# Guide Me
# Visual Assistant for the visually impaired


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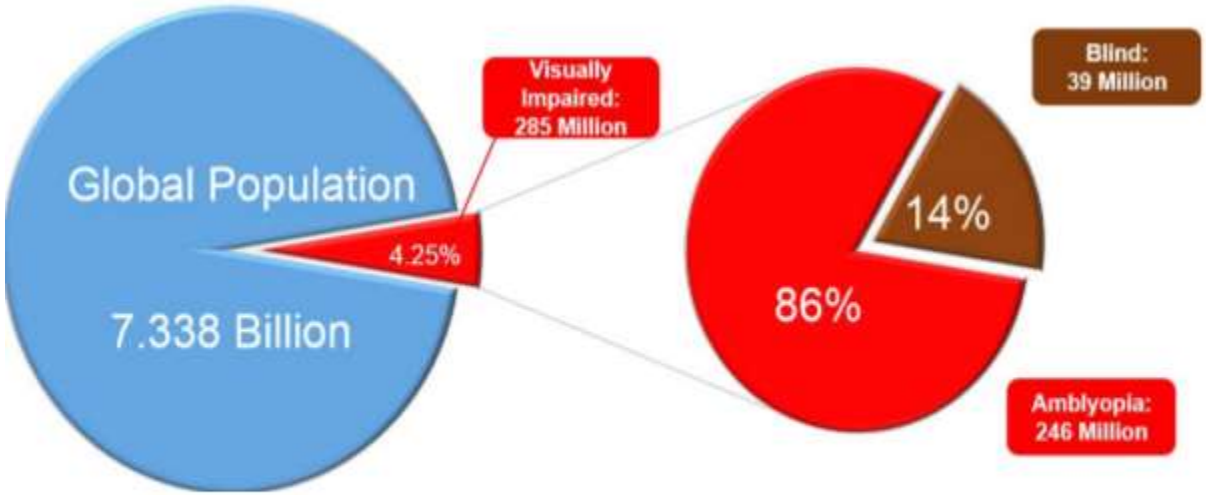
# Introduction

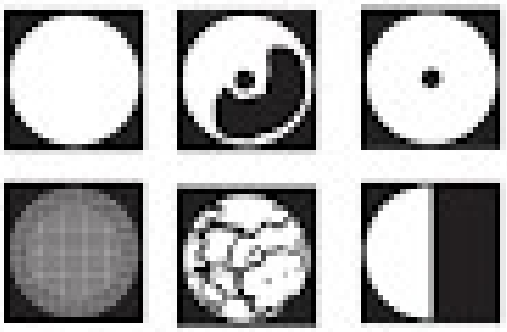
- Visual impairment is the functional limitation of the eye or eyes or the vision system.
- Globally, it is estimated that approximately 1.3 billion people live with some form of vision impairment.




