Near East University
Yakın Doğu Üniversitesi, Lefkoşa KKTC

FACULTY OF ENGINEERING

DEPARMENT OF BIOMEDICAL ENGINEERING

2014/2015 Academic Year

SPRING SEMESTER

BME 402

GRADUATION PROJECT II

SMART OBSTACLE DETECTOR FOR BLIND PEOPLE

Group Members: Özge Sevin Keskin(20101785)
Seda Akkese(20100974)
Fatma Zor (20110276)
Hasan Kutay(20090401)

ACKNOWLEDGEMENT

This study is carried out at the Department of Biomedical Engineering, Near East University during the 2014-2015 academic year.

We would like to express our gratitude to our advisor and supervisor Assist. Prof.Dr. Terin ADALI for guiding this work with interest.

We would like to also thank Ali IŞIN and Kamil DİMİLİLER and Co-supervisor Cemre ÖZGÖÇMEN for their support, help and interest. We are grateful to them for setting high standards and giving us the freedom to explore. We would like to thank our colleagues for the assistance and constant support provided by them.

We would like to thank Dr. Burhan Nalbantoğlu Devlet Hastanesi for their help to provide us needed products.

ABSTRACT

There is approximately 36.9 million people in the world are blind in 2002 according to World Health Organization. Majority of them are using a conventional white cane to aid in navigation. The limitation in white cane is that the information's are gained by touching the objects by the tip of the cane. The traditional length of a white cane depends on the height of user and it extends from the floor to the person's sternum. So we'll design ultrasound sensor to detect all kinds of barriers whatever its shape or height and warn him with warning sounds. The main aim of this project is to assist the blind persons without the human need. It is well known that the blind people carry a hand stick with them whenever they need a support. Sometimes even when they use this stick, there is no guarantee that the blind persons are safe and secured in reaching their destinations. There may be an obstacle in their path but is not encountered by the person with the help of the stick. Thus, the people may be injured if the obstacle is big enough or dangerous. Thus, a design has been developed to assist the blind and provide them a clear path. The system consists of ultra sonic sensor fixed to the user's stick. While the user moves the stick in the forward direction, the ultrasonic sensor fixed to the stick tries to detect the obstacle if any present in the path. If the sensor detects the obstacle, the output of the receiver triggers and this change will be detected by the microcontroller since the output of the receivers is given as inputs to the microcontroller. Thus, the microcontroller immediately alerts the buzzer as soon it receives the triggered output from any of the sensors. Thus, the user can change the direction of the stick, in any other direction to avoid any kind of injury, as soon the buzzer is activated. The entire controlling unit will be fixed to the hand stick

The system not only gives the buzzer sound with the same intensity but it gives the sound which depends on the distance between the user and the obstacle.The paper presents a theoretical model and a system concept to provide a smart obstacle detector for blind people. The system is intended to provide overall measures – Traffic light detection by using Matlab Software, obstacle detection and sound alarm system.The system consist of arduino, circuit table, ultrasonic sensor , camera, Matlab, bluetooth earphone, bluetooth module and buzzer. The aim of the overall system is to provide a low cost, efficient traffic light detection and obstacle detection aid for blind people. Visually impaired people find difficulties detecting obstacles in front of them, during walking in the street, which makes it dangerous. The smart stick comes as a proposed solution to enable them to identify the world around. In this paper we propose a solution, represented in a smart stick with infrared sensor to detect stair-cases and pair of

ultrasonic sensor to detect any other obstacles in front of the user, within a range between thirty to seventyfive meters.

1.INTRODUCTION

1.1 Problem definition

1.1.1 Blindness

Blindness is the inability to see anything, even light. If you are partially blind, you have limited vision. Complete blindness means that you cannot see at all and are in total darkness. Legal blindness refers to vision that is highly compromised: What a person with healthy eyes can see from 200 feet away, a legally blind person can see only from 20 feet away.

If you suddenly lose the ability to see, seek medical attention right away. Go to the emergency room for treatment. Do not simply wait for your vision to return. Immediate treatment increases the chances of restoring your vision, depending on the cause of your blindness.
Treatment may involve surgery or medication.

1.1.2 What Are the Types of Blindness?

Total blindness means that you cannot see anything. If you have partial blindness, you may suffer from blurry vision or the inability to distinguish the shapes of objects, depending on the cause of your vision impairment.

1.1.3 What Causes Blindness?

The following eye diseases and conditions can cause blindness:

•Glaucoma refers to four different eye conditions that damage the optic nerve that carries visual information to your brain.

•Macular degeneration destroys the part of your eye that enables you to see details. It usually affects older adults.

•Cataracts cause cloudy vision and are more common in older people.

•A lazy eye can make it difficult to see details and may lead to vision loss.

•Optic neuritis is inflammation that can cause temporary or permanent vision loss.

•Retinitis pigmentosa refers to retina damage, but leads to blindness only in rare cases.

•Tumors that affect the retina or optic nerve can also cause blindness.

If you suffer from diabetes or have a stroke, blindness is a potential complication. Birth defects, eye injuries, and complications from eye surgery are other common causes of blindness.

1.1.4 Who Is at Risk for Blindness?

The following categories of people are at risk for blindness:

●People with eye diseases, such as macular degeneration and glaucoma

●People with diabetes

●Stroke victims

●Eye surgery patients

●People who work with or near sharp objects or toxic chemicals

●Premature babies

1.1.5 What Are the Symptoms of Blindness?

If you are completely blind, you can see nothing. If you are partially blind, you might experience the following symptoms:

●cloudy vision

●the inability to see shapes

●seeing only shadows

●poor night vision

●tunnel vision

1.1.6 How Is Blindness Diagnosed?

A thorough eye exam by an optometrist will help to determine the cause of your blindness or partial loss of vision. Eye doctors administer a series of tests that measure the clarity of your vision, the function of your eye muscles, and how your pupils react to light. The eye doctor will examine the general health of your eyes using a slit lamp, which is a low-power microscope paired with a high-intensity light.

