

# **TEKNOFEST**

## **AEROSPACE AND TECHNOLOGY FESTIVAL**

### **THE BARRIER-FREE LIVING COMPETITION**

#### **PROJECT DETAIL REPORT**

**PROJECT NAME: THIRD EYE**

**TEAM NAME: ABRT01**

**TEAM ID: #431899**

**TEAM LEVEL: HIGH SCHOOL**

**TEAM MEMBERS:**

**SAID MOHADDES SADEQI (CAPTAIN)**

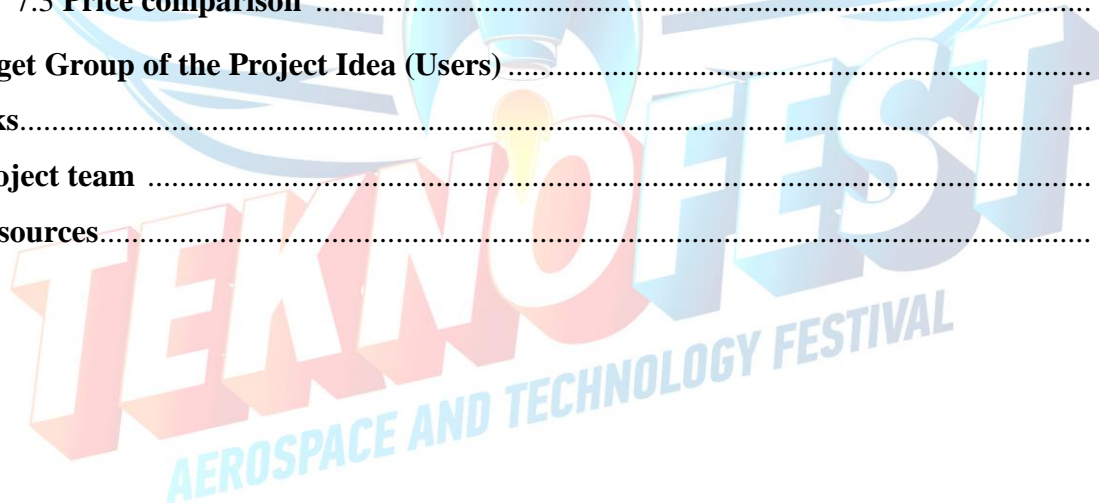
**NADEEM RAHGOSHA**

**ADVISOR NAME:**

**SOHEIL ALIZADAH**

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## Project Detail Report

### 1. Project Summary:

Third eye is a complete kit, perfectly designed for the blind, which detects obstacles in front of the blind and informs them. It contains a smart glasses, smart headphone, smart gloves, a pair of smart shoes and a GPS pack (to inform their location to their family), all put together help the blind detect the obstacles in front of them. This kit can boost the blinds' confident in many areas such as walking independent and getting more accurate. The Ultrasonic sensor calculates the distance (the distance between the blind person and the obstacle), it also informs the blind by headphones that he/she is approaching to an obstacle from a specific distance (70cm). The gloves are for house and job areas which can help them be more accurate. LDR sensor is for dark places (night), it automatically turns on the LED lights after a specific range of darkness therefore people can recognize that a blind is passing by so it prevents collisions and accidents. We have considered adding GPS to inform their families about their location. These all are connected to Arduino by Jumpers and bread board is for making the Jumpers more organized. And to finish it, we coded the Arduino by Arduino IDE program.



