



COMSATS University Islamabad (CUI)

**Project Proposal
(SCOPE DOCUMENT)**

for

Smart Glass
Version 1.0

By

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SCOPE DOCUMENT REVISION HISTORY

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Table of Contents

Abstract.....	3
1. Introduction.....	3
2. Problem Statement.....	3
3. Problem Solution for the Proposed System	4
4. Related System Analysis/Literature Review	4
5. Advantages/Benefits of Proposed System	5
6. Project Scope	6
7. Modules.....	6
7.1 Module 1: User Management.....	6
7.2 Module 2: Obstacles detection	6
7.3 Module 3: Image Classification	6
7.4 Module 4: Segmentation	7
7.5 Module 5: Generation of voice from text.....	7
7.6 Module 6: Detecting people emotion	7
7.7 Module 7: Measuring the distance	7
8. System Limitations/Constraints	7
9. Software Process and Design Methodology	7
10. Tools and Technologies	8
11. Project Stakeholders and Roles.....	8
12. Team Members Individual Tasks/Work Division.....	9
13. Data Gathering Approach	9
14. Concepts.....	9
15. Gantt Chart.....	10
16. Mockups.....	10
17. Conclusion	11
18. References.....	11
19. Plagiarism Report.....	12

Project Category:

- ☐ A- Problem Solving and Artificial Intelligence
- ☐ B- Image Processing

Abstract

According to the latest research, there are 285 million visually impaired people, and the problem is increasing day by day. So, developing something which can help them in their routine with minimum cost is still a developing area. We are proposing a system which will help them in their daily life at a low cost. There is plenty of projects, which are developed to help them but with limited features and mostly are not cost effective.

In this project, we proposed a system in which with the help of the latest technology we will develop smart glasses to help them in their day to day tasks. We will use navigation and detection systems to solve the mobility problems of visually impaired people. For this purpose, the system will detect the obstacles in real-time video and will alert the users through voice.

1 Introduction

Could you imagine life without eyesight? How they are living life. Many of them even can't walk without support. They are facing great problems in getting an education. Disabilities are the major problems in our societies that are increasing day by day. It attracts technology companies and researchers to make some solutions that can assist them with their daily life. We want to make a system which can help them in their daily life without any support. The smart glasses project can help them to overcome these problems. Smart glasses will assist them in walking. For a successful mobility experience, it will detect the environment in real-time and will send voice instruction to assist them. Moreover, it will assist them in reading. Smart glasses are the computing glasses with a stereo camera attached to them. The camera will be moved with the head and will capture the surrounding which the user is watching.

The main parts of our project are:

Surroundings detection: In this part camera attached to the glass will detect the surroundings and will convert this information into text.

Emotions detection: In this part system will detect the emotions of the users either they are happy, or sad.

Distance measurement: In this part distance of the obstacles will be measured with the help of stereo vision. This measure the real-time distance of the obstacles/objects.

Text to voice conversion: After detecting the objects and measuring its distance voice instruction will be given to assist them.

2 Problem Statement

Disabilities are the major problems in our societies that are increasing day by day. It attracts technology companies and researchers to make some solutions that can assist them with their daily life.

There are similar projects, e.g., smart cane, smart shoes are available in the market. These projects are very good for visually affected people, but their cost is very high due to hardware. They are not affordable for all people. There is a need for a system which can help them in their daily life with a very low cost.

The smart shoe app cannot detect the objects. In the smart cane app features like the classification of object and distance measurement from obstacles/objects are missing. Due to hardware's implementation cane and shoes are heavy to carry everywhere.

By doing this project we will learn new skills such as image processing and detection in real-time. Moreover, we learn how to convert the text into voice. We will be using the stereo vision in which we will implement some math formulas to calculate the real-time distance. We will be using API'S so it will help to learn the usage of API'S.

3 Problem Solution for the Proposed System

To overcome the problem, we are proposing a system in which we will design a system that will cost very low. This system will help visually impaired people to interact with the surroundings in new ways. They will not need any caretakers for all of their tasks.

- i- Our main purpose of the system will be to help visually impaired people. Although, it can not solve all their problems but will help them to a great extent.
- ii- Smart glasses will capture the image via a stereo camera.
- iii- Libraries will be used to classify the images after detecting and processing them.

- iv- With the help of stereo vision distance from the obstacles will be calculated and will send the information to the user.
- v- The system will convert the text into a voice message and will send it to the user through headphones.
- vi- To overcome reading problems, we will introduce the book reader in our system.
- vii- Extra featured like GPS locators, wireless charging, etc. could be added in the future.

4 Related System Analysis/Literature Review

Previously designed system for the project are:

- i- Smart cane
- ii- Smart shoes
- iii- Tap tap see

A smart cane can help people to walk more confidently. This Arduino based cane can help the people to walk with more security like it will detect the obstacles and will warn the user.

Smart shoes will guide them using GPS using and Google Maps. These shoes are impaired with the smartphone. This app keeps the records of the user where are they going.

Tap-tap see is an iOS-based app that helps visually impaired people to solve daily life problems.