1.1.7 How Is Blindness Treated?

In some cases of vision impairment, eyeglasses, surgery, or medication may help to restore your vision.

If you experience partial blindness that cannot be corrected, treatment usually involves guidance on how to function with limited vision. For example, you can use a magnifying glass to read, increase the text size on your computer, and use audio clocks and audiobooks.

1.1.8 How Can Blindness Be Prevented?

To help prevent vision loss, get regular eye examinations to detect any eye diseases. If you are diagnosed with certain eye conditions, such as glaucoma, treatment with medication can help to prevent blindness.

1.1.9 Estimation of Blindness

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The 2011 statistics by the World Health Organization (WHO) estimates that there are 285 billion people in world with visual impairment , 39 billion of which are blind and 246 with low vision .

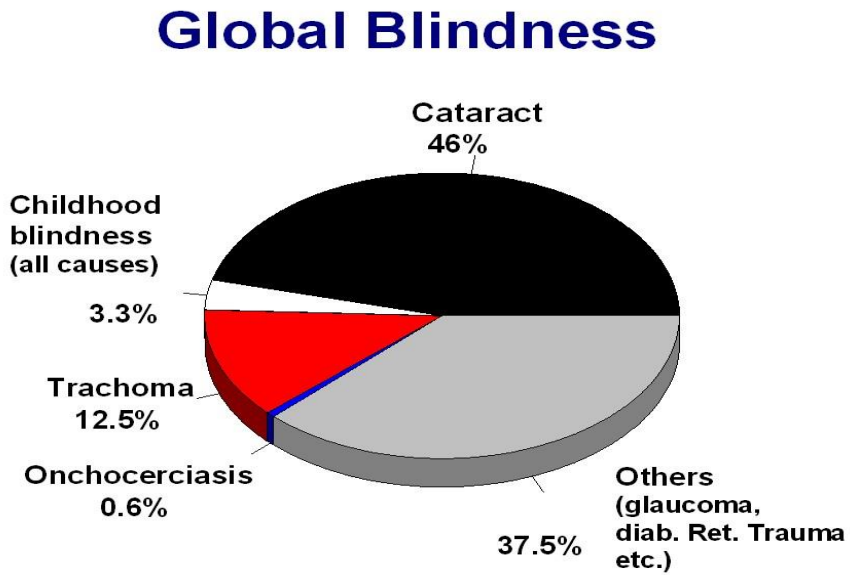


Table 1.1

The traditional and oldest mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The most important drawbacks of these aids are necessary skills and training phase, range of motion and very little information conveyed. With the rapid advances of modern technology, both in hardware and software front has brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind navigate independently and safely. Also high-end technological solutions have been introduced recently to help blind persons navigate independently. Comparison to other technologies many blind guidance systems use ultrasound because of its immunity to the environmental noise. Another reason why ultrasonic is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuitry. Also the reason why Arduino Circuitry is important and preferable is the useful and easy programming system. This different units are discussed to implement the design of a 'Smart Obstacle Detector' for blind.

2.HISTORY

2.1 History of White Cane

Blind folks everywhere have used canes as mobility tools for centuries, but it was not until after World War I that the white cane was introduced.

In 1921, James Biggs, a photographer from Bristol who became blind after an accident and was uncomfortable with the amount of traffic around his home, painted his walking stick white to be more easily visible. In 1931 in France, Guilly d'Herbemont launched a national white stick movement for the blind. On February 7, 1931, he symbolically gave the first two white canes to blind people, in the presence of several French ministers. 5,000 more white canes were later sent to blind French veterans from World War I and blind civilians.

In the United States, the introduction of the white cane is attributed to George A. Bonham of the Lions Clubs International. In 1930, a Lions Club member watched as a man who was blind attempted to cross the street with a black cane that was barely visible to motorists against the dark pavement. The Lions decided to paint the cane white to make it more visible. In 1931, Lions Clubs International began a program promoting the use of white canes for people who are blind.

The first special White Cane Ordinance was passed in December 1930 in Peoria, Illinois granting blind pedestrians protections and the right-of-way while carrying a white cane.

The long cane was improved upon by World War II veteran rehabilitation specialist, Richard E. Hoover, at Valley Forge Army Hospital. In 1944, he took the Lions Club white cane (originally made of wood) and went around the hospital blindfolded for a week. During this time he developed what is now the standard method of "long cane" training or the Hoover Method. He is now called the "Father of the Lightweight Long Cane Technique." The basic technique is to swing the cane from the center of the body back and forth before the feet. The cane should be swept before the rear foot as the person steps. Before he taught other rehabilitators, or "orientors," his new technique he had a special commission to have light weight, long white canes made for the veterans of the European fronts.

On October 6, 1964, a joint resolution of the Congress, HR 753, was signed into law authorizing the President of the United States to proclaim October 15 of each year as "White Cane Safety Day". President Lyndon Johnson was the first to make this proclamation.

2.2 A folding support cane

While the white cane is commonly accepted as a "symbol of blindness", different countries still have different rules concerning what constitutes a "cane for the blind".

In the United Kingdom, the white cane indicates that the individual has a visual impairment; with two red bands added it indicates that the user is deaf-blind.

In the United States, laws vary from state to state, but in all cases, those carrying white canes are afforded the right-of-way when crossing a road. They are afforded the right to use their cane in any public place as well. In some cases, it is illegal for a non-blind person to carry a white cane.