Global Visually Impaired Population Statistics

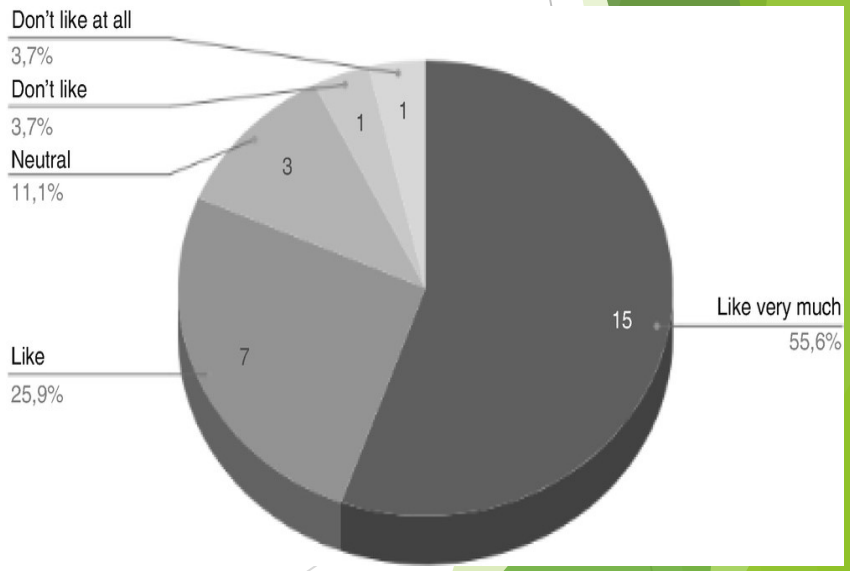
# Introduction

- Types of visual impairment:
  - Loss of visual acuity
  - Loss of visual field
  - Photophobia
  - Diplopia
  - Visual distortion or perceptual difficulties



# Motivation

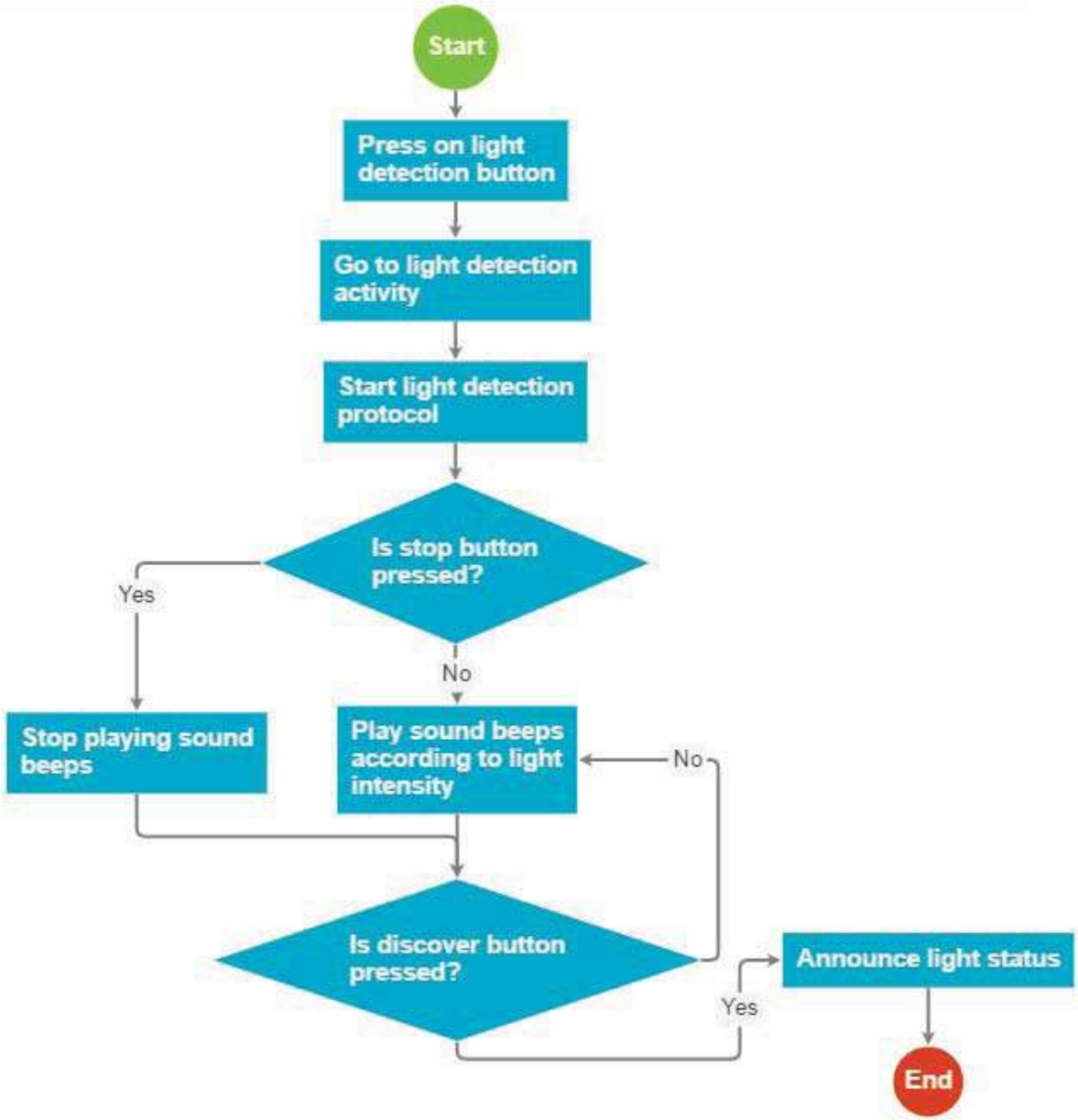
- Visually impaired or partially sighted people shall have a part in society as well as work independently.
- Visually impaired people would like to have a virtual assistance at home.
- Our work is motivated by both application domain and previous work.



