THE SMART GLASSES USING IOT AND UNITY

EESH GUPTA
Dept of CSE
SRM Institute of Science and Technology, Kattankulathur
Tamil Nadu, India
er4873@srmist.edu.in

S S SANTOSH VALISETTI
Dept of CSE
SRM Institute of Science and Technology, Kattankulathur
Tamil Nadu, India
st6931@srmist.edu.in

Dr. P.Madhavan
Associate Professor(CSE)
SRM Institute of Science and Technology, Kattankulathur
Tamil Nadu, India
madhavap@srmist.edu.in

***Abstract*— The project is based on IOT(Internet of Things) field of Computer Science branch. The world sees the future of technology in micro sized magic boxes wherein the devices would turn into a compact thing which can be taken anywhere and used viably. Therefore the idea of "THE SMART GLASSES". Using Augmented Reality and ultrasonic sensors, camera, beeper and vibrator the model stands out among all the existing models by uniquely adding the idea of having "EYES AT THE BACK" where any close encounter of any person or vehicle in the personal space of the respective person leads to direct alert through vibration and beeping.**

Keywords*— *Internet of Things, AR, Ultrasonic Sensor, Smart Glass.

I. INTRODUCTION

The project "The Smart Eyes" is a unique and purposeful venture that adds up to the already existing technologies. The cogent vision to create this project came after thoughtful thinking and analyzing all the nuances for making this type of technology. It helps people to be fully aware of the surroundings with the tech. It is a very simple looking yet impactful project that uses cameras, sensors etc. to solve the purpose it is designed for. Smart glass is a kind of eyeglass-type wearable device, it uses a camera, various sensors, AR. The biggest advantage of using smart glass is that it is possible to continue working while displaying information on the screen with see-through AR technology.

The AR technology can be seen through the unity software that we are using and the model prototype contains ultrasonic sensors to examine when to vibrate and beep. This unprecedented project is one step forward in the magnificent world of smart glasses. Arduino Nano is the master chip that controls all the functions happening in the model. Unity is a game development software that allows the user to develop a 3-D environment and helps in making AR projects. A 3D Model can be displayed as a 2-D image through 3D rendering process or used in a simulation environment. In terms of game development, 3D modeling is merely a stage in the whole development stage and can be created automatically or manually. The manual modeling procedure to prepare geometric data for 3D computer graphics is identical to plastic arts.

The Vuforia integration with the UNITY enables users to create augmented reality experiences that can be seen on any device having a camera. It incorporates computer vision tech for recognizing and tracking planar images and 3D objects in real-time. This image recognizing capability allows developers for positioning and orienting virtual objects in accordance to real objects whenever they are observed through the camera of any device. The virtual object records the location, arrangement and orientation of the image in real time to correspond the user's view on the object with the object's perception on the target. Thus, it appears that the virtual object is a part of the real world entity.

In the world of technology, it's not astonishing if one says that people like to roam around with all the tech goodies revolving around their body and the problem starts to rise when people wear headphones and walk on the road. It's where this device comes to the rescue. Though this system will have an AR system attached with the spectacles but wishing to add a camera and motion sensor at the rear band so that as soon as anyone steps in more close to the person wearing it, the band vibrates and beeps and alerts the person, is the ultimate vision. As the earth is suffering from the worst pandemic attack it will prove to be helpful in keeping social distancing as well.

II. RELATED WORKS

AR mocule helps workers in production business. It directly showcases the data related to task to the user spatially. It helps to guide the user through the work and unknown tasks. The study is shown by V. Paelke in his research paper[1].
The use of this Augmented Reality Smart Glasses(ARSG) is efficiently evaluated by Anna Syberfeldt , Oscar Danielsson and Patrik gustavsson in their ARSG in the smart factory. Implementation of the ARSG in the industrial floor shop is studied and identified under the research[2].
Lik-Hang Lee and Pan Hui studied all the Smart glasses available and concluded the research study on a wide range of literature , classifying the Smart glasses into various categories like touch, free-hand, and touch less. They specified all the key points on how these Smart glasses can be exploited using the sensors and receptors and testing them in order to check for any side effects that are caused for some people due to various reasons[3].
Stuart Elder and Alex Vakaloudis took deep technical research on smart glasses to identify all the possible technical references, designs and developments. They have explored all the available resources to make a social ecosystem for a better tomorrow[4].
All the possible interpretations of the Smart glasses in educational field is clearly analyzed by Nallapaneni Manoj Kumar; P. Ranjith Krishna; Pavan Kumar Pagadala; N. M. Saravana Kumar in their research paper. They stated the possible usage of smart glasses in the educational field via using them in various scenarios like Augmented reality , recording the classes/lectures, documenting the lecture instantly, preparing the report on the spot, capturing