Table 1: Related System Analysis with Targeted Project Solution.

Application Name	Weakness	Proposed Project Solution
<ul style="list-style-type: none"> Smart Cane 	<ul style="list-style-type: none"> It can not classify the obstacles instead tells the user that there is an obstacle. Takes time to process the whole image. 	<ul style="list-style-type: none"> Our proposed system will detect every object/obstacle. Our system will detect the objects in real-time.
<ul style="list-style-type: none"> Smart shoes 	<ul style="list-style-type: none"> It is expensive due to the hardware involved. Detect objects but do not recognize them. 	<ul style="list-style-type: none"> Our system will be cost-effective due to less hardware involved. The system will detect each object and will classify them.

<ul style="list-style-type: none"> • Tap Tap see 	<ul style="list-style-type: none"> • Works only on already captured images • Processing time is high 	<ul style="list-style-type: none"> • Works in a real-time environment. • Works very fast than other systems.
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5 Advantages of the Proposed System

Our proposed system has the following advantages over other systems.

- Our system is developed through coding and software with less hardware and it is less expensive than other systems.
- It uses python's advanced libraries, so it works very fast and detects the real-time image and processes them very fast.
- It detects and classifies all the objects and it is one of the unique features which is not available in other systems.
- Book reader is one of the great features we are providing in this system.
- It will help them to detect the currency.

6 Project Scope

Our targeted users are visually impaired people. Our system will detect the obstacles and will alert the user through voice. This feature will be achieved with the help of Yolo using open CV and pyttsx3. Moreover, it will help them to detect the people he can trust as they will be already saved in the database with their names.

The system will detect the object and will assist the user through voice. These object's classification will be stored in the database. Some advanced algorithms will be used to detect which object is harmful to the user. Moreover, this information will be used to train the system.

The parent or guardian user will easily send voice messages and know the location of the user and able to open the camera of glasses anytime. The user can also send a voice message through one click.

7 Modules

7.1 Module 1: User Management

In this module, the user will be required to log in or signup into his account to access the data from the database. In this section user's personnel data will be stored. This module's main purpose is to access the user data in case of mobile application usage.

Features of these modules will be:

- Signup
- Login
- Forgot password
- Dashboard

7.2 Module 2: Obstacles detection

In this module using python libraries, objects/obstacles will be detected through the camera in real-time video. This will be done with a stereo camera attached to the glasses. The user will be able to search real-time objects and distance of that object in surroundings.

7.3 Module 3: Image Classification

To classify the object, we will train the program. There are three techniques to classify the images:

- i- Supervised classification
- ii- Unsupervised classification
- iii- Object-based image analysis

7.4 Module 4: Segmentation

To detect a specific image from the whole scenario we will use the fragmentation techniques. In this module, we will save the user's personnel data such as the user's building, neighborhood, etc.,. For this purpose, we will use modern segmentation approaches.

7.5 Module 5: Calculating the real-time distance:

To calculate the distance from the obstacles to the user it will use the computer vision stereo and advance mathematical approaches.

7.6 Module 6: Generation of voice from the text:

In this module using the Google API's text generated from the image classification will be converted into voice and will alert the user.

7.7 Module 7: Detecting people emotions and currency:

In this module emotions of the people around the user will be detected and data will be provided to the user in the form of voice. Moreover, it will detect the currency and tells the user.

System Limitations

System limitations are given below:

- The system can detect the objects/obstacles where the user is watching. It cannot give u a view of 360 or the objects behind the user. e.g. car coming from behind.
- Our system will convert text into the English language commands only.

8 Software Process and Design Methodology

Agile software development methodology will be used for that project as changes will be required during the development. Moreover, we can get feedback from our relevant stockholders during the development. We will use an agile methodology for our project as it is flexible and good for fewer team members. The other reason for choosing this methodology that supports the incremental changes that respond to the changing. We will use object-oriented technology as we will re-use the component in our project.

9 Tools and Technologies

In this project, several tools and technologies will be used. Open cv will be used to detect real-time objects/obstacles. Then Google APIs will be used to convert the text into speech. Moreover, some products of adobe will be used for some design work.

Table 2: Tools and Technologies for the Targeted Project.

Tools And Technologies	Tools	Version	Rationale
	PyCharm	2019.3.1	IDE
	Mongo DB	5.10.2	DBMS
	Anaconda	1.9.12	Simplify package management and deployment
	MS Word	2019	Documentation
	MS PowerPoint	2019	Presentation
	Adobe XD	30.1.12.4	Mockups Creation
	Adobe Illustrator	CSC 6	Design Work
	Stereo Vision	1.0.4	Library to calculate the distance from obstacles
	Open CV	4.4.0	A computer program for real-time computer vision
	Google Text-to-Speech	1.1.8	Google API's to convert text into speech
	Technology	Version	Rationale
	Python	3.8.5	Programming language
	React native	0.63.1	Mobile app framework
	Html	5	Web Development

10 Project Stakeholders and Roles

In this project, the main stakeholders will be the student, supervisor, and the final year project committee.