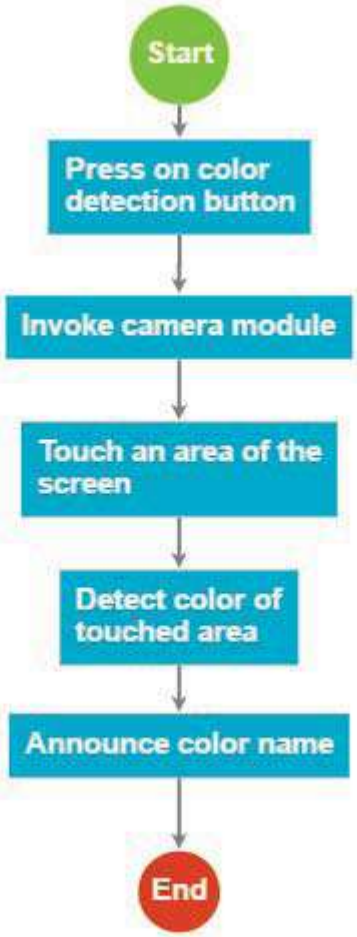
# Related Work
# 1- Intelligent Eye

- The aim of the Intelligent Eye Android mobile application is to combine several features to provide visually impaired people with high quality services.
- The application was tested by 10 people with visible impairments.
- Future work is to add more features.

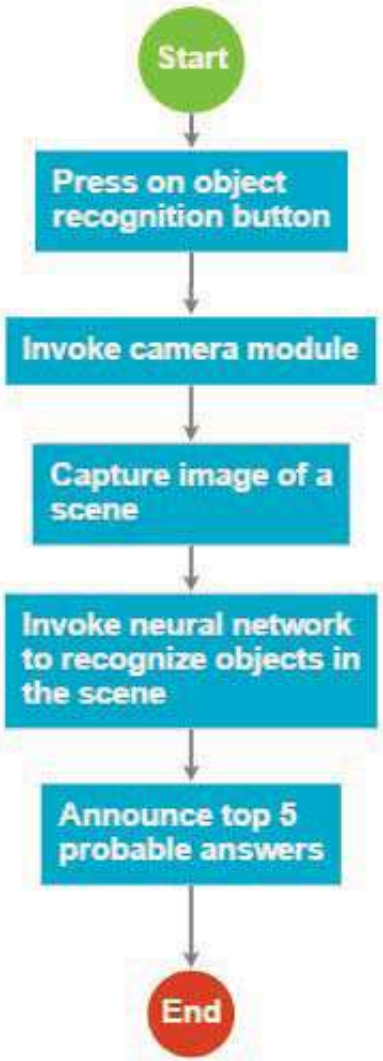
| | Average | Median | Min | Max |
|---|---|---|---|---|
| Familiarity of the interface | 4.4 | 4.5 | 3 | 5 |
| How easy is the application as a whole | 4.1 | 4 | 3 | 5 |
| How good is the performance | 3.7 | 4 | 3 | 4 |
| How is its responsiveness | 4 | 4 | 3 | 5 |
| Clarity of the prompt messages | 3.9 | 4 | 3 | 5 |