important images and videos. Exploring all the possible advantages of using the Smart glasses and their drawbacks are stated[5].
Objective of model built by Feng Lan, Guangtao Zhai and Wei Lin is to make the blind people feel the environment around them and be able to access it.[6].
Describing the making and steps to make a prototype by implementing heads-up display built by T. P. Caudell and D. W. Mizell. It includes head position monitoring and a real world registration system allowing a machine-drawn diagram to be superimposed on a particular position on a real-world object.[7]

III. PROPOSED METHODOLOGY

In this, the sensor traces any person or object standing behind a person within 30 centimeters of range then the beeping sound and vibration alert is sent directly to the goggles to alert the user. Then the user can ON the camera to see the rear view. Here is the schematic functioning of the smart glasses depicted by Figure-1(Flow Chart) which shows the flow of functioning of sensors and camera.

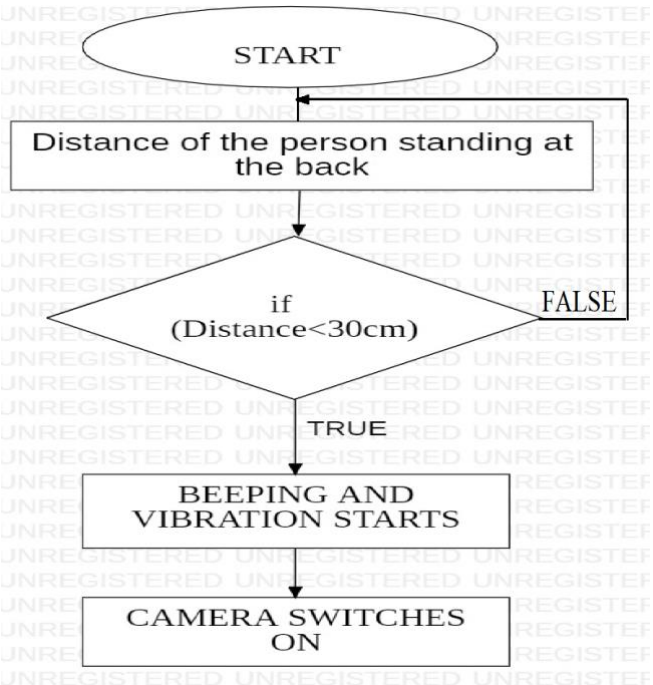

Figure-1(Flow Chart)

1. INVENTIONS:

There has always been a constant rise in the technologies used by the people around the world and it comes as no surprise that people love to hear songs while walking on the road which can lead to fatal injuries. Moreover, as we try to withstand this era of coronavirus, it seems Social Distancing is the best way out. Keeping this in mind we came up with an idea of eyes at the back wherein anyone at the back of a person comes in close proximity of about 30cm the goggle vibrates and beeps to alert the person. It also includes an AR visualization at the front to make it user friendly.

2. DESCRIPTION (THE MAKING):

This device basically helps in avoidance from any mishap and can be further developed to be used in the military.

A. Structuring using IOT:

The components needed to be well designed and well-thought of before implementing them into something practical. Figure-2 depicts the schematic representation wherein the connection of wires with various components is shown and the battery is shown which will serve as a power outlet to run the smart glasses and Figure-3 is the real-world implementation of the Figure-2.