2.3 Comparison to guide dogs

While a guide dog, the other major mobility aid for blind people, can interact more with the user and the environment, making them more useful in certain locations, white canes are alternatives for reasons of price, care, and in case of some people, allergies. Despite the high profile of guide dogs, however, most blind people still use canes at least sometimes, and many still use canes entirely.

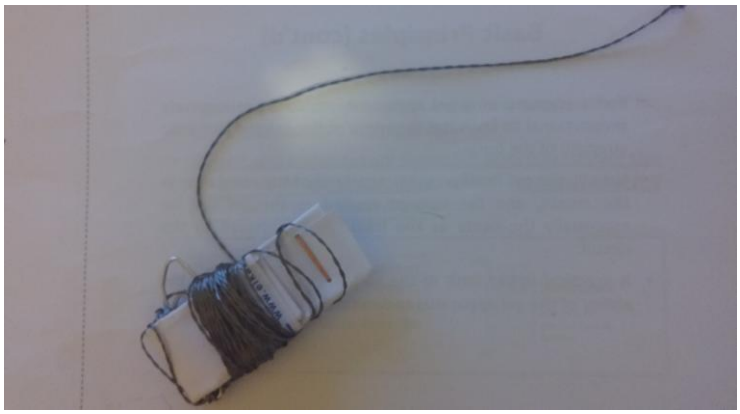
3. DESIGN AND DEVELOPMENT

We have designed our stick as the picture shown below (Picture 1.1). We built in the ultrasonic sensor near to the bottom of the stick with hybrid yarn (Picture 1.2). Ultrasonic sensor detects up to fourtyfive degree. If we have put in ultrasonic sensor upside on the stick, then stick would detect the ground. If ultrasonic sensor senses ground, results will not occur correctly.

We use adjustable aluminium folding walking stick.Folding walking stick is ideal for home use and travel, comfortable and light weight, non-slip rubber tip, fits into pocket or handbag.

We put in arduino uno,buzzer ,battery at the top of the stick. Because these electronic part may be damaged immediately. We put in these electronic parts in a black box to cover the circuit part for better visual.We use hybrid yarn cable so cables are foldable so when the user folds the stick the cables won't break. We use white foam to prevent arduino’s heat increase.

Picture 1.1



Picture 1.2

4. MICROCONTROLLER

4.1 WHAT IS ARDUINO?

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer (Picture 1.3). It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. *Picture 1.3*

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.

The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.We use this Project arduino uno type.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

4.2 ARDUINO SYSTEM DESIGN FLOWCHART

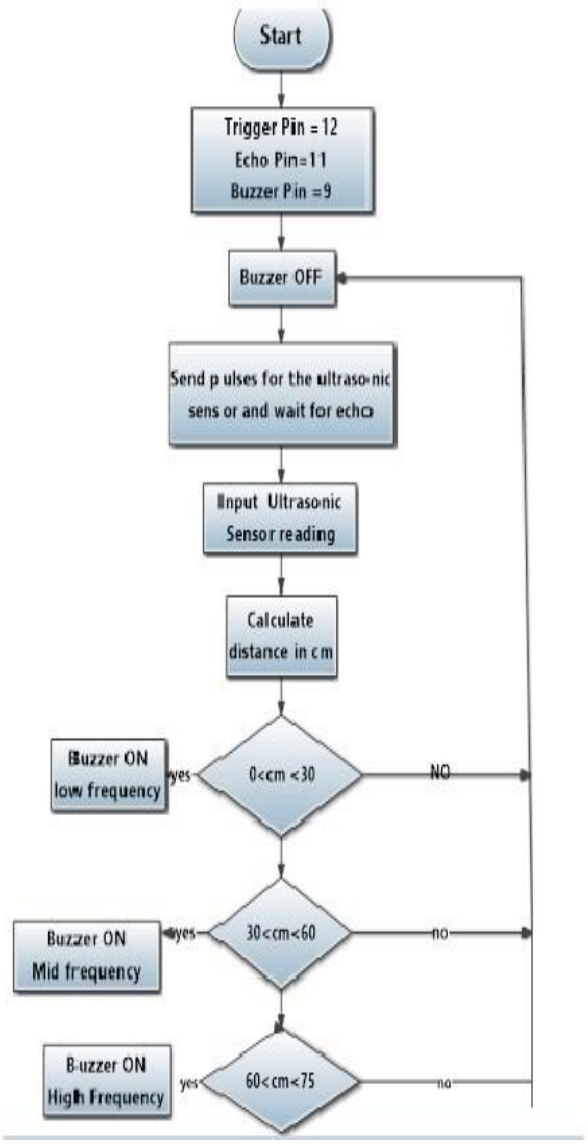


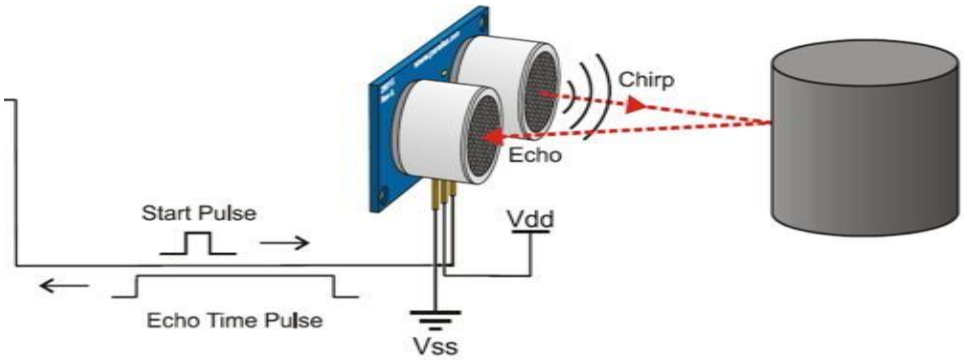
Table 1.2

The table above (Table 1.2) depicts the proposed design of an Arduino Circuit System. The system elements consist of various subsystems . The sensor based circuitry consisting of HCSR04 ultrasonic sensor, Jumper Cables , Buzzer and Resistors. This system will give alarm when there is obstacle infront of the user at the distance of 75cm. The alarm sound frequency will increase as the user gets closer to the obstacle. Arduino system can detect the obstacle by using ultrasonic sensors sound waves. The sound waves are sent to the obstacle, hits it and turns back to the system and gives output sound. Camera and Matlab system consist of different programming codes that we can be able to define the traffic lights colours if it is red or green and give sound alarm to the user.