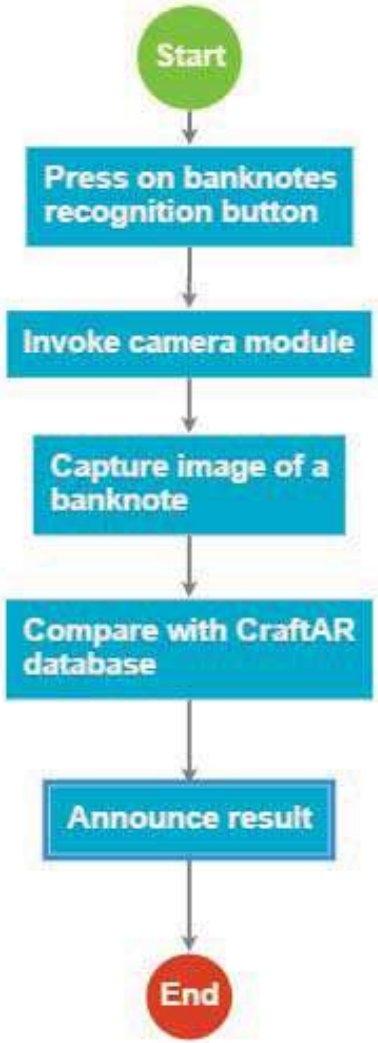

1. Light Detection




2.Color Detection




3. Object Recognition

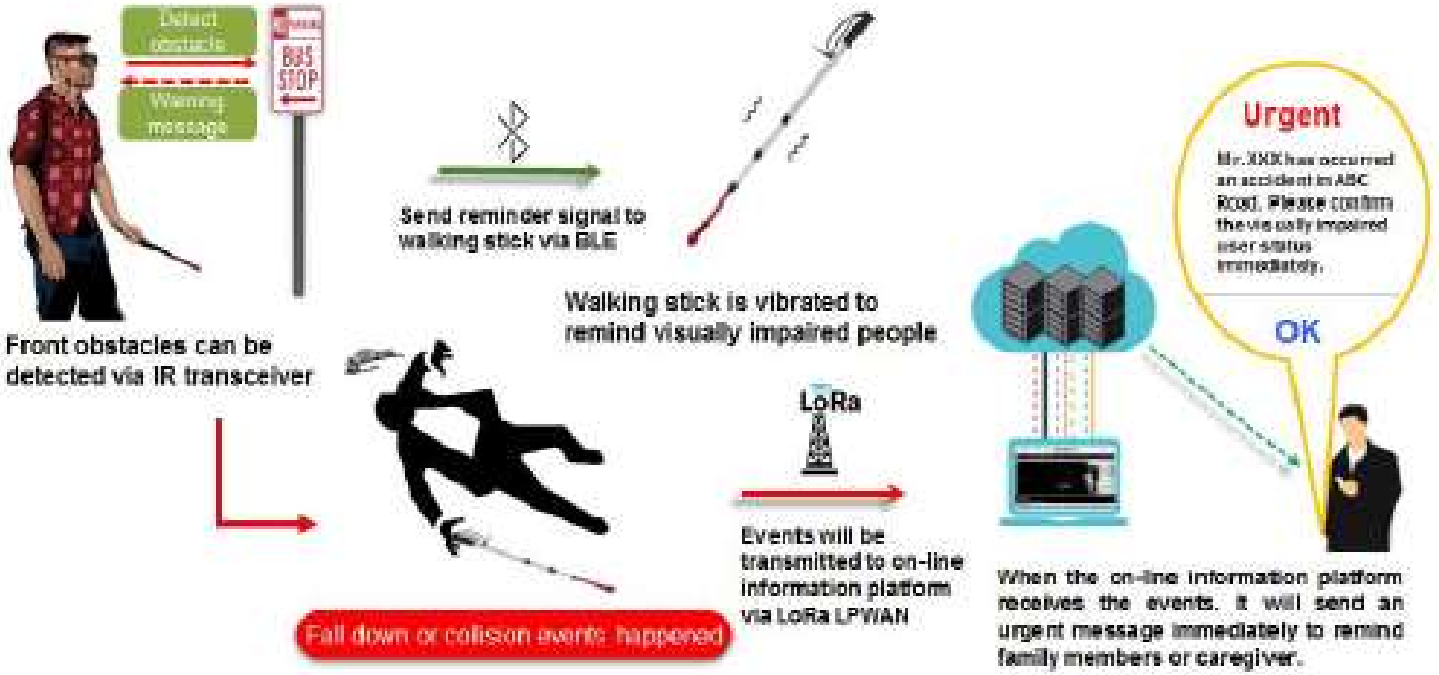



4. Banknotes recognition

# Related Work
# 2- Intelligent Assistance System

- The proposed intelligent assistance system consists of:
  - Wearable smart glasses
  - Intelligent walking stick
  - Mobile devices application
  - On-line information platform
- GPS recordings are saved if a visually impaired person falls or a collision event happens