*Image No.1: prototype, project's first version*

## 2. Defining the Problem Situation:

Many people are not able to take care of their daily activities normally and easily due to certain disabilities they have acquired, and are deprived of many of their relative individual rights. For this reason, measures should be taken to facilitate the lives of the disabled especially the blind, they are ignored and so isolated from humanity and its achievements. The humans are having very comfortable lives using technology but there is a group of people who are still deprived from the technology's benefits. ( Worldwide, between 300 million and 400 million people are visually impaired due to various causes. Of this group, approximately 50 million people are blind, unable to see light in either eye. Eighty percent of blindness occurs in people over 50 years old) [1]. We are talking about vision while almost everything depends on our sight and vision. Then just imagine not being able to see? Yes, our world would be dark and there will be no joy or interest in the world for us without our sight. "I am only waiting to die, there is no hope or wish for me anymore" blind person said in Herat, Afghanistan \*see image 11\*. They are so much inconfident, ignored and fully dependent. They usually sit somewhere passing time and waiting to die. Until now they have been a very ignored part of the society as any instruments made for them are not sufficiently beneficial. Sensitive organs such as eyes are one of the most important organs that most humans are naturally granted, unfortunately not for all. Humanity is facing the lack of these abilities due to different problems, especially blindness. Obviously blindness is a worldwide problem (approximately 50 million people are blind) [1]. The humanity is always trying to find a way for recovering the people who are not able to see anymore. This is exactly the problem for which our project is presenting solution. (The biggest challenge for a blind person, especially the one with the complete loss of vision, is to navigate around places) [2].

(The most valuable thing for a disabled person is gaining independence. A blind person can lead an independent life with some specifically designed adaptive things for them. There are lots of almost adaptive equipment that can enable a blind person to live their life independently but they are not easily available in the local shops or markets neither they are practically usable. Refreshable Braille Display is an example of such useful devices. A blind person needs to hunt and put much effort to get each equipment that can take them one step closer towards independence) [3].

There are many products helping the blind but they are so much expensive and they are not easily available in the local shops or markets neither they are practically usable. Almost all of them are designed for the rich people which are expensive and not easily accessible for/in public. They might only be almost usable in first world countries, they are not accessible neither workable here in third world countries (Afghanistan). One of the important benefits in our project is that it covers most of the blinds' problems. None of the similar product can cover the upper and lower obstacles, but ours do cover both the lower and upper obstacles plus having a gloves to be more accurate and a GPS to inform blinds' live location to their relatives.

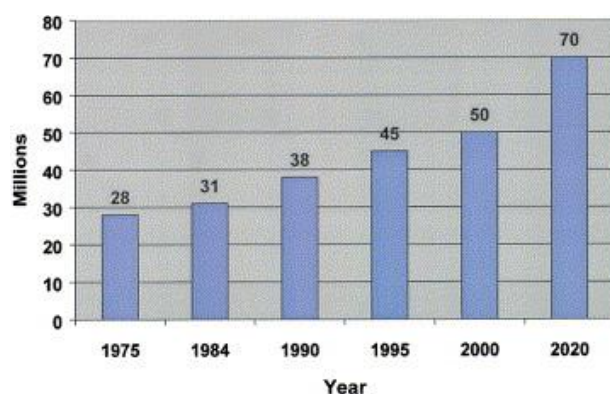


IMAGE NO.2: NUMBER OF BLIND PEOPLE IN DIFFERENT PERIODS OF TIME[5]



IMAGE NO.3: NUMBER OF THE BLIND AND LOW VISION WORLDWIDE [6]

### 3. Solution

For having a better life, the blind need to be confident enough at first, the blind need to believe their abilities. As long as their biggest problem is navigating around, therefore we have designed a complete kit, in order to make the life easier for them. We have bunch of detectors in our project; the pair of smart shoes will detect the lower obstacles and the smart glasses will cover the upper obstacles. We have considered another useful option which is accessibility to GPS, in order to inform the blind's location to their families. We are developing this kit to help the blind to be able to navigate and have a better life, therefore we have considered and predicted most of the problems that a blind may face (we met a group of blind people and tested our first prototype\*see image 8\*). This kit is going to be waterproof in order to be safe in rainy weather and the skeleton of the tool is made by almost plastic and less leather material in order to be light and more comfortable to wear. There is some lights designed to inform other people that there is a blind person walking by (this option is for nights). We are working on a vocal watch for them. These can cover all the problems mentioned above.

#### 3.1. Social benefit

With having this product, we can boost their confidence and make them feel more independent. This way their biggest problem (navigation) gets solved, they become able to participate in society and feel as a useful part of our society.

