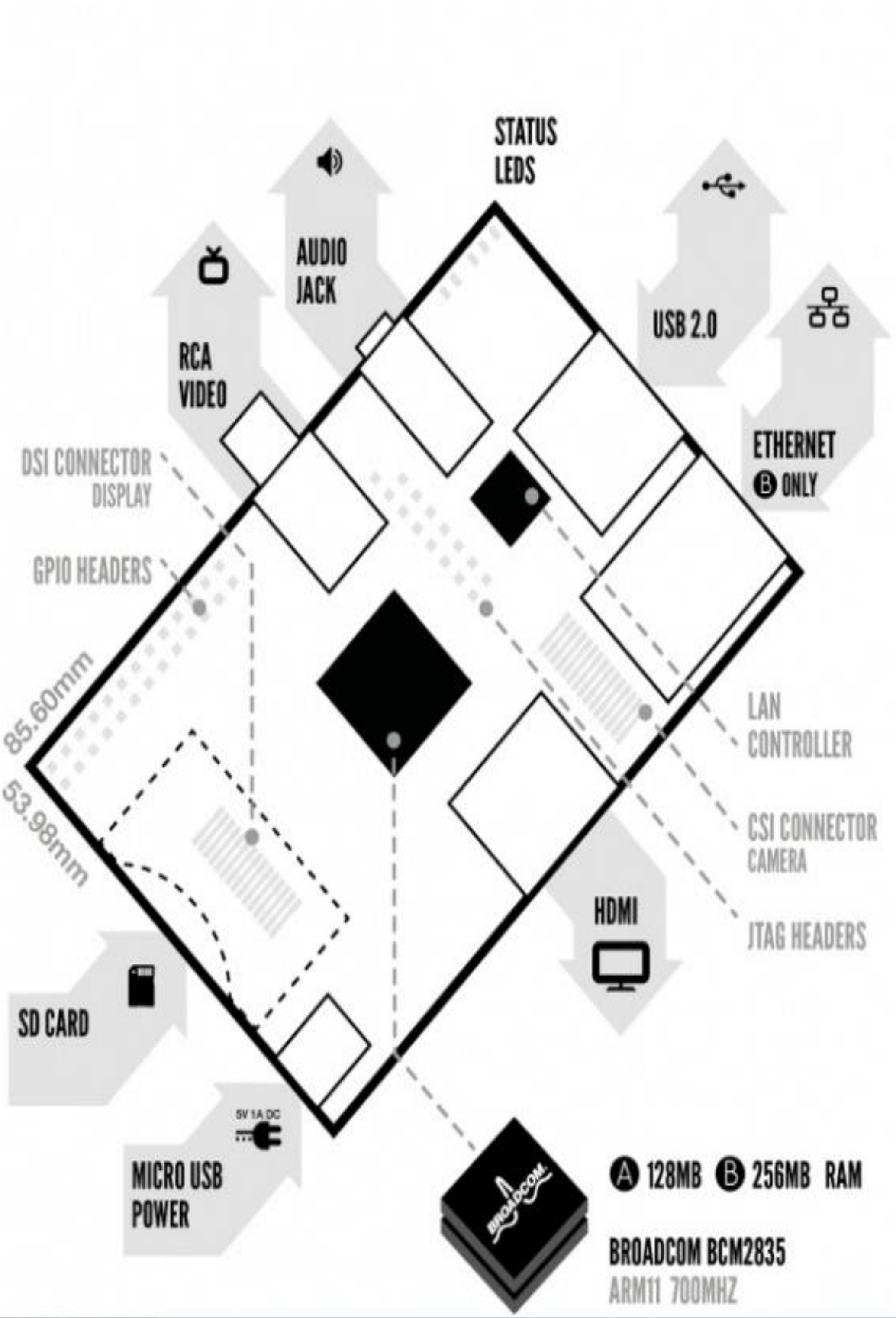
4.5.1.4. Keyboard & Mouse:

Most standard USB keyboards and mice will work with the RPi. Wireless keyboard/mice should also function, and only require a single USB port for an RF dongle. In order to use a Bluetooth keyboard or mouse you will need a Bluetooth USB dongle, which again uses a single port. Remember that the Model A has a single USB port and the Model B has two (typically a keyboard and mouse will use a USB port each).

