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Belagavi, Karnataka-590 018

A

Mini Project Report

On

"BLIND GLOVE WITH COLOR DETECTION"

Submitted

in partial fulfillment of the requirement for the award of the Degree of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

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DECLARATION

We the members of the mini project team, studying in the VI semester of Electronics and Communication Engineering, Vidyavardhaka College of Engineering, hereby declare that the entire mini project titled **"BLIND GLOVE WITH COLOR DETECTION"** has been carried out by us independently under the guidance of **Prof. Kavyashree .B ,** Department of Electronics and Communication Engineering, Vidyavardhaka College of Engineering. This mini project work is submitted to the Visvesvaraya Technological University, Belagavi, in partial fulfilment of the requirement for the award of the degree of **Bachelor of Engineering** in **Electronics and Communication Engineering** during the academic year 2022-2023.

This mini project report has not been submitted previously for the award of any other degreeor diploma to any other Institution or University.

Place: Mysuru

Date:10/07/2023

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ABSTRACT

The Blind Glove with Color Detection and Voice Module is an innovative assistive technology designed to address the challenges faced by visually impaired individuals. Historically, individuals with visual impairments have relied on tactile cues and assistance from others to navigate and interact with their environment. However, these methods often limit their independence and autonomy.

Our project aims to empower visually impaired individuals by introducing a wearable glove equipped with a color sensor and advanced color detection algorithms., with the help of color sensor the glove can accurately identify and differentiate colors. The detected colors are then conveyed to the user through a voice module, providing audio feedback in a clear and concise manner.

TABLE OF CONTENTS

Acknowledgements	i
Abstract	ii
Index	iii
List of Acronyms	iv

INDEX

CHAPTER 1 INTRODUCTION

1.1 Background	01
1.2 Introduction	01
1.2.1 Characteristics	03
1.3 Problem Statement	03
1.5 Motivation	03
1.6 Existing System	04

CHAPTER 2 METHODOLOGY

CHAPTER 3 RESULTS AND DISCUSSION

CHAPTER 4 ADVANTAGES ,DISADVANTAGES AND APPLICATIONS

CHAPTER 5 CONCLUSION AND FUTURE SCOPE

REFERENCES

APPENDIX

CHAPTER 1

INTRODUCTION

The Blind Glove with Color Detection project with a voice module aims to address the challenges faced by visually impaired individuals in color recognition and communication. Visual impairment significantly impacts the ability to perceive and differentiate colors, which are essential for various daily activities. This project combines wearable technology, color detection algorithms, and voice synthesis to create a comprehensive solution that enhances color perception and facilitates independent interaction with the environment.

The introduction section provides an overview of the project, outlining its objectives, scope, and significance. It establishes the context for the development of the Blind Glove with Color Detection system and sets the stage for understanding its potential impact on the lives of visually impaired individuals.

1.1 Background

Visual impairment is a prevalent condition that affects millions of individuals worldwide. People with visual impairments encounter challenges in recognizing and distinguishing colors, which can hinder their ability to perform everyday tasks effectively. Traditional approaches to color recognition for visually impaired individuals have relied on tactile cues or assistance from sighted individuals, but these methods often lack real-time functionality and independence.

1.2 Introduction

The Blind Glove with Color Detection project seeks to bridge the gap in color recognition and communication for visually impaired individuals. By combining wearable technology, color detection algorithms, and voice synthesis, the project aims to provide a portable and user- friendly solution that enables real-time color identification and audio feedback.

The glove-based color detection system integrates specialized color sensors and image processing algorithms to capture and analyze colors in the user's surroundings. The captured color data is processed using an embedded microcontroller, which then triggers the voice module to generate audio feedback based on the detected colors.

1.2.1 Characteristics

The Blind Glove with Color Detection system possesses key characteristics that make it a valuable tool for visually impaired individuals. It offers real-time color recognition, enabling immediate identification of colors in the environment. The system provides audio feedback through a voice module, converting the detected colors into synthesized speech. The glove is designed to be portable, lightweight, and comfortable to wear, ensuring ease of use and convenience for the user.