#### 3.2. Sub-components

It contains smart glasses, smart headphones, smart gloves, a pair of smart shoes and a GPS pack (to inform their location to their family), all put together help the blind detect the obstacles in front of them.



IMAGE NO.4: THE PROJECT  
PROTOTYPE (SECOND VERSION)



IMAGE NO.5: THE PROJECT 3D DESIGN

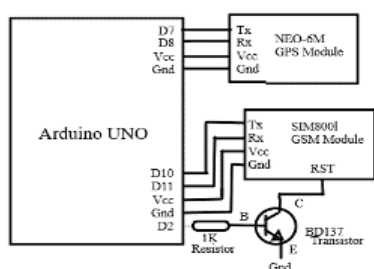


IMAGE NO.6: GPS diagram and the GPS module (NEO-6)

#### 4. Method

This kit is made of an Arduino, many Ultrasonics, an IR sensor, GSM module, GPS module (NEO-6), SIM card, headphone, LED lights, many jumpers, a bread board and a battery. The Ultrasonic sensor calculates the distance (the distance between the blind person and the obstacle), it also informs the blind via headphone that he/she is approaching to an obstacle from a specific distance (70cm). We have one Ultrasonic in each shoe, glasses and the gloves so the blind can be much more accurate, the glasses inform the blind person through headphone which much better than alarming itself, we added some vibrating modules in the shoes in order to inform the blind by vibration and have set a vibrating module with so weak impulse in the gloves to inform the blind person. We have considered GPS module for informing the blind's family (it doesn't need strong internet, it makes it usable in everywhere even in third world countries, their families can receive the blind's location by calling them, and the GPS will send them the live location by using GSM). LDR sensor is for dark places (night) which it automatically turns on the LED lights after a specific range of darkness therefore the people can recognize that a blind is passing by so it prevents collisions and accidents. These all are connected to Arduino by Jumpers and bread board is for making the Jumpers more organized. And finally we coded the Arduino by Arduino IDE program.

Glasses are for detecting the higher obstacles, In addition shoes are for detecting lower obstacles, and the gloves are for the near and job and around analysing whether there is any obstacle or not.

We have tested our prototype with some blinds in (Herat Afghanistan, Blinds centre \*see image 11\*), the results were very positive and they were extremely happy, the project was so much welcomed, appreciated and admired that “ we cannot wait for the day using this product, we do want to walk independent and be like all those people outside”. They suggested us to add a pair of smart gloves to be usable on house and job areas in order to be much more accurate and aware of their roundabouts. They named our project “ my magical friend”. They shared their daily problems so we could do our best to cover all those problems. They had a problem on knowing the time and location, which was so important. Therefore we added a GPS on our project to help them know where they are, or what time is.



*IMAGE NO.7: THE 3D DESIGN OF THE TOOLS IN OUR PROJECT*



*IMAGE NO.8: TESTING THE PROTOTYPE IN BLIND'S CENTRE*

## 5. Innovative Aspect

We live at an amazing time in terms of finding technological solutions for people who have lost their sight. Each day seems to bring a new medical or electronic solution, making the world more accessible for people who are blind or visually-impaired. As most of us had some blind people in our family or relatives and noticed their weak points and their situation, first we got really disappointed and tried to cover at least a part of it. So we started working on blinds problems and after making the first prototype we tested and received their feedbacks and so much appreciation it was extremely welcomed across the city, therefore we are developing our project even more.

we are introducing this project to the world and humanity, to step the humanity forward. Although there have been some similar products but, in similar products made in recent years, Are too expensive, unaccessable and are practically not feasible.