4.3 WHAT IS ULTRASONIC SENSOR ?

Sound is a natural phenomenon which helps us to recognize our environment without physical contact over widely varying distances. Ultrasonic sensors use sound to accurately detect objects and measure distances (Picture 1.4). These sensors provide outstanding background suppression to reliably detect objects, regardless of the object's appearance. The output used – switching, analog or both – is determined based on your application requirements.

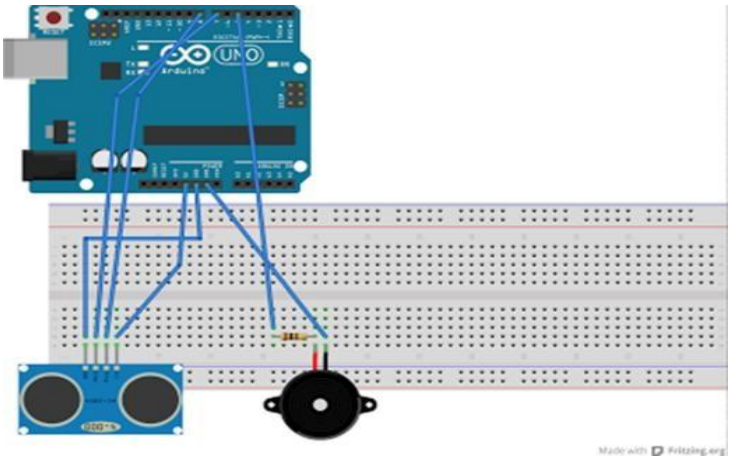
Picture 1.4



Picture 1.5

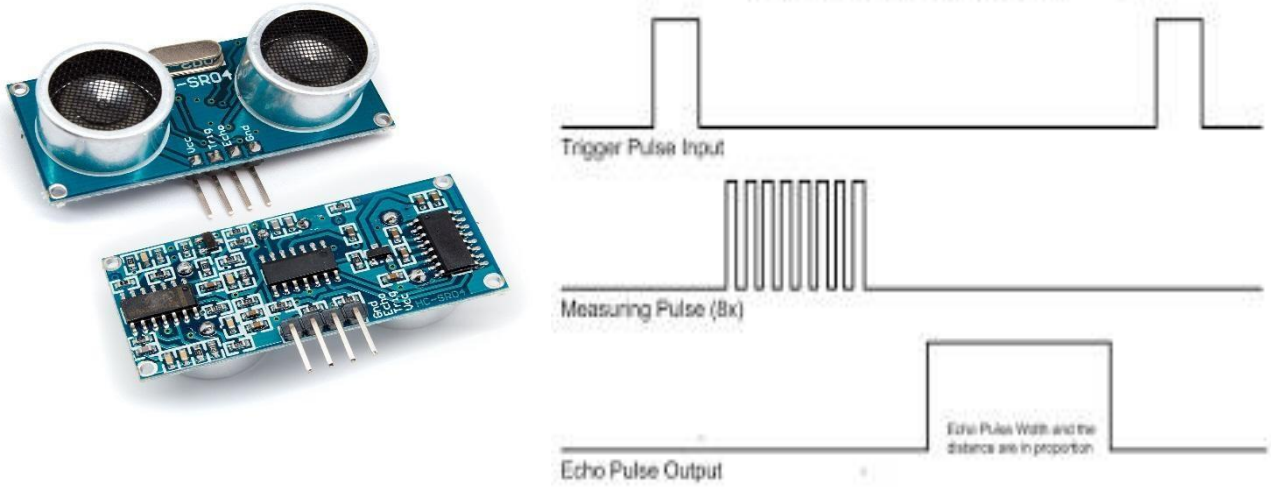
Sensor propagate sound waves .Sound waves strike to the object and turn back to sensor.Arduino has software part that provides the control on Ultrasonic sensor .We can specify the distance range (Picture 1.5).

We connected the Arduino Uno to Ultrasonic Sensor and Buzzer using jumper cables (Picture 1.6).



Picture 1.6

Ultrasonic principle ,In SOD the working principle of Ultrasonic sensor is similar to sonar which evaluate qualities of a target by interpreting the echoes from sound waves respectively (Picture 1.7). Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. The time interval between the sent signal and received signal is determined to measure the distance from an object. Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. Independent to target materials, surface and color. Detect small objects over long operating distance. Work very well by dust, dirt or high moisture environments. Resistant to external disturbances such as vibration, light, noises…An ultrasonic sensor consists of a transmitter and receiver which are available as separate units or inserted together as single unit (Picture 1.8).



Picture 1.7

Picture 1.8

We'll use HC-SR04 ultrasound sensor which transmits ultrasound waves using physical properties to calculate the range between the user and any barrier on his way by using reflection to calculate the distance by calculating the time the waves takes to travel on its way from the source to the target and the way back from the target to the receiver by:

Velocity of sound = 340 m/s

The time needed in seconds

The total distance= v*t

The distance = the total distance/2

Technical specifications:

This project started after I looked at the Polaroid Ultrasonic Ranging module. It has a number of disadvantages for use in small robots etc.