1.1 Problem Statement

The inability to accurately perceive and differentiate colors poses significant challenges for visually impaired individuals. These challenges manifest in everyday activities such as selecting clothing, matching items, and understanding visual information. The lack of real-time

Color recognition solutions tailored to the needs of visually impaired individuals hinders their independence and limits their ability to engage with the environment effectively

1.5 Motivation

The motivation behind the Blind Glove with Color Detection project stems from the desire to empower visually impaired individuals and enhance their quality of life. By providing a wearable device that combines color detection and audio feedback, the project aims to bridge the gap in color recognition and facilitate independent decision-making and engagement with the surroundings. The project seeks to empower visually impaired individuals by providing them with a tool that promotes independence, autonomy, and inclusivity.

1.6 Existing System

The existing systems for color recognition in visually impaired individuals often lack real-time functionality, are cumbersome, or rely on external assistance. This project aims to overcome the limitations of existing systems by integrating color detection capabilities directly into a wearable glove. The integration of a voice module further enhances the user experience by providing immediate and accurate audio feedback based on the detected colors.

The Blind Glove with Color Detection project offers a promising solution to the challenges faced by visually impaired individuals in color recognition and communication. By leveraging wearable technology and voice synthesis, this project aims to empower visually impaired individuals with enhanced color perception, independence, and accessibility.

1.7 Components Used

- DFPlayer Mini Player Module
- GY-31 TCS3200 Colour Sensor
- Arduino Compatible UNO R3
- Speaker
- Jumper Wires
- Breadboard
- 1K Resistor
- Micro SD Card with Reader

CHAPTER 2

METHODOLOGY

The block diagram of blind glove with colour detection using Arduino uno, colour sensor, and digital file miniplayer is as shown in fig2.1.Here the input is given to the color sensor which detects the colored object and sends the information to Arduino uno board which is redirected to the DFmini player. This sends the respected audio file to speaker. Resulting in playing the audio through speaker.

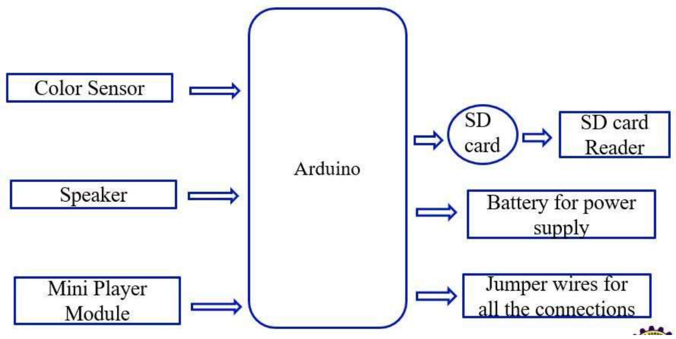


Fig 2.1: Block diagram of blind glove with colour detection

The work flow of blind glove is as follows:

Design and Planning

- Clearly defined the project objectives based on user requirements.
- Developed a design plan, considering component placement and glove ergonomics.
- Planned the wiring and connections between the components.

Component Integration

- Connected the GY-31 TCS3200 Colour Sensor to the Arduino UNO R3 usingappropriate jumper wires and pins.
- Established connections between the DFPlayer Mini Player Module and the ArduinoUNO R3.
- Connected the speaker to the DFPlayer Mini Player Module.

Software Development

- Installed the required libraries for the GY-31 TCS3200 Color Sensor and DFPlayerMini Player Module in the Arduino IDE.
- Developed the software code for the Arduino UNO R3 to read color data from thesensor and control the voice module.
- Implemented color detection algorithms using the sensor data to identify differentcolors.
- Programmed the Arduino to send commands to the DFPlayer Mini Player Module forplaying corresponding audio feedback.