There are many products helping the blind but they are so much expensive and they are not easily available in the local shops or markets neither are practically usable. Some of them are designed for the rich people which are expensive, while (89% of visually impaired live in low and middle-income countries)[4]. They are not easily accessible and they are connected to internet but, they might only be almost usable in first world countries, they are not accessible neither workable here in third world countries (like Afghanistan). One of the important benefits of our project which distinguishes our project from similar products is that it covers most of the blinds problems. None of the similar product can cover the upper and lower obstacles, but ours do cover both the lower and upper obstacles plus having a pair gloves to be more accurate in house and job lifes. We have provided GPS technology for telling the time and location. We noticed that the blinds family are always stressed and worrying about their blind member of family that whether their blind is healthy or crushed somewhere or where they are, so we added the GPS to inform their families about their location. We have had some location telling optioned in similar products but they were connected to internet and were so much expensive plus, they needed a strong internet connection which weren't usable in third world countries. But we connected the GPS module with a GSM which is applicable everywhere with the least signal.

### 5.1. Comparison (between our project and the similar products)

Although, our project is unique and not exactly or almost similar product are available in the market, but there are some products helping the blind in different ways. Therefore, let's compare them with our project. We are trying to define each and every aspect in a table to compare in a better way.



Criteria	Our project	Other products
Applicability (let's see whether if our project is more useful or other products)	we have tested the prototype, the result was so much positive, in addition, this kit is feasible in everywhere and there is no need for internet for our GPS module.	they are too expensive, inaccessible and they are practically not feasible in third world countries.
Differential Features	As long as we considered all the aspects and have shoes, glasses, headphone, GPS module. Therefore, it's much more capable and can cover more problems of a blind.	They are single item products, which cover a few problem of the blind. Like they cover obstacles in upper buddy but there is nothing considered to the lower obstacles.
Cost	As long as our project doesn't have exactly similar product but we ensure that it is cheaper than the products that help the blind. Estimated cost of our product after becoming a commercial product is 50\$ (but for now it's 112\$ as long as we order them from out of country).	As we mentioned, our project is unique but there is some product doing a part of our project's duty. Anyways, those are more expensive than our product. Let's see the braille displays' cost: (The price of braille displays range from \$3,500 to \$15,000, depending on the number of characters displayed.)[7]
Shape and design	Due to not having 3D printer, we could not design a friendly design for our project.	As long as the other products have enough facilities and they have been made under a 3D printer their shape are more friendly and better.

CHART NO.1: COMPARISON CHART

## 6. Applicability

Using glasses, we can detect the obstacles at the upper, and using shoes, we can detect the obstacles at the lower. And gloves are for clearer accuracy in house and their job areas.

This project is highly applicable, we have had many experiments through practicing the product by some blind and got their useful ideas. This project is the need of many people outside, therefore surely it can be a commercial product. In a world where (we have approximately 50 million people who are completely blind)[1], therefore surely it can be a commercial product.

With the use of advanced machines and the appropriate investment, this product is able to become a commercial product and will be a blessing to humanity and to the blind people of society.

There are some risks in our project,

- First it is a bit big due to not having enough facilities like 3D printer
- Not being waterproof (it is going to be waterproof, we are working on it, we considered leather material to use),
- Not having a freindly view(which it can be fixed by a 3D print freindly desgin which we are trying to access to),
- Not having original item and sensors (we have ordered them from other countries and they seems not original enough)

## 7. Estimated Cost and Project Scheduling

### 7.1. the project estimated cost and items

As long as, we donot have the most of the sensors and items in our country (Afghanistan), so we are obliged to write the online costs that we have orderred plus the rent of these items.

No.	Name	pcs	Price/\$	Total price/\$
1	Arduino mini	4	10\$	40\$
2	Ultrasonic	5	5\$	25\$
3	GPS module	1	7\$	7\$
4	GSM module	1	10\$	10\$
5	SIM card	1	2\$	2\$
6	LED lights	1 <b>pack</b>	1\$	1\$
7	LDR module	2	1\$	2\$
8	Vibration module	4	0.5\$	2\$
9	Lithium Batteries	4	2\$	8\$
10	Shoes	1 pair	5\$	5\$
11	Glasses			
12	Jumper (M*F, M*M, F*F)	3 <b>pack</b>	2\$	6\$
13	Bread board	2	2\$	4\$
<b>Total price</b>			112\$	