4.5.1.5. Display:

There are two main connection options for the RPi display, HDMI (High Definition) and Composite (Standard Definition). • HD TVs and many LCD monitors can be connected using a full-size 'male' HDMI cable, and with an inexpensive adaptor if DVI is used. HDMI versions 1.3 and 1.4 are supported and a version 1.4 cable is recommended. The RPi outputs audio and video via HMDI, but does not support HDMI input. • Older TVs can be connected using Composite video (a yellow-to-yellow RCA cable) or via SCART (using a Composite video to SCART adaptor). Both PAL and NTSC format TVs are supported. When using a composite video connection, audio is available from the 3.5mm jack socket, and can be sent to your TV, headphones or an amplifier. To send audio to your TV, you will need a cable which adapts from 3.5mm to double (red and white) RCA connectors. Note: There is no analogue VGA output available. This is the connection required by many computer monitors, apart from the latest ones. If you have a monitor with only a D-shaped plug containing 15 pins, then it is unsuitable.

4.6 Raspberry pi Port specification:



4.6.1 Power Supply:

The unit is powered via the microUSB connector (only the power pins are connected, so it will not transfer data over this connection). A standard modern phone charger with a microUSB connector will do, providing it can supply at least 700mA at +5Vdc. Check your power supply's ratings carefully. Suitable mains adaptors will be available from the RPi Shop and are recommended if you are unsure what to use.

Note: The individual USB ports on a powered hub or a PC are usually rated to provide 500mA maximum. If you wish to use either of these as a power source then you will need a special cable which plugs into two ports providing a combined current capability of 1000mA.

4.6.2 Cables:

You will need one or more cables to connect up your RPi system.

• Video cable alternatives: o HDMI-A cable o HDMI-A cable + DVI adapter o Composite video cable o Composite video cable + SCART adaptor

• Audio cable (not needed if you use the HDMI video connection to a TV)

• Ethernet/LAN cable (Model B only)

4.6.3. Additional Peripherals:

You may decide you want to use various other devices with your RPi, such as Flash Drives/Portable Hard Drives, Speakers etc.