Calibration and Testing

- Calibrated the GY-31 TCS3200 Color Sensor by adjusting gain and frequency scalingfactors.
- Uploaded the software code to the Arduino UNO R3.
- Conducted testing to ensure accurate color detection and audio feedback for differentcolors.
-

Glove Assembly

- Assembled the components onto a breadboard or suitable circuit board as per thedesign plan.
- Placed the Arduino UNO R3 and color sensor securely within the glove.
- Properly connected and positioned the speaker within the glove.

Power Management

- Provided a suitable power source for the Arduino UNO R3 and the DFPlayer MiniPlayer Module.
- Considered power supply or battery options that met the components' requirementsand provided sufficient runtime

As depicted, the colour sensor detects the objects color and this information is sent to Arduino uno ,which redirects the signal to DF miniplayer .As shown in fig2.2, this mini player connectedto speaker , reads the corresponding connected audio file. This is heard using speaker.

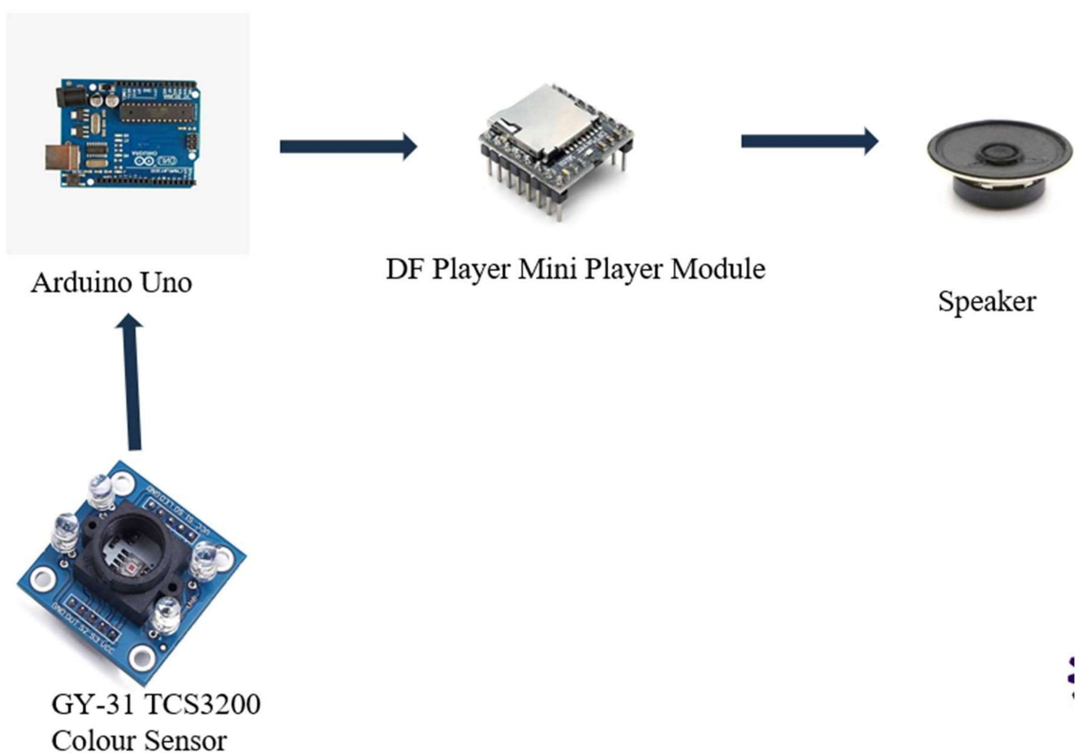


Fig2.2: Flow Chart of color detector glove

CHAPTER 3

RESULTS AND DISCUSSION

Results

The working model of our project is shown in fig 3.1.
Color Detection Accuracy: The effectiveness of the color detection algorithm and the GY-31 TCS3200 Color Sensor would impact the accuracy of color identification. The results could show the system's ability to accurately identify a wide range of colors under various lighting conditions.

