Smart system for the Blind

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***Abstract*—The Smart Glasses System is a device whose prime goal is to help the blind person move more freely and easily without any difficulties. The system will also include a Smart Cap which will detect the user temperature and alert if it exceeds. The purpose of this system basically is to help the virtually impaired. As there are multiple smart accessories such as smart glasses, smartwatches, etc. available in the market. But all of them are built for us. There is a significant lack of technology to aid the physically challenged. We wanted to build something that is useful for visually challenged people. So, we designed this low-cost system that can be used to help the visually impaired.**

I. INTRODUCTION

The human eye is an organ that gives us a sense of sight, allowing us to see the surrounding world, interpreting shapes, colors, and dimensions of objects by processing the reflection of light. Good vision is critical and essential to conducting daily life as it is required in countless activities such as reading, watching, communicating, working, etc.

Vision impairment is a term used to describe limited eyesight that cannot be corrected with eyeglasses, contact lenses, or eye surgery. The cause of impairments may be triggered by age-related macular degeneration, glaucoma, cataract, diabetic retinopathy, etc. The loss of vision makes it hard to carry out a daily task.

According to the World Health Organization (WHO), in 2021, there were approximately 253 million people with vision impairments, among whom 36 million are blind [1]. Vision impairment directly impacts the quality of life since the absence of vision reduces proficiency in various activities. For instance, different types of assistive devices have been proposed to facilitate mobility and living of the visually impaired with the advancement in modern technologies.

Visually impaired people do lead a normal life with their style of living. Social and infrastructural challenges are a major problem for them. Navigating around places is the biggest challenge for a blind person, especially a person with complete loss of vision. The blind person must be informed or asked about the changes made around them if they have a visitor or a person living with them. There is a significant lack of technology to aid the physically challenged. We wanted to build something useful for visually challenged people.

In this paper, we develop low-cost Smart Glasses which will help visually paired people navigate more easily. Also, the system will have a smart cap that will prevent the user from getting a heat stroke with its smart early notification ability. Our objective is to build a system that will help the visually blind user to move about and it will also keep track of the temperature of the user by using the LM-35 temperature sensor and Dht11 temperature and humidity sensor.

II. LITERATURE SURVEY

In[1] this paper the author has proposed low-cost smart glasses for the blind. With the help of this device, the blind person can feel the obstacle in front of him easily and this can save them from accidents. This product can be bought at a very low price rate. This product has been built with the help of waste. This makes blind people independent. These “SMART GLASSES” are designed for blind people. Obstacle detection by the SONAR sensor concept has been used here. The distance of the obstacle is sent to the Arduino as soon as the obstacle is detected by the sensor. The distance is converted into centimeters from milliseconds and check whether the distance of the obstacle is less than 3m, if yes, then we send the output through a buzzer. The beeping frequency of the buzzer is indirectly proportional to the distance of the obstacle from a human.

In [2]this paper, we propose a compact and lightweight transmission system that assists the blind in interpreting signs. Communication will be based on wireless transmission over the visible light frequency band. Our objective is to make them simple and low cost so that they can be easily accessible to everyone regardless of their financial background. The system is designed so that the complexity is put to the other edge. The platform in this paper composes of a pair of smart glasses that can read illuminated signs which send out warnings to keep aware of the surrounding environment.

In [3] this paper, they proposed a unique smart glass for visually impaired people to overcome their traveling difficulties. It could detect the obstacle and measure the distance perfectly using the ultrasonic sensor and a micro-controller. After receiving information from the environment, it passes to the blind person through a headphone. This paper presents a unique smart device for visually impaired users,

which can help them to travel anytime avoiding any kinds of obstacles indoor and outdoor environment. Our proposed device is more comfortable and less expensive. The ultrasonic sensors are used in this device which is small, light in weight, and consume less power thus user friendly.

In [4] this paper presents an indoor navigation wearable system based on visual markers recognition and ultrasonic obstacles perception used as audio assistance for blind people. In this prototype, points of interest in the environment were identified by the visual markers; additionally with the information obtained in real-time by sensors the location status is enriched. For indicating the distance and direction between closer points that building a virtual path using a map that lists these points is used. Glasses built with sensors like RGB camera, ultrasonic, magnetometer, gyroscope, and accelerometer are also worn by the blind user. The results show that increased quality in indoor navigation directed to the blind users has a lot of gaps, room for improvement and that the approaches used are promising.

In [5] this paper presents a novel application, Heat Watch, which predicts heatstroke and prevents heatstroke by ensuring users breaking and water intake. The application estimates user's core temperature based on a human thermal model and vital sensors equipped with smartwatches. We also designed the application to track users' water intake by assuming to apply existing activity recognition techniques to acceleration sensors inside a smartwatch. The results have revealed our method can instantly detect high temperatures exceeding 38.0! n with over 0.7 recall. The result also showed precision and recall dramatically increase when we accept some error of warning timing.