Table 3: Project Stakeholders for the Targeted Project.

Project Sponsor	COMSATS University Islamabad
Stakeholder	<ul style="list-style-type: none"> • Student <ul style="list-style-type: none"> ○ Muhammad Hasnain Khan ○ Muhammad Komail • Supervisor Ms. Sajida Kalsoom • Final Year Project Committee: Evaluation of the project

11 Team Members Individual Tasks/Work Division

Table 4: Team Member Work Division the Targeted Project.

Student Name	Student Registration Number	Responsibility/ Modules
• Muhammad Hasnain Khan	• FA17-BSE-071	Module 1,2,3, 4
• Muhammad Komail	• FA17-BSE-086	Module 5,6,7

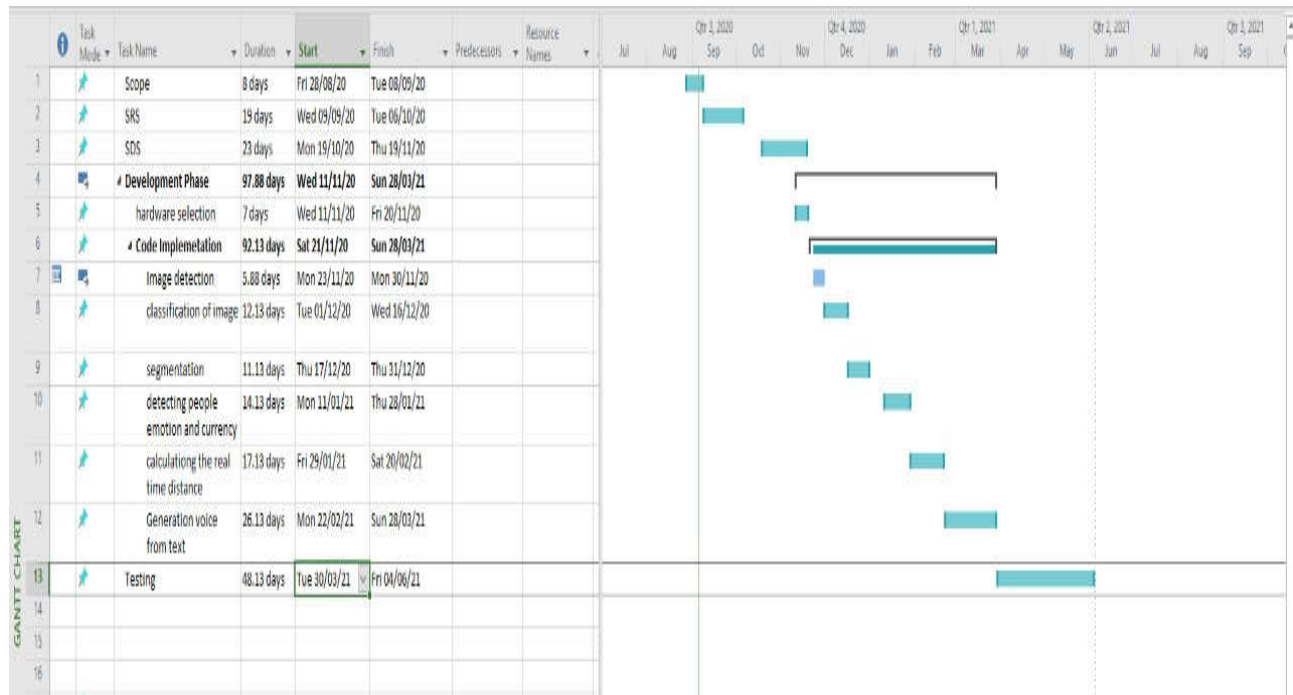
12 Data Gathering Approach

Our main data gathering approach will be researched by different researchers. Moreover, a questionnaire from the relevant persons will be our second approach for data gathering.

13 Concepts

- **Concept 1: Image detection**
In this project, we will learn to detect the objects in real-time. We will learn about image processing and analyzing videos.
- **Concept 2: computer stereo vision**
In this project, we will implement some mathematical equations in some real-life software. We will learn how to measure the distance in real-time video.
- **Concept 3: text to voice conversion Algorithms**
After capturing and detecting the image next step will be a conversion from text to audio format. For that purpose, we will use Google API.
- **Concept 4: Hardware implementation**
In this project, we will learn how to implement software in hardware to overcome the problems.
- **Concept 5: image processing and inserting into the database**
Image processing is a method to convert image into digital form and then applying some methods to get the best result.

14 Gantt Chart



15 Mockups



Figure 1: Design Mockup

16 Conclusion

This project will be a great help for visually impaired people. It will help them in their daily life and will lower their dependency on other people. Our project includes image detection, segmentation, rectification to get a better image of the object. After that converting the text into speech and alerting the user from the danger. The next step will be measuring the distance from the obstacles and then telling it to the user through voice. Moreover, our project will help them in reading. In short, our project will be helpful in every situation with a very low cost as the whole project includes software and less hardware.

17 References

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5. Plagiarism Report

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