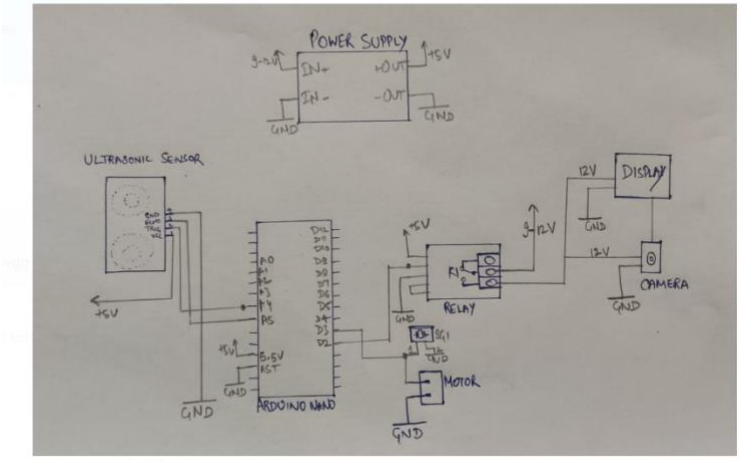

Figure-2

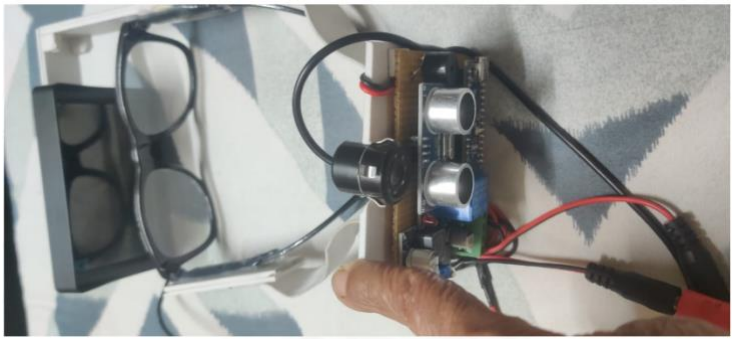

Figure-3

B. Components Used:

- ULTRASONIC SENSORS: An ultrasonic sensor is a type of electronic device which calculates the target object's distance by throwing ultrasonic sound waves, and converting the reflected sound into an electrical signal. The lower the range set the precise it gets.

- ARDUINO NANO: The Arduino Nano is a tiny, fully equipped board based on the ATmega328P. It is identical to Arduino Uno board in a smaller form factor.

- BUZZER: A buzzer is an audio signaling device that creates a beeping sound as soon as the microcontroller allows it to do so and a vibrator for vibration is also attached.

- RELAY: The Relay is a controllable power relay equipped with four outputs that help you create an Internet of Things project with safe, reliable power control.

- CAMERA: The camera acts as an input device and conversion of digital signals to analog makes it possible for TFT screen to project what the camera sees.

- TFT SCREEN: Stands for "Thin Film Transistor." These are used in LCDs and are perfect for small scale projects.

- LM2596: The LM2596 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down(buck) switching regulator, capable of driving a 3A load with excellent line and load regulation.

- UNITY FOR AR: Unity is a game development engine made by Unity Technologies and it supports the Augemented Reality module through the amalgamation of Vuforia environment in it.

C. EXPERIMENTING:

The below scene, Figure-4, represents the real world simulation using UNITY 3D software wherein four people are standing and one person is standing in the front listening songs.

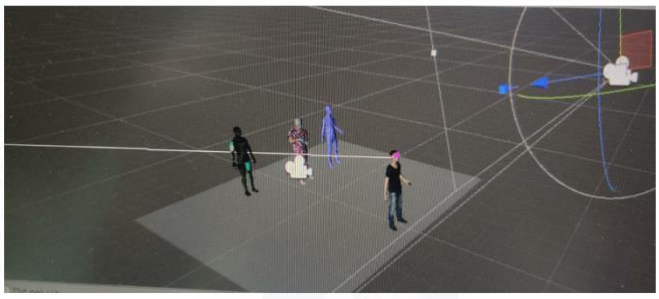

Figure-4

As soon as a person steps in too close to this person the beeping and vibrating in the goggles worn by respective person starts to alert that someone is in their close proximity. As can be seen in Figure-5 as soon as a person steps in too close to the person wearing smart goggles the footage is reflected in the TFT screen attached to the goggle as shown in Figure-6.