Voice Module Performance: The voice module's integration and audio feedback quality would be a significant aspect to evaluate. The results could indicate the clarity, intelligibility, and timeliness of the audio feedback provided by the system.

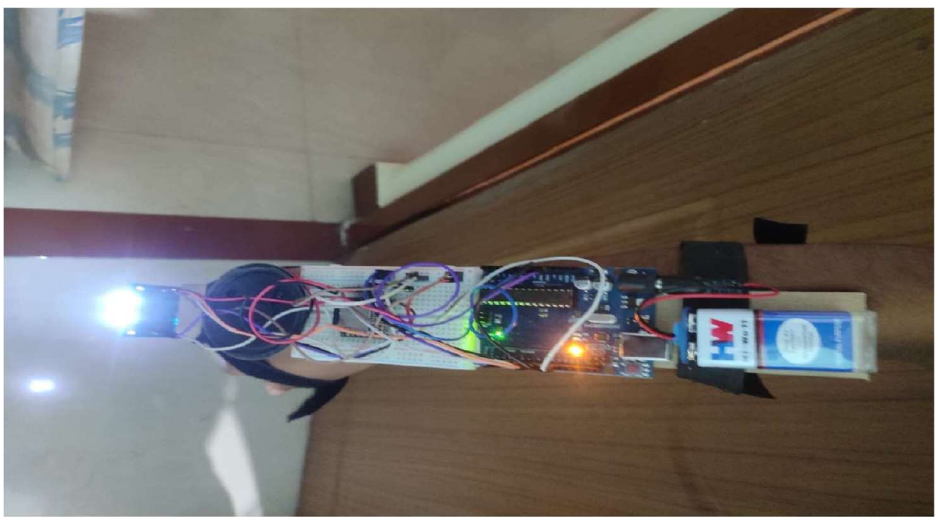


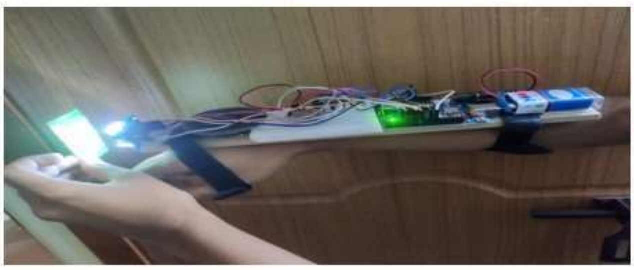
Fig3.1 :Working Model

The blind glove with color detection and voice module holds significant potential in assisting visually impaired individuals in identifying colors and enhancing their independence. While specific results and discussions based on real-world implementation are not available, the projected benefits and limitations provide valuable insights.

The system's ability to accurately detect colors and provide real-time audio feedback can greatly improve color perception and enable visually impaired individuals to make independent decisions and choices based on color information. This technology has applications in various domains, including daily activities, navigation, education, safety, and rehabilitation.

However, it is crucial to address the limitations and challenges associated with the system. These include color detection accuracy, hardware and software complexity, user adaptation, and comfort considerations. The development and refinement of color detection algorithms, hardware design, and user interfaces are essential to overcome these limitations and improve the overall user experience.

User feedback and satisfaction play a vital role in shaping the blind glove system's success. Gathering feedback from visually impaired individuals and incorporating their input into future iterations of the system can lead to enhancements in usability, comfort, and functionality.



Green colour detection

Blue colour detection

Red colour detection

Fig3.2: Colour Detection

The glove is designed to detect 3 colors , they are blue, red, green .The glove when detectsthe color its audio file from DF miniplayer is played. The fig 3.2 shows the color detection results detecting green, blue, red respectively. When a green colored object is placed in front of sensor, the audio file pronouncing green is made to play, which is as depicted in first figure in fig3.2.Then similarly when blue and red color is sensed by the sensor , the audio file pronouncing blue and red is audible through speaker.