**CHART NO.2: THE ESTIMATED COST AND NUMBER OF ITEMS**

## 7.2 project scheduling

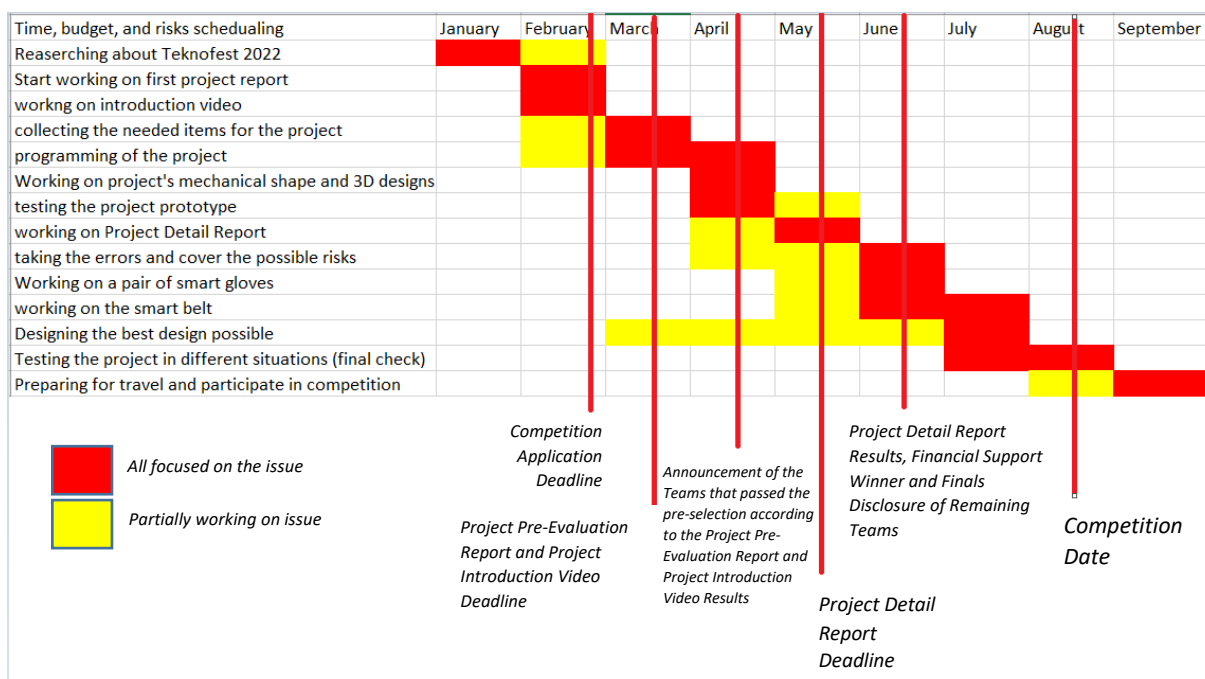


CHART NO.3: THE TIME PLANNING

## 7.3 Price comparison

Our project	Other products
<p>As long as our project doesn't have exactly similar product but we ensure that it is cheaper than the products that help the blind.</p> <p>Estimated cost of our product after becoming a commercial product is 50\$ (but for now it's 112\$ as long as we order them from out of country).</p>	<p>As we mentioned, our project is unique but there is some products doing a part of our project's duty. Anyways, those are more expensive than our product.</p> <p>Let's see the Braille Displays' cost: (The price of braille displays range from \$3,500 to \$15,000, depending on the number of characters displayed.)[7]</p>

CHART NO.4: THE PRICE COMPRISON

## 8. Target Group of the Project Idea (Users):

It's perfectly designed for the blind and low vision people. It will increase their confidence in many areas. Feeling independent and nivating easily. There have been many people suffering from blindness and having low vision. Therefore the project is especially designed for them.