Figure-5

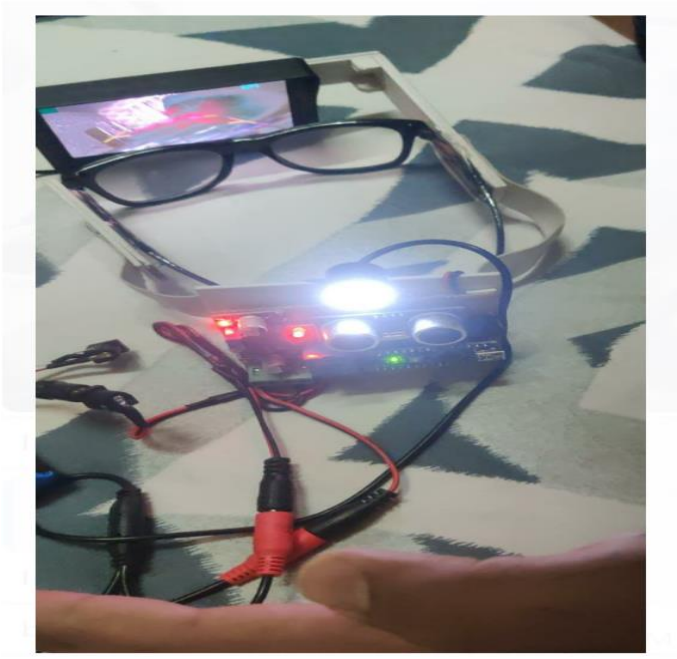

Figure-6

Figure-7 contains AR technology wherein virtual buttons are there to navigate through the various icons present. This helps in easy viewing and moreover it can be used to implement other similar AR ideas like smart library wherein we can scan the image pasted at every rack of the library to get the details of the books in that specific rack as shown in Figure-8 and further get the details of the book you choose to see, referring Figure-9.

Figure-7

Figure-8

Figure-9

IV. RESULTS AND IMPLEMENTATION

The Obstacle detecting module and output devices like the beeper, vibrator and display screen are connected to the microcontroller unit. The rechargeable battery supplies power to the central processing unit. This module constitutes of an ultrasonic sensor, camera module, processing unit consisting of an Arduino Nano which controls the whole module through the programming and then the output is shown on the TFT screen and is expressed as beeping and vibration. The Arduino Nano runs the ultrasonic sensors and gets the distance if the distance of the object is within 30cms then it operates and analyzes the information and gives the output through the vibrator and buzzer accordingly.

PSEUDO CODE RELATED TO ARDUINO NANO:

```
function SonarSensor(int trigPinSensor,int echoPinSensor)
{
 avg_dist=0;
 do till 25 iterations
 {  put trigpin LOW and wait 2 microseconds then
    switch trigpin HIGH and wait 10 microseconds
Turn it LOW again
pulseIn funtion will return the time on how much the
configured pin remain the level HIGH or LOW in this case
it will return how much time echoPinSensor stay HIGH
first we have to divide the duration by two
avg_dist += distance;
delay(2);
}
avg_dist/= 25;
return avg_dist;
}

function Hcsr_04()
{
   SonarSensor function
 print("D1:") print(UltraSensor1)
 if UltraSensor1 between 1 and 30
 {
  Put relay1 at  LOW
  Put buzzer at HIGH and delay for 3s
  }
 else
 {  Put buzzer at LOW
    Put relay1 at HIGH }
}
function setup()
{
 trigPin1 is an OUTPUT, echoPin1 is an INPUT
 relay1 is an OUTPUT, buzzer is an OUTPUT
relay1 is on at HIGH
}
function loop()
{ Hcsr_04();}
```

Using SONAR instead of ultrasonic sensor gets the people detection with the help of graphs wherein the graph for person would vary as follows in Figure-10. For people detection the pattern typically falls between A and B.

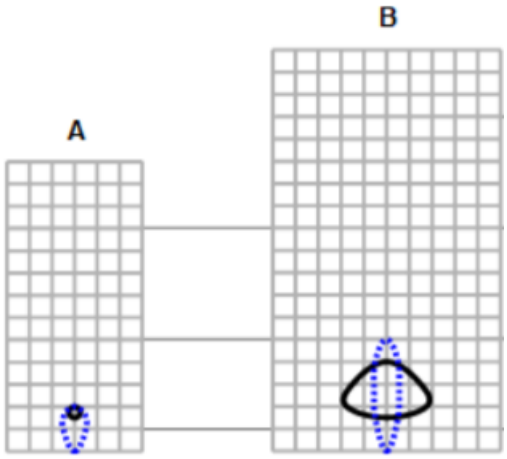

Figure-10

V. CONCLUSION

The study based on smart glasses has been done and successful implementation for the same and the innovation about having sensors and camera at the back too has been implemented successfully. The future scope for the same would be adding Machine Learning techniques to identify the obstacles behind and saving them for reviewing them afterwards.

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