1. The maximum range of 10.7 meter is far more than is normally required, and as a result
2. The current consumption, at 2.5 Amps during the sonic burst is truly horrendous.
3. The 150mA quiescent current is also far too high.
4. The minimum range of 26cm is useless. 1-2cm is more like it.
5. The module is quite large to fit into small systems.

The output of the amplifier is fed into an LM311 comparator. A small amount of positive feedback provides some hysteresis to give a clean stable output. The problem of getting operation down to 1-2cm is that the receiver will pick

up direct coupling from the transmitter, which is right next to it. To make matters worse the piezo transducer is a mechanical object that keeps resonating sometime after the drive has been removed. Up to 1mS depending on when you decide it has stopped. It is much harder to tell the difference between this direct coupled ringing and a returning echo, which is why many designs, including the Polaroid module, simply blank out this period.

Looking at the returning echo on an oscilloscope shows that it is much larger in magnitude at close quarters than the cross-coupled signal. I therefore adjust the detection threshold during this time so that only the echo is detectable. The 100n capacitor C10 is charged to about –6v during the burst. This discharges quite quickly through the 10k resistor R6 to restore sensitivity for more distant echo's. A convenient negative voltage for the op-amp and comparator is generated by the MAX232.

Unfortunately, this also generates quite a bit of high frequency noise. I therefore shut it down whilst listening for the echo. The 10uF capacitor C9 holds the negative rail just long enough to do this.

4.3.1 The development of the sensor

Since the original design of the HCSR-04 was published, there have been incremental improvements to improve performance and manufacturing reliability. The op-amp is now an LMC6032 and the comparator is an LP311. The 10uF capacitor is now 22uF and a few resistor values have been tweaked. These changes have happened over a period of time.

All HCSR-04's manufactured after May 2003 have new software implementing an optional timing control input using the "do not connect" pin. This connection is the PIC's Vpp line used to program the chip after assembly. After programming it's just an unused input with a pull-up resistor. When left unconnected the HCSR-04 behaves exactly as it always has and is described above. When the "do not connect" pin is connected to ground (0v), the timing is changed slightly to allow

the HCSR-04 to work with the slower controllers such as the Pic axe. The HCSR-04's "do not connect" pin now acts as a timing control. This pin is pulled high by default and when left unconnected, the timing remains exactly as before.

With the timing pin pulled low (grounded) a 300uS delay is added between the end of the trigger pulse and transmitting the sonic burst. Since the echo output is not raised until the burst is completed, there is no change to the range timing, but the 300uS delay gives the Pic axe time to sort out which pin to look at and start doing so. The new code has shipped in all HCSR-04's since the end of April 2003.

The new code is also useful when connecting the HCSR-04 to the slower Stamps Such as the BS2. Although the HCSR-04 works with the BS2, the echo line needs to be connected to the lower number input pins. This is because the Stamps take progressively longer to look at the higher numbered pins and can miss the rising edge of the echo signal. In this case you can connect the "do not connect" pin to ground and give it an extra 300uS to get there.

4.3.2 WARNING SYSTEM

Smart Obstacle Detector is produced warn sounds when the stick is detected any obstacle. We use piezoelectric buzzer to warn the blind people (Table 1.3).

4.3.3 PIEZOELECTRIC BUZZERS

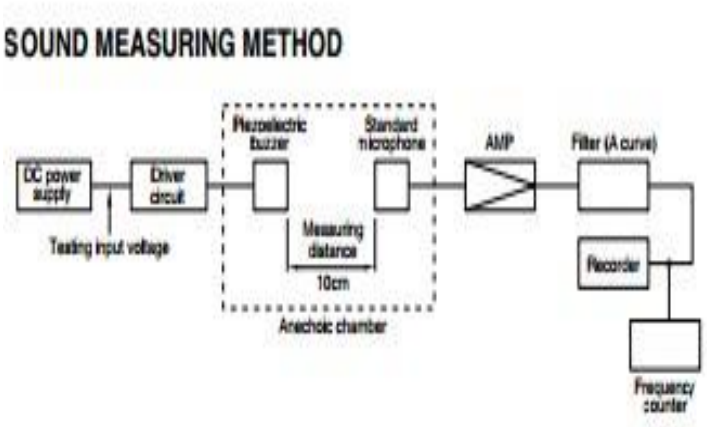
FEATURES

- The PS series are high-performance buzzers that employ unimorph piezoelectric elements and are designed for easy incorporation into various circuits.
- They feature extremely low power consumption in comparison to electromagnetic units.

• Because these buzzers are designed for external excitation, the same part can serve as both a musical tone oscillator and a buzzer.

• They can be used with automated inserters. Moisture-resistant models are also available.

• The lead wire type(PS1550L40N) with both-sided adhesive tape installed easily is prepared (Table 1.4).



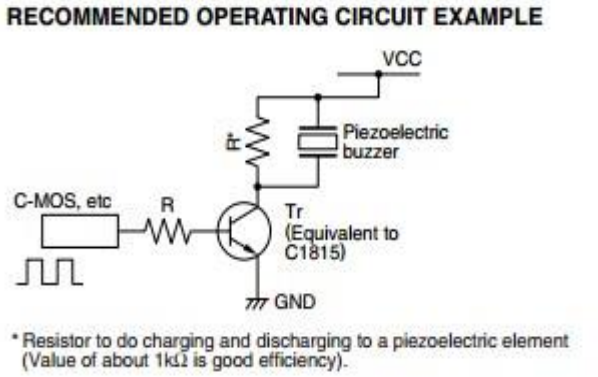


Table 1.3

Table 1.4

4.3.3 Pin Terminal Type PS12 Type PS1240P02BT Features

• Miniature size(ø12.2×T6.5mm).

• High cost performance.