4.6.4. Internet Connectivity:

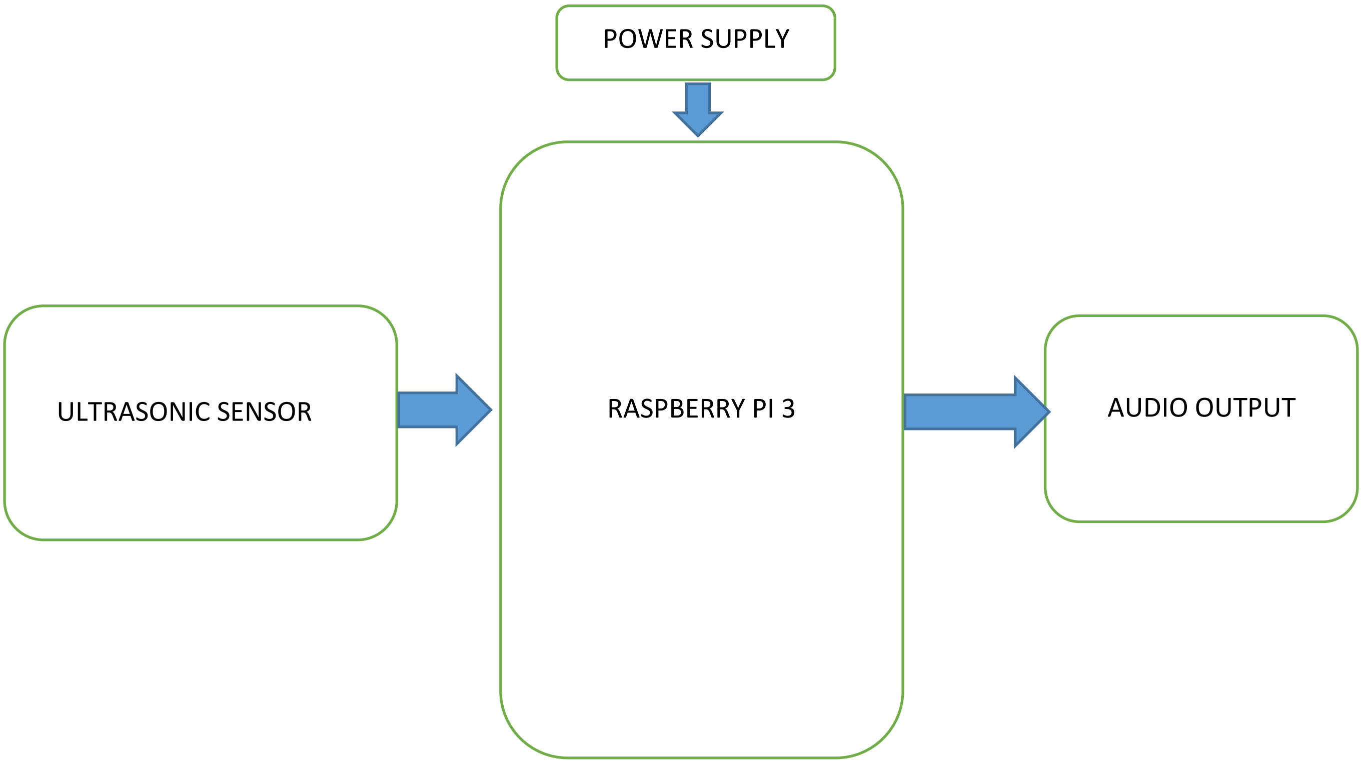
This may be via an Ethernet/LAN cable (standard RJ45 connector) or a USB WiFi adaptor. The RPi Model B Ethernet port is auto-sensing which means that it may be connected to a router or directly to another computer (without the need for a crossover cable).

4.6.5. USB hub:

In order to connect additional devices to the RPi, you may want to obtain a USB hub, which will allow multiple devices to be used. It is recommended that a powered hub is used - this will provide any additional power to the devices without affecting the RPi itself. A USB 2.0 model is recommended. USB 1.1 is fine for keyboards and mice, but may not be fast enough for other accessories.

5. SYSTEM ARCHITECTURE AND MODULE DESIGN

5.1 BLOCK DIAGRAM:



5.2MODULE DESIGN:

The modules of the system are:

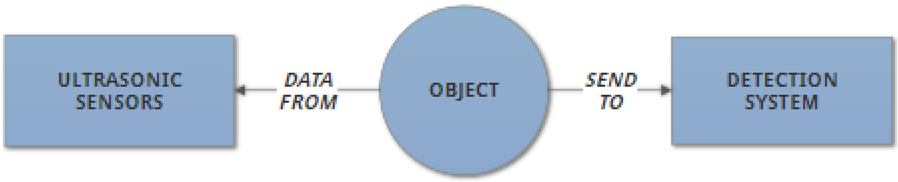
a) DATA GATHERING MODULE

b) OBJECT DETECTION MODULE

c) ALERT MODULE

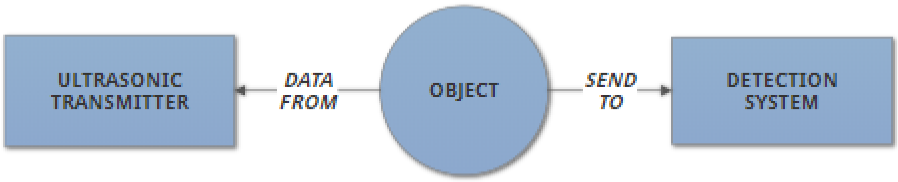
5.2.1 DATA GATHERING MODULE

Initially the waves are transmitted from the ultrasonic sensor and the maximum range of the sensor is gathered and received in the detection system



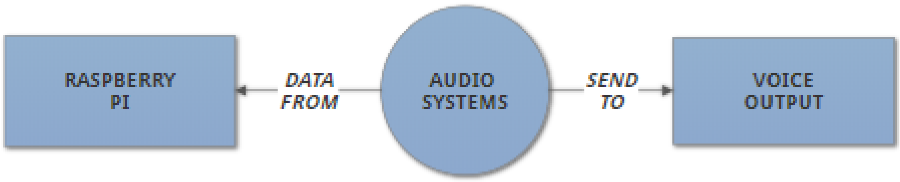
5.2.2 OBJECT DETECTION MODULE

When the object is detected within the critical range of the ultrasonic sensor , the distance between the object and the sensor is calculated and sent to the detection system.