## 9. Risks

Our product may also have some negative affects and surly we are trying our best to cover them all in a perfect way, in order to gift the humanity a perfect product. But we noticed some risks till now;

- ✚ Not being that especially designed and being bigger than applicable size, due to not having 3D printer (but we are trying our best to cover these all or at least get access to a 3D printer)
- ✚ Not being safe in climate changes, specially rainy weathers (we considered using leather materials in outlayer of products)
- ✚ The items are not original, as we ordered them from another country and also we couldnt find some of our considered items. Therefore, we were obliged to use a similar task doer instead, so we are not sure if the item can do it's task correctly.
- ✚ Since we are ordering the items from other country neither timing nor price is guaranteed.
- ✚ We need some sensors that we could neither find here nor in our neighbor countries.

Problem	Impact
Inoriginal materials Not having 3D print	The machine's might not work as expected Not a friendly view and not getting into a commercial product
Less flexiblity	Users might get annoyed using the product in different climates
Unguaranteed time and budget plan	We might face budget problems and as our items come from abroad it might take longer than scheduled

**CHART NO.5: THE PROBLEM AND IMPACT**

There may occur some problems during the implementation of the project so we tried to predict most of them.

- ✚ We guessed that the batteries may get low, besides considering lithuem battries we also considered adding rechargeable batteries.
- ✚ Someof the tools might not work correctly as they are not original. [plan B: we will try to access and replace original items as soon as possible (like buying from Turkey)]

## 10. project team:

### 10.1. Team instruction



**Soheil Alizadeh – Team instructor –**

**Mechatronics Department – HERAT, AFGHANISTAN**

**Field of specialization: mechatronics, programing, automotive engineering, robotics, artificial intelligence.**

**1. Said Mohaddes SADEQI – team captain –  
Afgan-Türk Maarif Okulları Herat Erkek Lisesi – 12<sup>th</sup> grade student**

**Field of responsibility: programming, mechanics and designing.**



**2. Nadeem RAHGOSHA – team member –  
Afgan-Türk Maarif Okulları Herat Erkek Lisesi – 10<sup>th</sup> grade student**

**Field of responsibility: electronics, mechanics and quality controller.**

## 11. Resources

11.1.[1] Things to know about blindness

Medical Author: Andrew A. Dahl, MD, FACS Medical Editor: William C. Shiel Jr., MD, FACP, FACR

Medically Reviewed on 4/25/2022

<https://www.medicinenet.com/blindness/article.htm>

11.2.[2] Daily Life Problems, Struggle and Challeng

Lalit Kumar ‘Samyak Lalit’ is the Founder, Principal Writer and Editor of WeCapable.comes Faced by Blind People

<https://wecapable.com/problems-faced-by-blind-people/>

11.3.[3] Daily Life Problems, Struggle and Challenges Faced by Blind People

Lalit Kumar 'Samyak Lalit' is the Founder, Principal Writer and Editor of WeCapable.comes Faced by Blind People

<https://wecapable.com/problems-faced-by-blind-people/>

11.4.[4] Latest Global Estimates of the Prevalence of Blindness Published

Infographic created by IAPB

<https://www.cureblindness.org/eye-on-the-world/news/latest-global-estimates-of-the-prevalence-of-blindness-published>

11.5.[5] Blindness in the World

Measles blindness, Semba et al., Survey of Ophthalmology

[https://www.surveyophthalmol.com/article/S0039-6257\(00\)00177-6/fulltext#relatedArticles](https://www.surveyophthalmol.com/article/S0039-6257(00)00177-6/fulltext#relatedArticles)