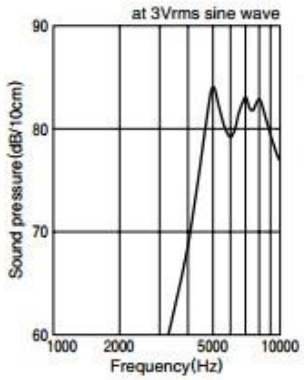
• Suitable for automatic radial taping machine(12.7mm-pitch)(Table 1.5)(Table 1.6).

SPECIFICATIONS AND CHARACTERISTICS

Sound pressure	60dBA/ 10cm min.	[at 4kHz, 3Vo-p rectangular wave, measuring temperature: 25±5°C, humidity: 60±10%]
Operating temperature range	–10 to +70°C	
Storage conditions	+5 to +40°C, 20 to 70%RH, please use within 6 months	
Maximum input voltage	30Vo-p max.	[without DC bias]
Minimum delivery unit	2500 pieces	[500 pieces/1 reel×5 reels]

FREQUENCY SOUND PRESSURE CHARACTERISTICS

SINE WAVE DRIVE



SQUARE WAVE DRIVE

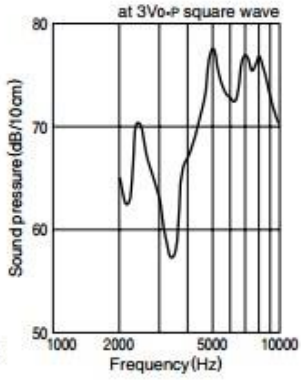


Table 1.6

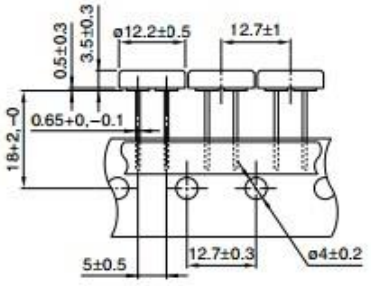
Table 1.5

PS1240P02CT3

FEATURES

- Thin type(ø12.2×T3.5mm).
- Suitable for automatic radial taping machine(12.7mm-pitch).

SHAPES AND DIMENSIONS



Be sure to solder the buzzer terminal at 350°C max.(80W max.)(soldering iron trip) within 5 seconds using a solder containing silver.

- Avoid using the piezoelectric buzzer for a long time where any corrosive gas (H2S, etc.) exists; otherwise the parts or sound generator may corroded and result in improper operation.
- Be careful not to drop the piezoelectric buzzer (Table 1.7).

LEAD WIRE TYPE
PS15 TYPE
PS1550L40N
FEATURES

- Miniature size(ø15×T1.6mm).
- High cost performance.
- The installation of this type is easy with both-sided tape.
- This product adopts an excellent both-sided adhesive tape in bonding and the sound characteristic.

SHAPES AND DIMENSIONS

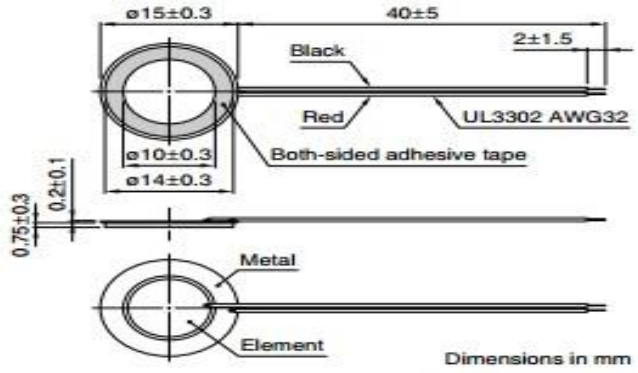
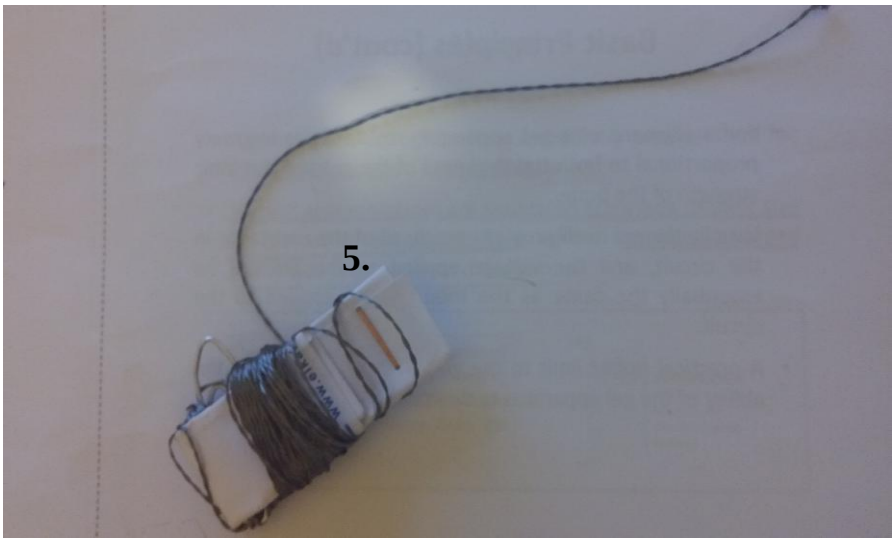


Table 1.7

4.3.5 Hybrid Yarn

It made up of stainless steel so it is a conductive material and has some advantages(Picture 1.9). First of all,it is used in textile industry and defense industry.Smart obstacle detector has to be foldable that hybrid yarn provides fold. In textile process, there is direct control over fiber placements and ease of handling of fibers. Besides economical advantages, textile technologies also provide homogenous distribution of matrix and reinforcing fiber. Thus textile performs are considered to be the structural backbone of composite structures. Textile technology is of particular importance in the context of improving certain properties of composites like inter-laminar shear and damage tolerance apart from reducing the cost of manufacturing. Textile industry has the necessary technology to weave high performance multifilament fibers such as glass, aramid and carbon, which have high tensile strength, modulus, and resistance to chemicals and heat into various types of preforms. Depending upon textile preforming method the range of fiber orientation and fiber volume fraction of preform will vary, subsequently affecting matrix infiltration and consolidation. As a route to mass production of textile composites, the production speed, material handling, and material design flexibility are major factors responsible for selection of textile reinforcement production.