5.2.3 ALERT MODULE

The gathered data is processed and the data is sent to the audio system where the user get the audio alert message



6. IMPLEMENTATION AND RESULTS

6.1 METHODOLOGY

When people drive though foggy and blurry vision areas, they are prone to accidents by crashing onto another vehicle. In one such situation when an accident occurs in blurry vision areas, the following vehicle who travel in the same path gets involved in the accidents.

In order to prevent such situations, this solution is designed with the help of Raspberry Pi kit with an Ultrasonic Sensor. The Ultrasonic Sensor detects when the vehicle enters the critical Region. Once the object is detected, the user is alerted with an audio alert message which produces information containing the distance between the user and the object infront.

6.2 RASPBERRY PI SCREEN:

This screenshot shows the graphical desktop of the raspberry pi connected to the monitor or projector

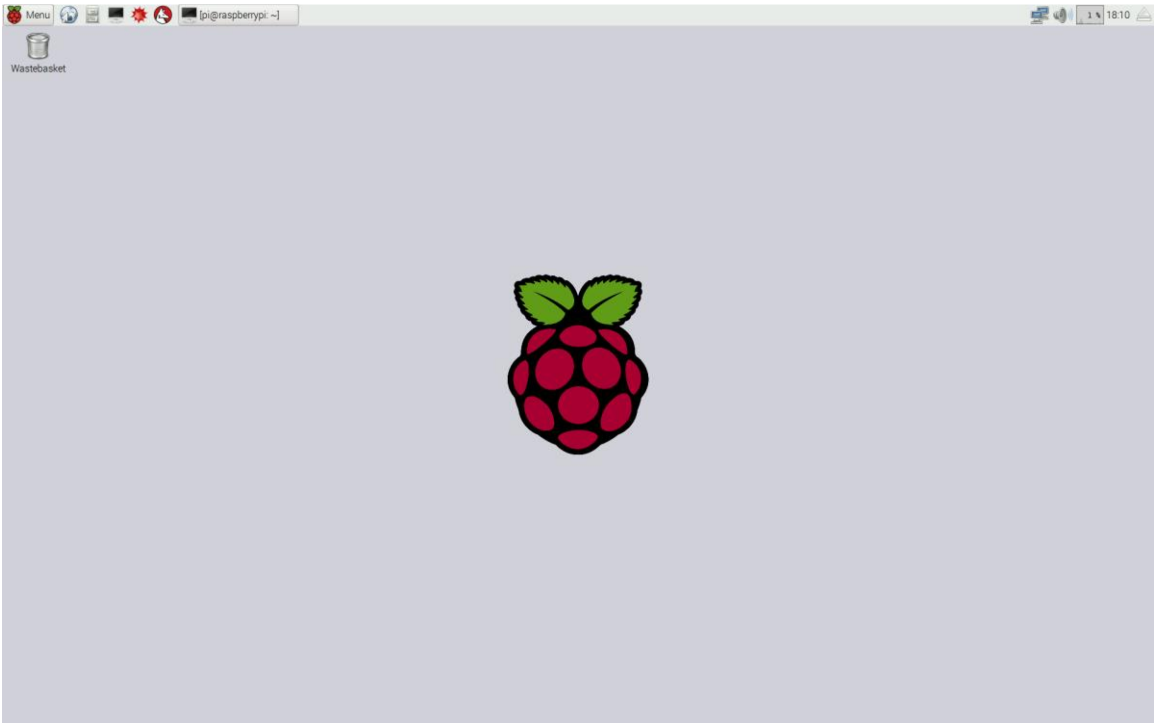
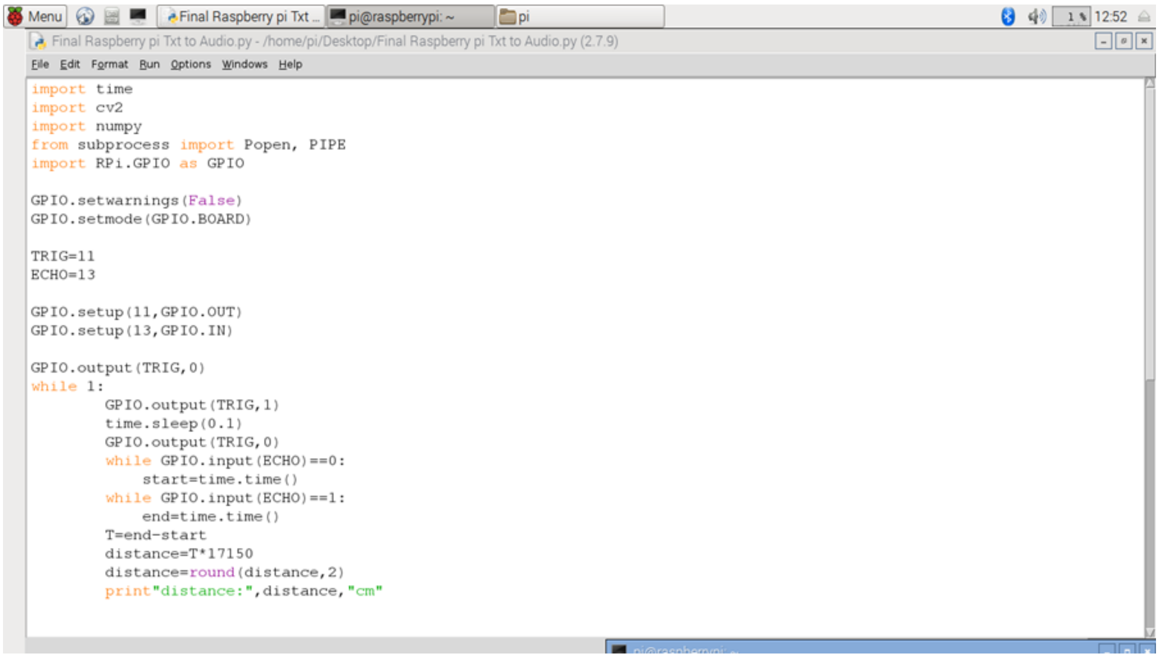
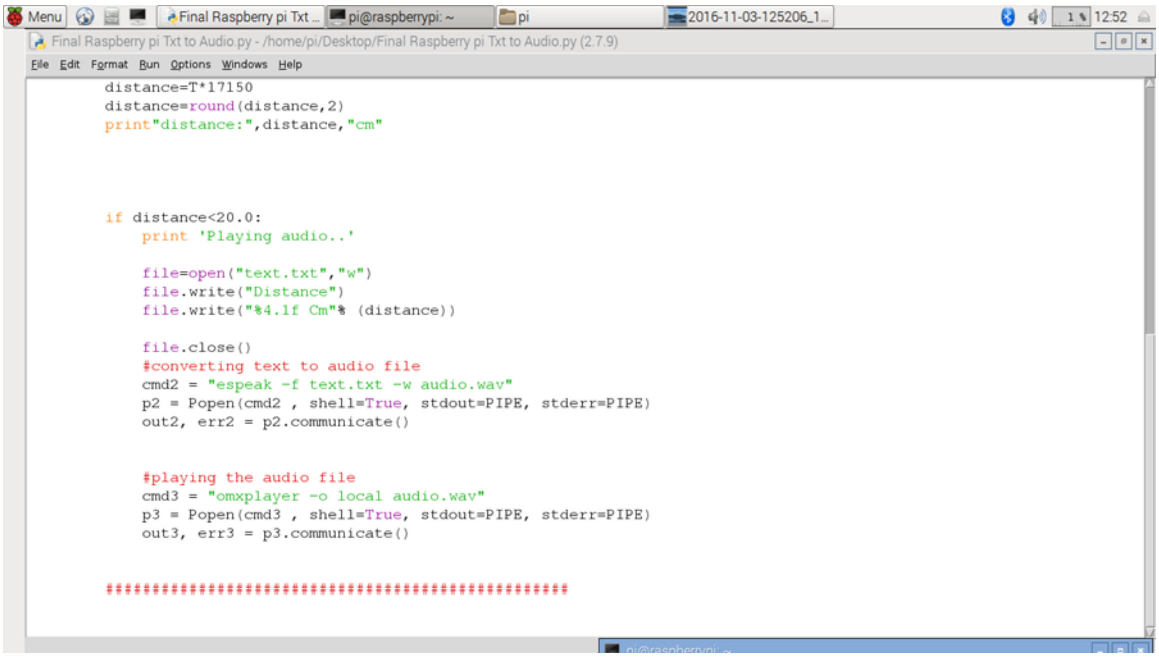