11.6.[6] 2020 ESTIMATES TO BE PUBLISHED IN LANCET GLOBAL HEALTH IN NOVEMBER 2020

WHO REPORT ON VISION, 10/4/2020

<https://www.globalvisiondata.org/news>

11.7.[7] Refreshable Braille Displays

Kirk Adams, PhD, President and CEO

<https://www.afb.org/node/16207/refreshable-braille-displays>

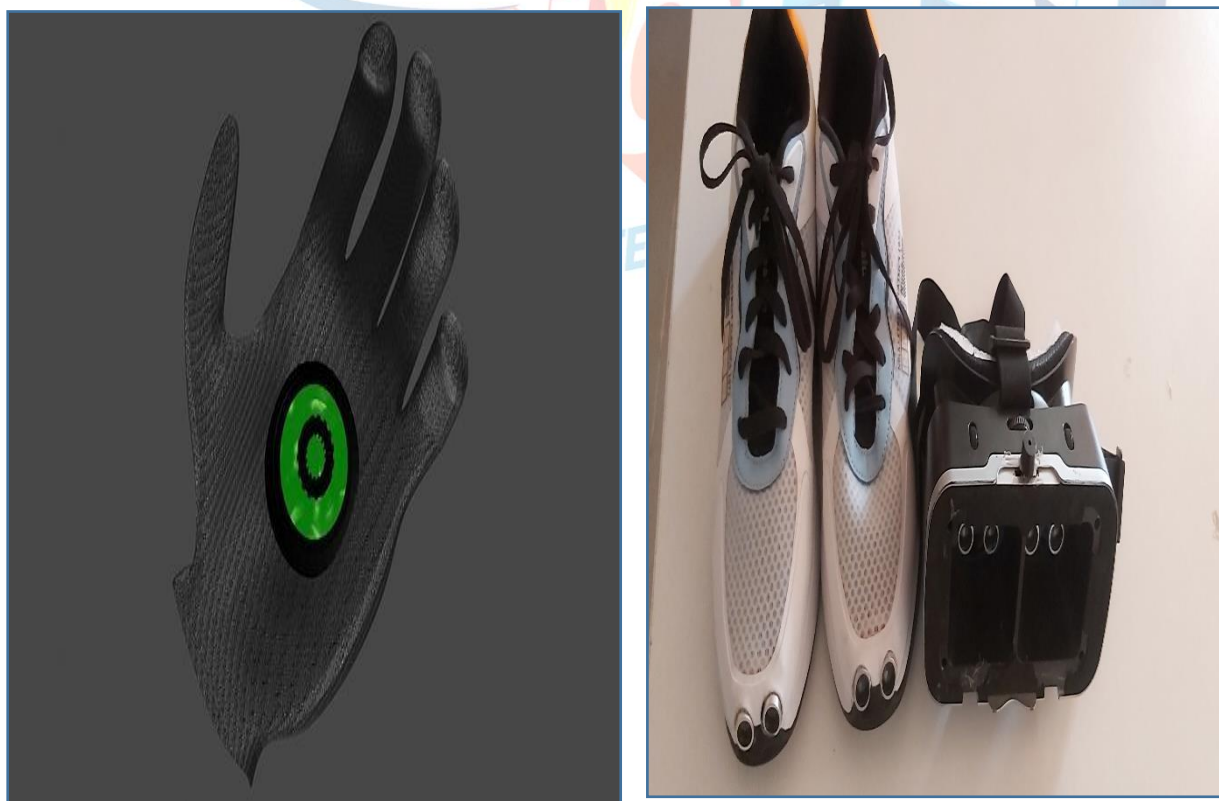


IMAGE NO.9: THE SECOND PROTOTYPE (THE GLOVES ARE NOT MADE YET, WE ARE WORKING ON THAT)

```
//This code is for smart shoes

float getDistance(int trig,int echo){
    pinMode(trig,OUTPUT);
    digitalWrite(trig,LOW);
    delayMicroseconds(2);
    digitalWrite(trig,HIGH);
    delayMicroseconds(10);
    digitalWrite(trig,LOW);
    pinMode(echo, INPUT);
    return pulseIn(echo, HIGH)/58.0;
}

void setup() {
    pinMode(4, OUTPUT);
}

void loop() {
    if((getDistance(2, 3) < 50)) {
        digitalWrite(4, true);
    }
    else {
        digitalWrite(4, false);
    }
}
}
```



*IMAGE NO.10: A SAMPLE OF THE CODE WRITTEN IN "ARDUINO IDE" PROGRAM FOR SMART SHOES and it's second version shoes.*



*IMAGE NO.11: TESTING THE PROTOTYPE IN BLIND'S CENTRE IN HERAT AFGHANISTAN*