Picture 1.9

4.3.6 Calculating the Distance

The HCSR-04 provides an echo pulse proportional to distance. If the width of the pulse is measured in μS, then dividing by 58 will give you the distance in cm, or dividing by 148 will give the distance in inches. μS/58=cm or μS/148=inches.

5.SOFTWARE PROGRAM

5.1 MATLAB SYSTEM DESIGN FLOWCHART

5.1.1 What is Matlab?

MATLAB is the high-level language and interactive environment used by millions of engineers and scientists worldwide. It lets you explore and visualize ideas and collaborate across disciplines including signal and image processing, communications, control systems, and computational finance.Developed by MathWorks, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python.

In 2004, MATLAB had around one million users across industry and academia.MATLAB users come from various backgrounds of engineering, science, and economics. MATLAB is widely used in academic and research institutions as well as industrial enterprises.

We use video processing for detection of traffic lights by using Matlab.It gives fast and efficient response in which we use camera for detection purpose. When the system starts working ;System's first aim is the image acquisition (obtain of image).The next step is the preprocessing of the obtained image which the system tries to understand which situation has the traffic light.If there is no traffic light detected, we repeat the loop again.The flowchart of Matlab shows how our system Works (Table 1.8). If traffic light has detected, the program starts to identify and process the colour of lights.Then the processing will give output as sound by the speaker and warn the blind people if there is traffic light and the colour of it.

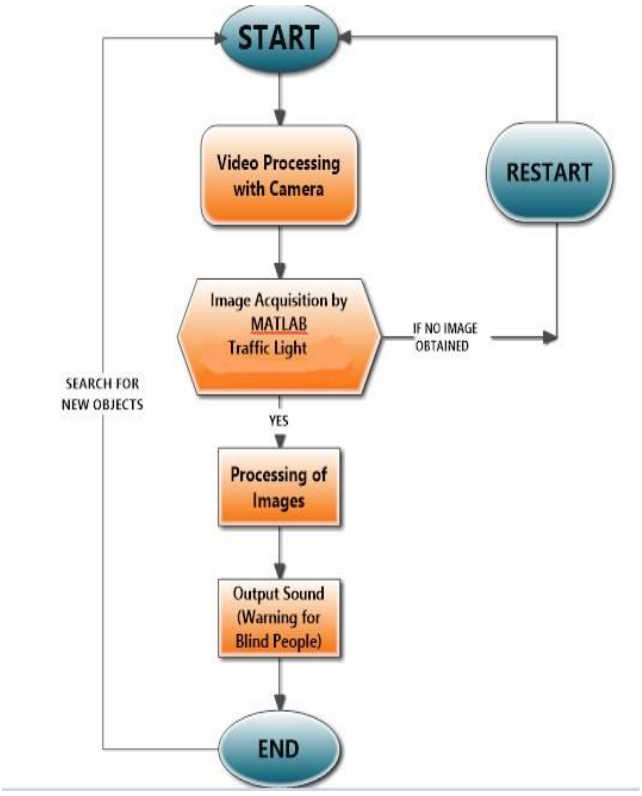


Table 1.8

6. OBSTACLE DETECTION UNIT

Eyes play a vital role in our life. All of us have seen the blind people and know the problems that they face in their life. In order to detection the obstacles blind people use stick when they are walking but this instrument just can help them find objects on the ground. Obstacle detection is a field of effort that has led to vast progress in primary safety systems and in primary–secondary safety systems interaction. To detect obstacles at a medium to long distance, either static or mobile, different technologies have been used, like laser scanners Solutions based on the sensory fusion of lasers canner, radar and computer vision have been used with the purpose of obtaining additional information for a better interpretation of the environment, as well as for mitigating the deficiencies of each sensor.

The first class is based on sensory or artificial vision systems.The sensory systems emit ultrasonic or laser beams to the environment, which are reflected by the object; the systemcalculates the distance from the object according to the timedifference between the emitted and received beam. The stereo vision systems use the object tracking algorithms and calculate the distance by using grayscale method (voice). The best known object detectors systems are the Lindsay Russell Pathsounder, Laser Cane, Mowat Sensor, Nothingam Detector,Sonicguide, Polaron, Sonic Torch etc.The proposed system uses an array of ultrasonic sensors]which basically works on the principle of the ultrasonic sound generation and alert mechanism via bluetooh headset.

7. ISSUES OF THE PROJECT

Of course, there are some unwanted issues that we have to deal with.

First of all, we tried to do our project in difficult conditions like we don't have any original Matlab program.As we explained before, we used Arduino Uno. For combining our materials in the stick we had to create a Matlab toolbox in Arduino Uno to be able to work our traffic light detection system on the stick.To be able to create a toolbox in Arduino Uno we needed an ORIGINAL MATLAB program.We couldn’t create a toolbox as we don’t have an original MATLAB, so we are working our program in our computers.For

this reason we couldn't give any sound warning because we need to work our system on arduino to give a sound warning.