In [6] this paper heatstroke can cause great harm to the human body when exercising in a high-temperature environment. However, a runner is not usually aware that a heat stroke is occurring as they ignore important physiological warnings. To solve this problem, using a wearable heat stroke detection device (WHDD), this study evaluates a runner's risk of heat stroke injury. Furthermore, the WHDD uses some filtering algorithms that are designed to correct the physiological parameters. Several people were chosen to wear the WHDD while conducting the exercise experiment to verify the effectiveness of the WHDD and investigate the features of these physiological parameters. The experimental results show that the WHDD can identify high-risk trends for heatstroke successfully from runner feedback of the uncomfortable statute and can effectively predict the occurrence of a heat stroke, thus ensuring safety.

III. PROPOSED SYSTEM

A. Smart Glasses

The 1st block diagram of our proposed model is shown in Fig.1. The system for the smart wearable glasses consists of 3 Ultrasonic Sensors, battery, Arduino Pro Mini, DF Player mini, DF Robot, 3,5mm Audio jack, vibrating motor, buzzer and a slide switch. Three ultrasonic sensors are placed left side, front side, and right side of the wearable device for perfect detection. In this way, an obstacle can be detected from three sides. The DF Robot DF Player mini gives the sound as per the direction of the obstacle from the man, a central processing unit comprising of Arduino Pro Mini which takes the information from the sensor about the obstacle distance and processes the information according to the coding done and sends the output through the DF-Robot DF Player mini and a vibrating motor, the power supply is given to the central a unit that distributes the power to different components. The sensor is mounted in between the top bar and bridge present in optical glasses. As a result, the visually impaired person can visit any place without having any difficulties such collide to others.

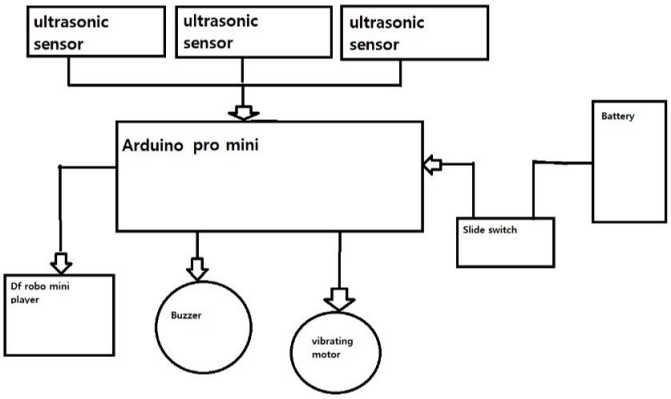

Fig. 1. Block Diagram of Smart Glasses

B. Smart Cap

The 2nd block diagram of our proposed model is shown in Fig.2. The system consists of a power supply, Arduino mega, LM35, DHT-11, and a buzzer. The LM35 temperature sensor is used to detect the temperature, DHT-11 sensor is used to detect both the temperature and humidity of the user. It also contains a Power supply, Arduino mega, and a buzzer. The DHT-11 and LM35 sensor send the reading to the Arduino mega and further, it tests the reading for the particular sensor. If the reading exceeds the specific value, the buzzer beeps. The basic idea behind the smart cap is, by using it the number of people getting heatstroke can be reduced giving a pre-notification.

IV. PROPOSED METHODOLOGY

A. PROBLEM DEFINITION

Blind people face a lot of problems in their day-to-day life. The biggest challenge for a blind person, especially the one with complete loss of vision, is to navigate around places. During summer, most people are busy and mostly ignore the effect of temperature on the body. 2020 was the second warmest year on record based on NOAA's temperature data, and land areas were recorded warm. The 10 warmest years

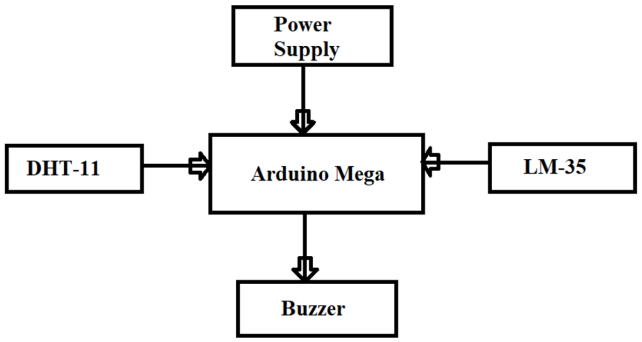

Fig. 2. Block Diagram of Smart Cap

on record have occurred since 2005. Therefore, the number of heatstrokes will increase gradually. The Smart Cap will help prevent such phenomena.