Fig 6.1 RASPBERRY PI SCREEN

6.2 CODE TO DETECT OBJECT WITHIN THE CRITICAL RANGE



```
import time
import cv2
import numpy
from subprocess import Popen, PIPE
import RPi.GPIO as GPIO

GPIO.setwarnings(False)
GPIO.setmode(GPIO.BOARD)

TRIG=11
ECHO=13

GPIO.setup(11,GPIO.OUT)
GPIO.setup(13,GPIO.IN)

GPIO.output(TRIG,0)
while 1:
        GPIO.output(TRIG,1)
        time.sleep(0.1)
        GPIO.output(TRIG,0)
        while GPIO.input(ECHO)==0:
            start=time.time()
        while GPIO.input(ECHO)==1:
            end=time.time()
        T=end-start
        distance=T*17150
        distance=round(distance,2)
        print"distance:",distance,"cm"
```

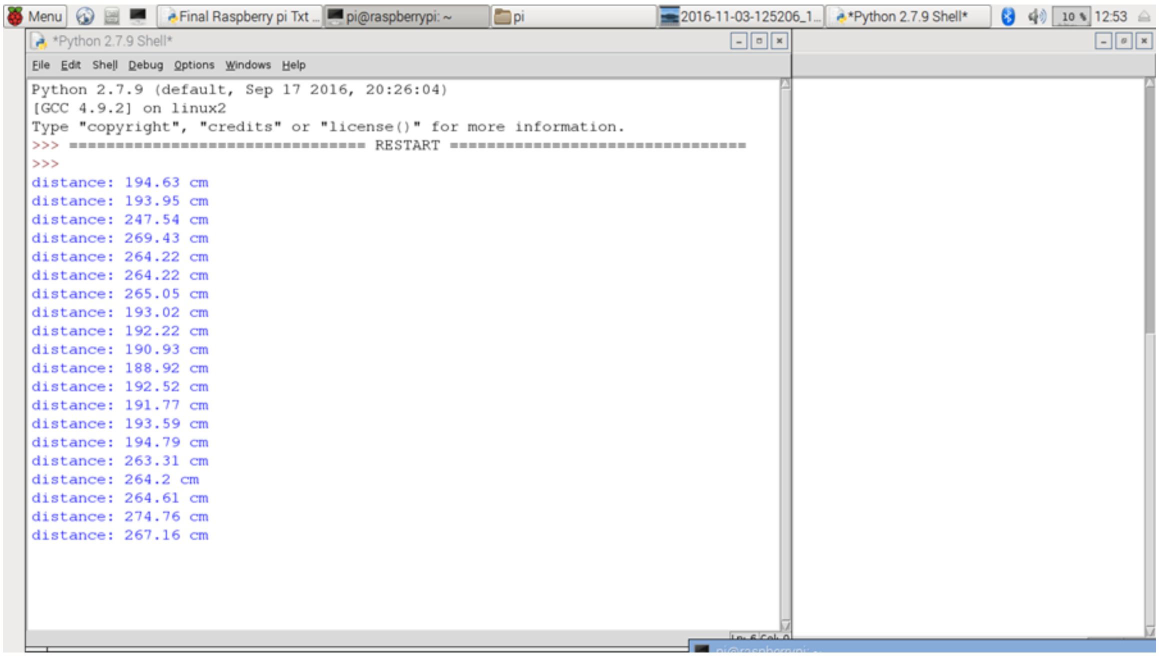


```
        distance=T*17150
        distance=round(distance,2)
        print"distance:",distance,"cm"



        if distance<20.0:
            print 'Playing audio..'

            file=open("text.txt","w")
            file.write("Distance")
            file.write("%4.1f Cm"% (distance))

            file.close()
            #converting text to audio file
            cmd2 = "espeak -f text.txt -w audio.wav"
            p2 = Popen(cmd2 , shell=True, stdout=PIPE, stderr=PIPE)
            out2, err2 = p2.communicate()


            #playing the audio file
            cmd3 = "omxplayer -o local audio.wav"
            p3 = Popen(cmd3 , shell=True, stdout=PIPE, stderr=PIPE)
            out3, err3 = p3.communicate()

        ##################################################
```