7.1 Matlab Support in Arduino

MATLAB Support Package for Arduino hardware enables you to useMATLAB® to communicate with the Arduino® board over a USB cable. This package is based on a server program running on the board, which listens to commands arriving via serial port, executes the commands, and, if needed, returns a result. This approach helps you:

- Start programming right away without any additional toolboxes.
- Work in MATLAB for interactive development and debugging.
- Interactively develop programs to acquire analog and digital data, and to control DC, servo, and stepper motors.
- Access peripheral devices and sensors connected over I2C or SPI.
- Run control loops at up to 25 Hz (not real time).
- Introduce mechatronics, signal processing, and electronics concepts in classroom labs.

7.1.1 Platform and Release Support

Available on 32-bit and 64-bit Microsoft® Windows®, 64-bit Mac OS, and 64-bit Linux®. This support package is available for R2014a and higher. It is recommended that you use the latest MATLAB release. However, for R2013b and earlier, please download the following File Exchange submission to add support: MATLAB and Simulink Support for Arduino.

7.1.2 Legacy Arduino Support

The MATLAB support package replaces the functionality of the legacy MATLAB and Simulink Support for Arduino. However, it does not contain Simulink blocks for live communication between the Arduino device and Simulink. Therefore, it is recommended to use the legacy support if you require this functionality. Please click Request Hardware Support and let us know that, in the future, you would like this capability to be built into the support.

7.1.3 Arduino Support for Matlab

The MATLAB Support Package for Arduino Hardware lets you use MATLAB to communicate with Arduino boards over a USB cable. You can learn more, see examples, and install the support package here: http://www.mathworks.com/hardware-support/arduinomatlab.html

The support package is available on 32-bit and 64-bit Windows, 64-bit Mac OS, and 64-bit Linux.

As an example, you can instantiate an Arduino object from MATLAB using:

```
>> a = arduino('COM5'); and
```

then do stuff like:

```
>> av = readVoltage(a,5);

>> writeDigitalPin(a,13,1);

>> delete(a) or if you have an Adafruit
```

motor shield V2:

```
>> a = arduino('com5','Uno','libraries','Adafruit\MotorshieldV2');

>> shield = addon(a,'Adafruit\MotorshieldV2')

>> s = servo(shield,1);

>> writePosition(s,0.5)

>> dcm = dcmotor(shield,1);

>> start(dcm)

>> pause(4)
```

```
>> stop(dcm)

>> sm = stepper(shield,1,200,'RPM',10)

>> move(sm,10)
```

Arduino Uno, Arduino Mega 2560 and Arduino Due are all supported.

8.FUTURE ASPECTS

In the future, our project will be improved by new generation engineers.Our stick can be improved in new technologies and it is a wide topic that engineers can add so many innovations.

They can solve the Matlab program issues and they can create a Matlab Toolbox in Arduino to run the program in the stick. By this, camera will be built in the stick as well. They will put a SD card to record the videos in stick's memory. More of this, they can buy a camera that has it's own memory and so no need for a SD card. It will be better because it will hold less space than an SD card.

They can add GPRS to help blind people find their ways. Of course, the GPRS should have voice warning system so that blind people can hear. If they add bluetooth module in Arduino and bluetooth earphone, they will guarantee the hearing for blind people. In traffic, there will be lots of noises so blind people couldn't be able to hear all of the sound that came from the stick. To make the sound warning they need a speaker and a program to make it.

Also they will add signboard reading so that blind people would be aware of what is on the road, where they are and the signs.

9.CONCLUSION

The paper proposed the design and architecture ,of a new concept of Smart Obstacle Detector for blind people. The advantage of the system lies in the fact that it can prove to be very low cost solution to millions of blind person worldwide. We have designed this project in order to raise of blind people's life quality. They can not go outside because of the fear of walking alone.The most interesting part of this project is that our cane is developed for the recognition of traffic lights.Stick will recognize the light and it will alert users.As the technological processes, there are more and more innovations that specially designed for the blind.

10. REFERENCES

1. J Huth, N Simm (2013) .Trafffic light detection,US Patent App.

2. R de Charette, F Nashashibi (2009) . Real time visual traffic lights recognition based on spot light detection and adaptive trafficlights templates,France,IEEE.

3. Kimura F.; Takahashi T., Mekada, Y., Ide L, Murase H., Miyahara T., Tamatsu Y.: "Measurement of Visibility Conditions toward Smart Driver Assistance for Traffic Signals" Intelligent Vehicles Symposium, 2007 IEEE.

4. Zhuowen T., Ron L.: "Automatic recognition of civil infrastructure objects in mobile object mapping imagery using a markov random field model" ISPRS, 2000 Amsterdam.

5. Chung Y.-C., Wang J-M, Chen S.-W.: "A Vision-Based Traffic Light System at Intersections", 2002.

6. Lai A-H-S., Yung N-H-C: "A Video-Based System Methodology for Detecting Red Light Runners", MVA 98, Workshop on Machine Vision Applications.

7. Tae-Hyun H., In-Hak J., Seong-lk C.: "Detection of Traffic Lights for Vision-Based Car Navigation System", 2006 PSIVT.

8. Kim Y.K., Kim K.W., Xiali Y.: "Real Time Traffic Light Recognition System for Color Vision Deficiencies" International Conference on Mechatronics and Automation, 2007 IEEE.

9. Lindner F., Kressel U., and Kaelberer S.: "Robust Recognition of Traffic Signals" Intelligent Vehicles Symposium, 2004 IEEE.

10. Meyer F.: "Contrast Features Extraction" Proceedings, 2nd European Symposium on Quantitative Analysis of Microstructures in Material Sciences, Biology and Medicine, Caen (pages 374-380), 1977.

11. Serra J.: "Image analysis and mathematical morphology", Ac. Press, Vol. I, 1982.

12. Jizeng W., Hongmei Y.: "Face Detection Based on Template Matching and 2DPCA Algorithm", 2008 Congress on Image and Signal Processing, 1982