B. PROPOSED ALGORITHM

Description based recommendation: A smart ultrasonic glasses for blind people comprises of a pair of wearable glasses, ultrasonic sensors - HC-SR04 for detection of obstacles in the way of blind man, a DF Robot DF Player mini give the sound as per the direction of the obstacle from the man, a central processing unit comprising of Arduino Pro Mini 328 which takes the information from the sensor about the obstacle distance and processes the information according to the coding is done and sends the output through the DF-Robot DF-Player mini and a vibrating motor, power supply is given to the central unit which distributes the power to different components. The sensor is mounted in between the top bar and bridge present in optical glasses. There is a smart cap also included in this system which detects the temperature of the user and the humidity using sensors like DHT-11 and LM-35. If the temperature exceeds the limit stored the buzzer will start to create sound. And via the Bluetooth module (HC-05) an alert will be sent to the user on their mobile on an app and make the user aware of the increase in temperature

C. FEATURES OF PROPOSED SYSTEM

We are proposing to develop a device that will help blind people move around more freely. It will give the user information of how far an object is accurately in centimeters via ultrasonic sensors. This device will be price efficient and user-friendly. The project will also contain a smart cap consisting of a Bluetooth module to suffice the need for a wireless system. The system will use an LM-35 Temperature sensor and DHT-11 Temperature and Humidity sensor which will notify the user via. Buzzer when the conditions around are extreme enough to trigger a heatstroke.

V. IMPLEMENTATION

The system starts after you turn on the switch. The ultrasonic and the DHT-11 sensors then start taking input and sending the temperature and distance data to the Arduino board. There are three ultrasonic sensors (one for left, one for center, one for right). Each sensor will take three different values simultaneously. The Arduino board then converts the distance in centimeters and the temperature in degrees Celsius. The distance into centimeters is then sent to the DF Robo mini player which then lets the user know the value through any input component like headphones. The data from DHT-11 is first analyzed by the Arduino board and if the temperature increases or decreases by the default value stored then it triggers the buzzer letting the user know the temperature change.

VI. RESULTS

The implementation is based on a smart-glasses and a smart cap. The glasses will be used by visually impaired users. Also, the smart glasses will be having a detachable smart cap to protect the user from getting a heat stroke. Low-cost smart glass that can be used to help the visually impaired move about more easily. The Smart cap prevents heat stroke with early notification ability. The device can notify the user when the temperature increases above the stored basic value via Buzzer. This can be used when the visually paired user goes in outdoor.

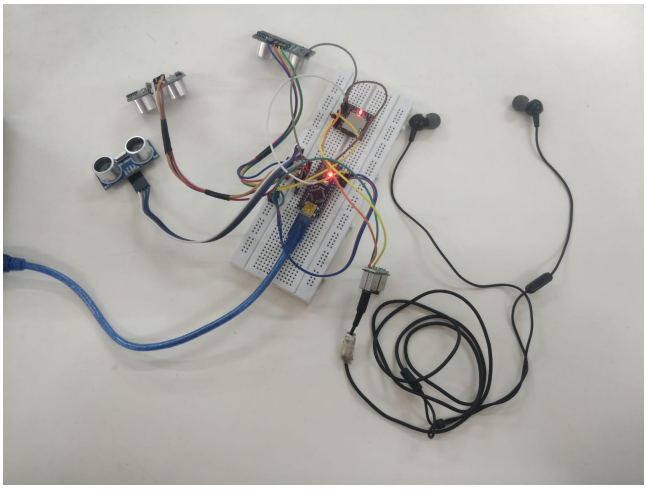

Fig. 3. Result1

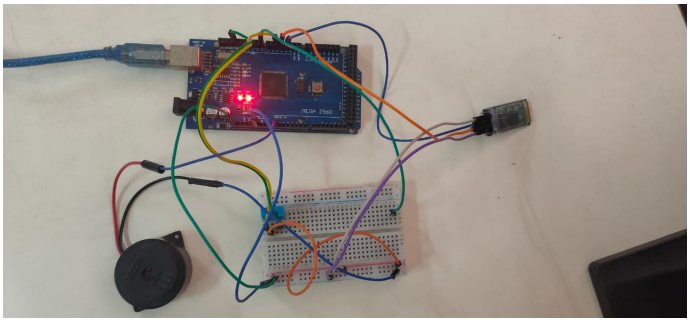

Fig. 4. Result2

VII. CONCLUSION

This project aims at developing an application that aids the blind in being a help to them. A smart guiding device for

visually impaired users, which can help them move safely and efficiently in a complicated indoor environment. Also, the smart cap will help prevent them from getting a heat stroke. The sensors used in this system are simple and with low cost, making it possible to be widely used in the consumer market. The Future Scope is that this system can be improved by including other sensors to measure many more certain parameters in the body and Location tracking can be added.

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