# Intelligent Assistance Scenario




- Future work is to integrate deep learning techniques for recognizing front images and to develop intelligent walking guiding related function

# Related Work
# 3- Computer Vision Technique for Scene Captioning

- The method for automated identification involves detecting and categorizing the scene image by point feature matching.

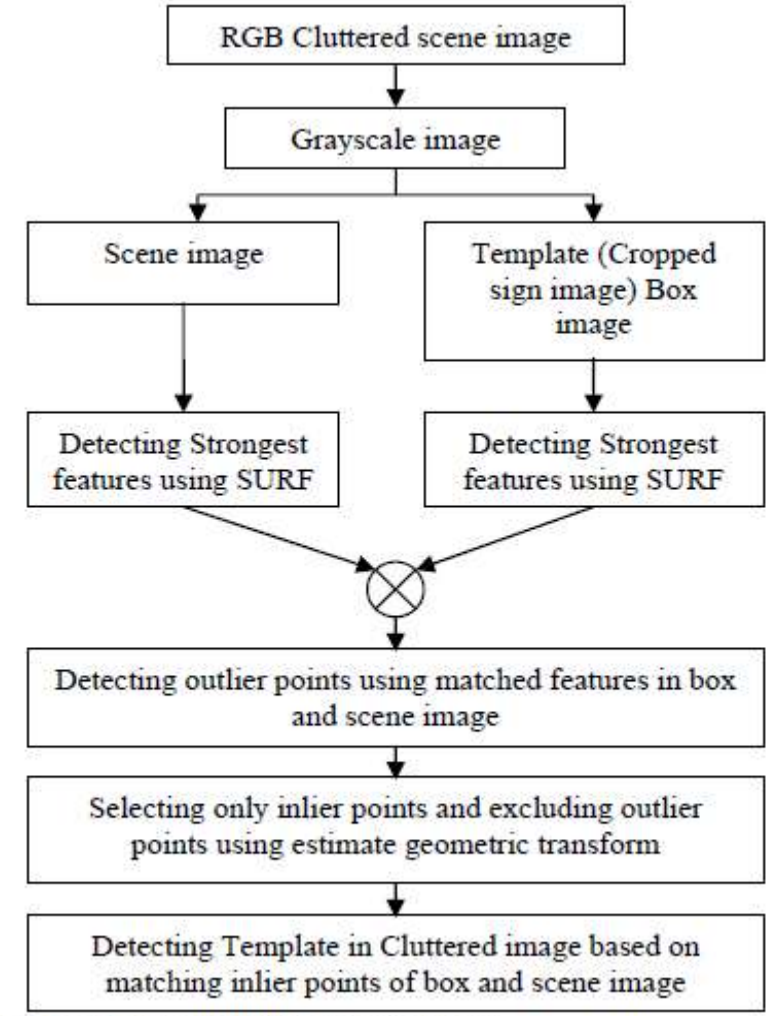



Fig. 1: Block Diagram of Proposed Methodology

- Speeded Up Robust Features (SURF) algorithm is used to detect strongest points from gray scale image of the scene image and strongest points from template.
- They achieved an accuracy of 91.67%.