CHAPTER 4

ADVANTAGES , DISADVANTAGES AND APPLICATIONS

Advantages of the Blind Glove with Color Detection and Voice Module

- Enhanced Color Perception: The blind glove provides visually impaired individualswith the ability to perceive and differentiate colors, allowing them to engage more effectively with their surroundings and perform color-dependent tasks.

- Independence and Empowerment: By accurately detecting and providing audio feedback on colors, the blind glove promotes independence and empowers visually impaired individuals to make independent decisions and choices based on color information.

- Improved Safety and Accessibility: The glove can enhance safety by detecting color- coded indicators or warnings, enabling users to navigate and interact with their environment more securely. It also promotes accessibility by providing access to color- based information and learning materials.

- Real-Time Feedback: The glove offers real-time feedback, allowing users to receive immediate audio information about detected colors. This feature enables quick decision-making and facilitates efficient interaction with the environment.

- Integration with Assistive Technologies: The blind glove can be integrated with other assistive technologies, such as smartphones or smart home devices, expanding its functionality and interoperability with existing accessibility tools.

Disadvantages and Limitations of the Blind Glove with Color Detection and Voice Module

- Color Detection Accuracy: The accuracy of color detection may vary based on environmental conditions, lighting variations, or object properties. The system's reliability in accurately identifying colors in all situations may require further refinement.

- Limited Color Range: The blind glove's color detection capabilities may be limited toa specific range of colors or shades, potentially excluding certain colors from detection or misidentifying them.

- Hardware and Software Complexity: The integration and development of the hardware components, software code, and algorithms can be complex, requiring expertise in electronics, programming, and signal processing. This complexity may pose challenges during development, maintenance, or troubleshooting.

- Design and Comfort Considerations: The glove's design and ergonomics need to be carefully addressed to ensure user comfort and ease of use. Balancing functionality withwearable comfort can be a challenge during the design process.

- **Color Identification**

The primary application of the blind glove with color detection and voice module is to assistvisually impaired individuals in identifying colors. By detecting and recognizing colors, the system provides audio feedback to the user, allowing them to differentiate between various colors in their environment. This can be particularly useful in daily activities such as selecting clothing, matching items, or distinguishing objects.

- **Independent Navigation**

The blind glove can aid in independent navigation for visually impaired individuals by detecting and providing audio feedback on colored landmarks or indicators. For example, theglove can identify colored signs, doors, or landmarks to assist in wayfinding and orientation.

- **Accessibility in Education**

The blind glove can be utilized in educational settings to enhance access to color-based learning materials. By providing real-time color identification and audio feedback, visually impaired students can actively participate in science experiments, art classes, or any subjectinvolving color-related concepts.

- **Assistive Technology Integration**

The blind glove's color detection and voice module can be integrated with other assistive technologies to create a more comprehensive solution for visually impaired individuals. Forinstance, the glove can communicate with smartphone apps or smart home devices, allowingusers to receive color-related information or control compatible devices using voice commands.

- **Personal Safety**

In certain situations, the blind glove can enhance personal safety by identifying color-coded safety indicators or warnings. For example, it can detect warning signs with different coloredbackgrounds or alert the user to potential hazards identified by color-coded systems (e.g., construction areas, traffic signals, or caution signs).

- **Rehabilitation and Therapy**

The blind glove can also be employed in rehabilitation and therapy programs for visually impaired individuals. By actively engaging with color detection and audio feedback, userscan improve their cognitive skills, sensory perception, and color recognition abilities.

- **Research and Development**

The blind glove with color detection and voice module can be utilized as a research tool in areas such as human-computer interaction, computer vision, and assistive technology development. Researchers can study the efficacy of different color detection algorithms, voice module integration techniques, and user experiences to advance the field of accessibletechnology for visually impaired individuals.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

In conclusion, the blind glove with color detection and voice module presents a promising solution for empowering visually impaired individuals to interact with their environment, improve safety, and enhance their overall quality of life. Continued research, development, and user-cantered design efforts will contribute to the ongoing improvement and effectiveness of this assistive technology.