Fig 6.2 CODE TO DETECT OBJECT WITHIN THE CRITICAL RANGE

6.3 OUTPUT SCREEN

1. The maximum distance is gathered and displayed in the screen 1.



2. When the object is detected in the critical range, the alert audio message is sent via audio device.

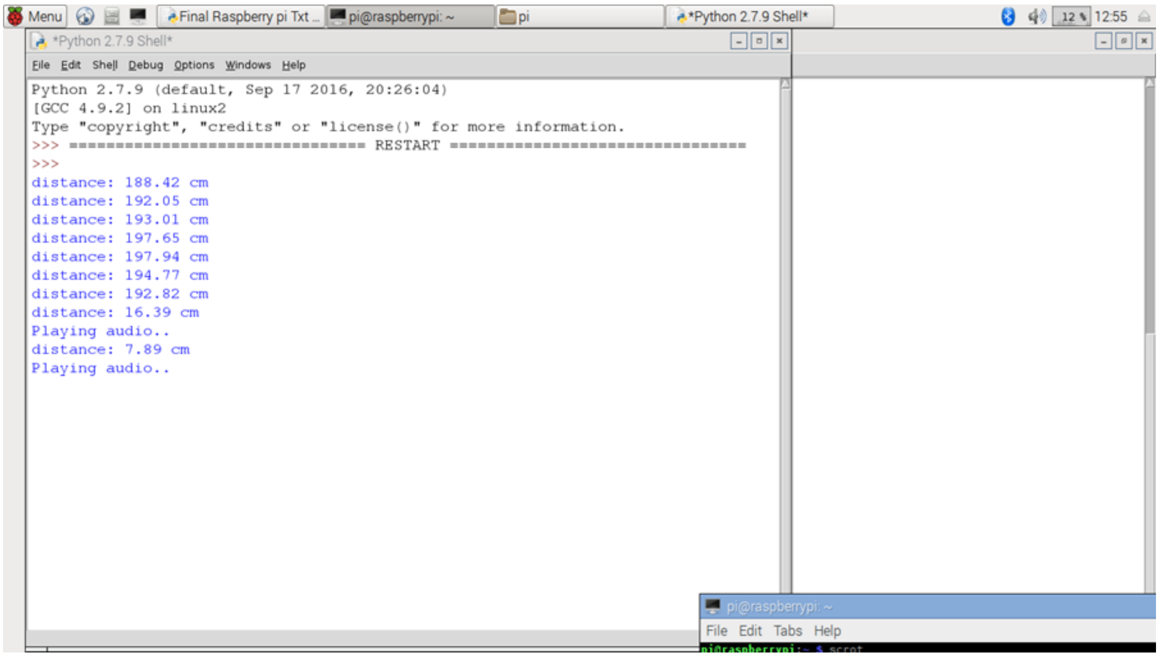


Fig 6.3 OUTPUT SCREEN

6.4 SETUP FOR THE PROPOSED SYSTEM:

Fig 6.4 depicts the entire setup of this proposed system. The system is integrated with a raspberry pi connected serially to an ultrasonic sensor and an audio device