TABLE I ACCURACY OBTAINED USING PROPOSED METHOD

| S No | Template Used | Results | | |
|---|---|---|---|---|
| | | No of Available Images | Correctly identified Images | Accuracy |
| 1 | Metro Station | 20 | 16 | 80% |
| 2 | Restrooms | 20 | 20 | 100% |
| 3 | Pharmacy | 20 | 19 | 95% |
| **Total** | | **60** | **55** | **91.67%** |

# Comparison

| Points of Comparison | Method | Objectives | Accuracy Achieved | Classification | Sensors |
|---|---|---|---|---|---|
| Intelligent Eye | Mobile Phone | Detecting color, light, objects and banknotes | Good in general and will accepted | CNN | Embedded light sensor |
| Intelligent assistance system | Wearable smart glasses and walking stick | Detecting objects while navigation | Not Mentioned | Not Mentioned | An IR transceiver sensor module, micro electromechanical sensor module, gyro and accelerometer |
| Automated identification of public signs | Images taken from the internet | Detecting common public signs | 91.67% | Speed Up Robust Features (SURF) | Sensory system, 3D CMOS linear sensor and 6dof inertial sensor |
| Our System | Mobile Phone | Guide user to required | ---------- | YOLO | Mobile camera and sensors |

# Problem Statement

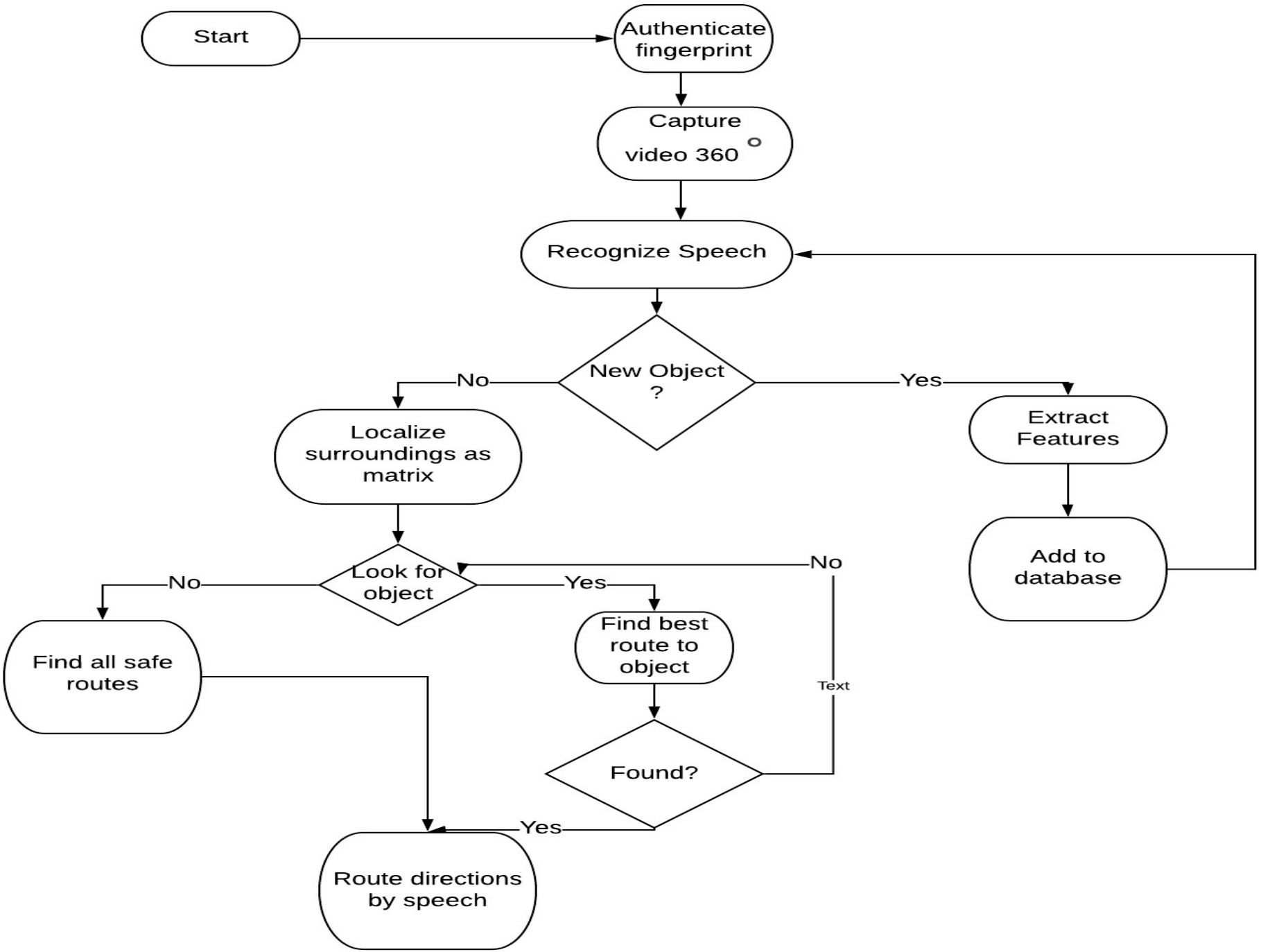
- Visually impaired people suffer multiple problems in their everyday lives while doing their daily chores
- They are always in danger of hurting themselves by hitting an obstacle while they are moving around
- Finding an object would be very difficult if they don’t remember its specific place