5.1 Future scope

Looking ahead, further advancements in color detection algorithms, machine learning techniques, and hardware miniaturization can unlock additional possibilities for the blind glove system. The integration with other assistive technologies and exploring wider accessibility options can broaden its impact and reach.

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LIST OF ACRONYMS

- RGB - Red, Green, Blue
- DF Player - Digital File Player
- Mini Player Module - MP3 player module
- GY-31 - Grove Color Sensor
- TCS3200 - Texas Instruments Color Sensor
- UNO R3 - Arduino UNO Revision 3
- SD - Secure Digital
- IDE - Integrated Development Environment

SOFTWARE CODE:

```
#include  "SoftwareSerial.h"
#include
"DFRobotDFPlayerMini.h"

SoftwareSerial mySoftwareSerial(10, 11); //
RX, TXDFRobotDFPlayerMini myDFPlayer;
void printDetail(uint8_t type, int value);

#define S0 4
#define S1 5
#define S2 7
#define S3 6
#define sensorOut 8

int frequency = 50;
int color=0;

void setup() {
 mySoftwareSerial.begin(9600);
 Serial.begin(115200);

 pinMode(S0, OUTPUT);
 pinMode(S1, OUTPUT);
 pinMode(S2, OUTPUT);
 pinMode(S3, OUTPUT);
 pinMode(sensorOut, INPUT);
 //Setting frequency-scaling
 digitalWrite(S0, HIGH);
 digitalWrite(S1, LOW);

 Serial.println();
 Serial.println(F("Initializing
 DFPlayer..."));

 //Use softwareSerial to communicate with
 MP3if
 (!myDFPlayer.begin(mySoftwareSerial)) {
 Serial.println(F("Unable to begin:"));
  Serial.println(F("1.Please recheck the
  connection!"));Serial.println(F("2.Please insert
  the SD card!")); while(true);
 }
 Serial.println(F("DFPlayer Mini online."));

 //Set volume value (From 0 to
 30)myDFPlayer.volume(30);
}
```

```
Void play() {
 color = readColor();
 delay(0);
 switch (color) {
  case 1:
  Serial.println("RED
  detected!");
  myDFPlayer.play(2);
  break;
  case
  2:
  Serial.println("BLUE
  detected!");
  myDFPlayer.play(1);
  break;
  case
  3:
  Serial.println("GREEN detected!");
  myDFPlayer.play(3);
  break;
  case
  0:
  break;
 }
 color=0;
}


//Read-Color Function
int readColor() {

 //Setting red filtered photodiodes to be
 readdigitalWrite(S2, LOW);
 digitalWrite(S3,  LOW);

 //Reading the output frequency
 frequency = pulseIn(sensorOut,
 LOW);int R = frequency;

 //Printing the value on the serial monitor
 Serial.print("R= "); //printing name
 Serial.print(frequency); //printing RED color
 frequencySerial.print(" ");

 //Setting Green filtered photodiodes to be
 readdigitalWrite(S2, HIGH);
 digitalWrite(S3,  HIGH);
```

```
//Reading the output frequency
frequency = pulseIn(sensorOut,
LOW);int G = frequency;

//Printing the value on the serial monitor
Serial.print("G= "); //printing name
Serial.print(frequency);  //printing RED color
frequency


Serial.print(" ");

//Setting Blue filtered photodiodes to be
readdigitalWrite(S2, LOW);
digitalWrite(S3, HIGH);

//Reading the output frequency
frequency = pulseIn(sensorOut,
LOW);int B = frequency;

//Printing the value on the serial monitor
Serial.print("B= "); //printing name
Serial.print(frequency); //printing RED color
frequencySerial.println(" ");

if(R<260 & R>230 & G<860 & G>800){
  color = 1; // Red
}
if(G<420 & G>370 & B<350 & B>305){
  color = 2; // Blue
}
if(R<450 & R>420 & G<420 & G>390){
  color = 3; // Green
}
return color;
}
```