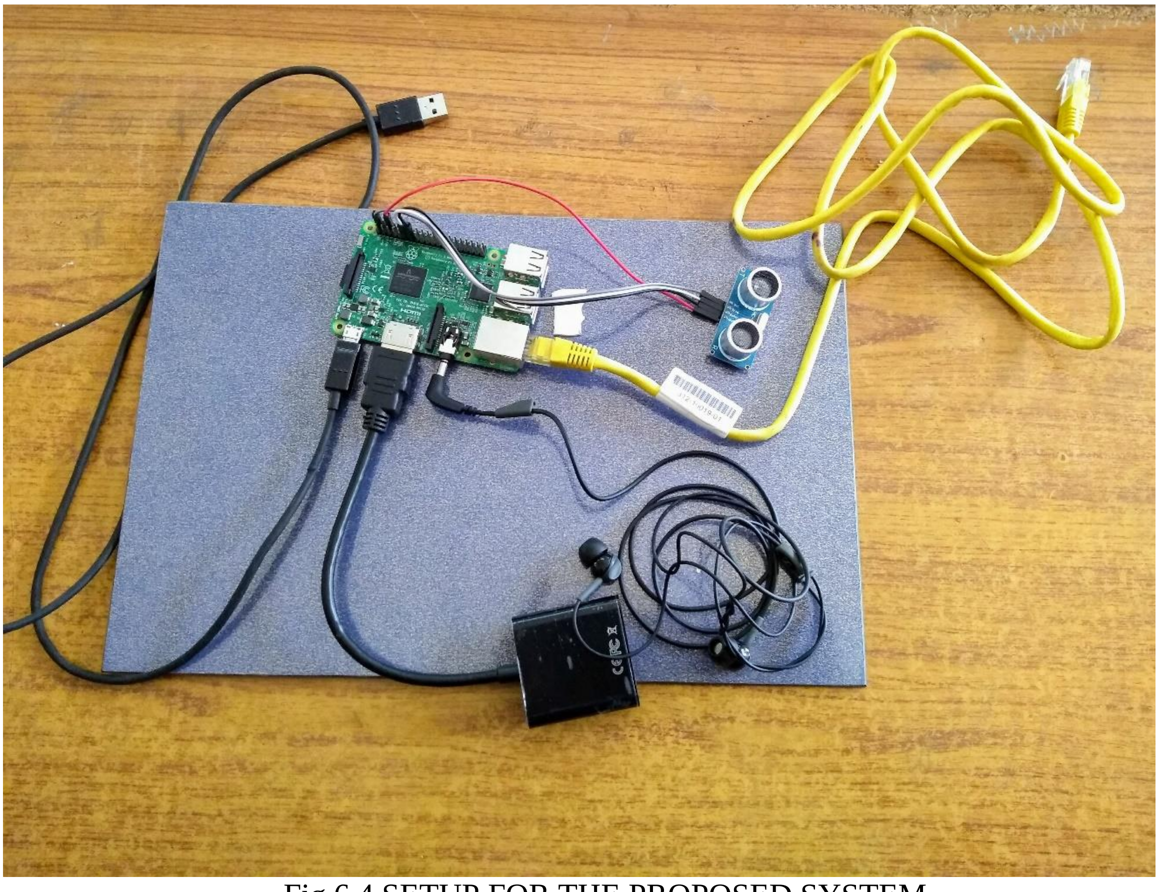


Fig 6.4 SETUP FOR THE PROPOSED SYSTEM

7. CONCLUSION

This Technology is useful while driving in Foggy environment (covered with Thick fog and mist) or also during night times. This is a low cost kit which can be installed in any vehicle to prevent Accidents. In The future, there can be options to control the angle of the sensors to detect obstacles in the sides of the vehicle. Also Based on the distance the speed of the car can also be calculated and shown to the user which is one of the useful information to prevent the accident. The sensor which is fixed in the front of the vehicle can also be fixed in the back in order to cover a huge range. This project can reduce the accident rate in Foggy environment.

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