# Problem Statement

- Recent work used wearable kits to detect objects using sensors.
- The reached automatic detection of objects is still not optimized.
- Object identification and allocation was not included.

# Scope

- The system will cover in its scope:
  - Scanning frames captured by user.
  - Localizing the indoor surrounding.
  - Safe navigation for the user to allow him to freely roam.
  - Alert user if there are near objects that are in his way.
  - Search for the required object when asked to and provide best route.


Start
Authenticate fingerprint
Capture video 360°
Recognize Speech
New Object ?
No
Yes
Localize surroundings as matrix
Extract Features
Add to database
Look for object
No
Yes
No
Find all safe routes
Find best route to object
Text
Found?
Yes
Route directions by speech

Input

Pre processing

Pedometer data

Authenticate fingerprint

Voice command

Video

1-Video enhancement

2-Remove noise from background

3-Turn audio to speech and process it using nlp

Free Navigation

Find Object

Recognize Object

Processing

Object detection
+
Measuring distance
+
create location matrix

Add to database
+
Labeling

Output

Find Possible Route

Find Free Routes to object

SPEECH GUIDANCE THROUGH MIC

# System Overview Input

- Choice of module.
- 360° video of the room
- Audio of the user's choice for finding an object or free roaming or adding a new personalized object.

# System input processing

- The audio input is processed to remove background noise and enhance audio quality.
- The video is processed frame by frame to enhance detection results.
- All objects appearing in the video are stored along with their distances.
- The user can choose recognizing new objects and is prompted to capture his item of interest to be stored along with the existing dataset along with a label of his choice.

# System Overview Processing

- A localization matrix is constructed using the detected objects and obstacles and their distances with the user as it's center.
- The System then analyzes all possible routes in the room.
- The system recognizes the user's movements using the phone's pedometer, then localizes his current position on the matrix and alerts him if he is moving to a blocked position on the matrix.

# System Overview Processing

- If the user chooses a certain detected object, the system guides him through speech output to the best route to the object.
- The system notifies the user that he has reached his object and allows him to find another object or enter free roaming mode from his current position.
- The system allows the user to add new objects to the existing dataset in order to personalize the project to his lifestyle and daily items.

# System Overview Output

- Audio output to provide directions for the best route to object.
- Audio output to provide alerts if the user is about to hit an obstacle or unknown territory.

# Thank You