



GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

Sarvajanik College Of Engineering And Technology , Surat



**Under Subject Of
DESIGN ENGINEERING 2-A**

**B.E. III , SEMESTER-V
ELECTRONICS & COMMUNICATION**

**Report On
Smart Blind Stick**

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FLOW

1. Introduction
2. Advantages and disadvantages
3. Working and prototype designs
4. AEIOU canvas & mappings
5. Future scope
6. Summary
7. References

Introduction

- Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight.
- Presently, blind people use a white stick as a tool for directing them when they move or walk.
- Here, we develop a tool which can serve as a blind stick being more efficient and helpful than the conventional one.



Motivation

- The mobility of blind people in unknown environment seems impossible without external help, because they don't have any proper idea about their surroundings. So, we are developing a smart walking stick which helps them to know about their surroundings and also guide them during travelling.

❖ Main aim of our project:

- 1. Blind people finding of way through a complex environment
- 2. The orientation and navigation for these people in unknown environment seems possible
- 3. Blind peoples are fearless or comfortable about independent mobility or travel

Advantages & Disadvantages

ADVANTAGES

- Having feature to left & right turn alarm signal.
- Obstacle detection with indication support.
- Dig information with indication alarm.
- Simple to use & low cost

DISADVANTAGES

- Limited & fixed route to follow daily routine.
- Till now, GPS can't attach in it due to 40 meter to change coordinate as to follow the path/ new path.
- Little sensor support in these fields

Working and prototype

1. **Components required:-**

- WOODEN STICK / PLASTIC STICK
- ARDUINO UNO
- ULTRASONIC SENSORS
- BUZZER
- BATTERY
- SWITCH
- LEDS



Working & prototype

1. Ultrasonic Sensor:-

A Transducer can measure distances using ultrasonic waves. It consists of two parts, transmitter and receiver. The transmitter emits the ultrasonic waves. The receiver detects the reflecting signals from the objects. The ultrasonic sensors work based on a principle which called “The Time of flight” using the speed of sound. A rang of pulses between (20 KHZ to 200 KHZ) is emitted by the sensor. When the pulse impacts an object and then reflected; therefore, the receiver of the sensor will be able to detect this signal. The time difference between the outgoing signal and the reflected signal known as (Δt) and the speed of sound at 20o c is equal to 343.5m/s.



Working & prototype

2. Arduino:-

A microcontroller chip is based on Atmega328p microchip. It's an open source board. The board has 14 digital pins, 6 analogue pins and can be powered by USB cable or 9v external battery



Working & prototype

3. Buzzer:-

A "piezo buzzer" is basically a small speaker which will be connected directly to an Arduino. "Piezoelectricity" is an impression where certain crystals can deform once electricity is applied to them. By applying an electrical signal at the proper frequency, the crystal will create sound.

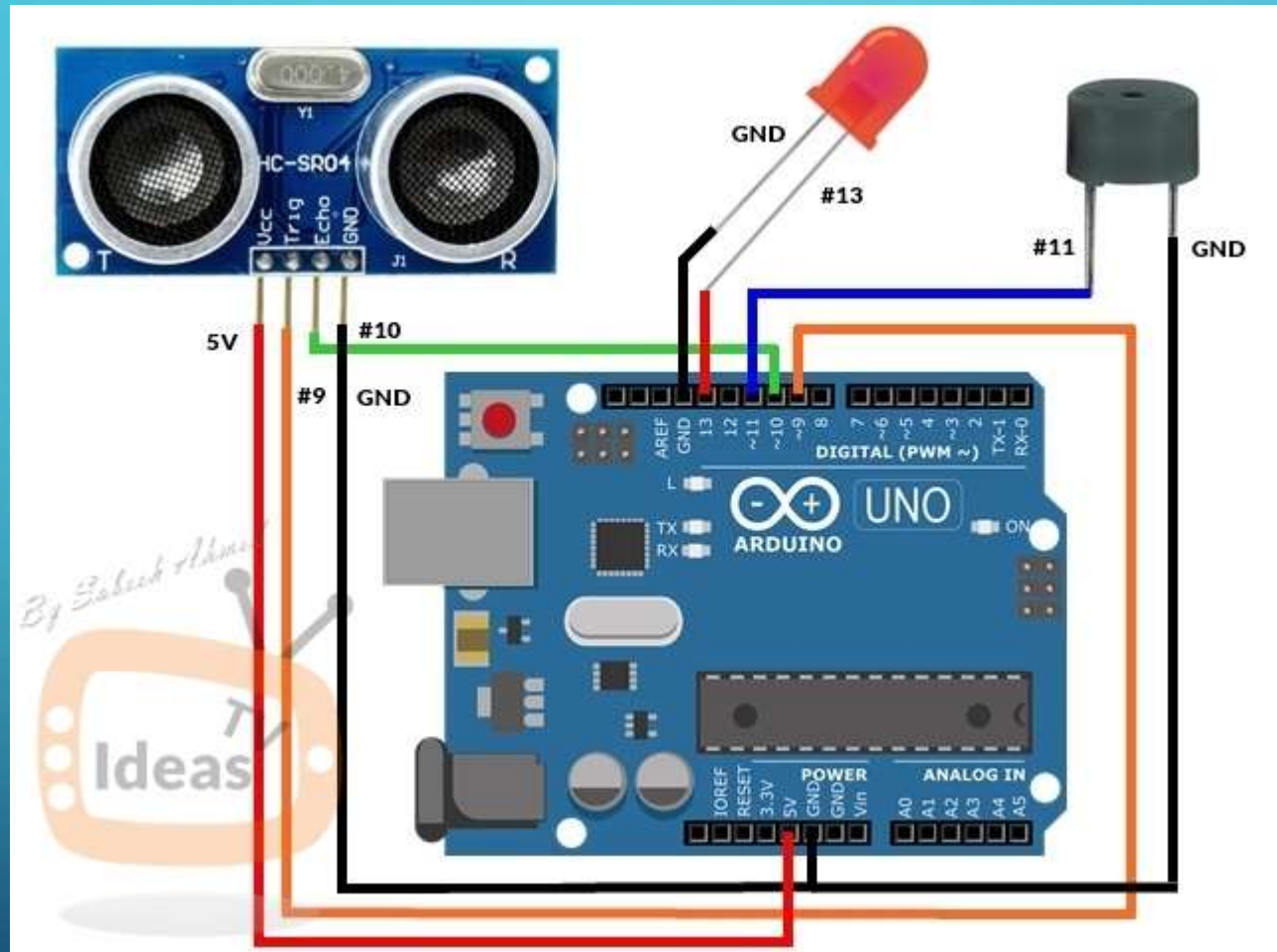


4. Vibrating motor:-

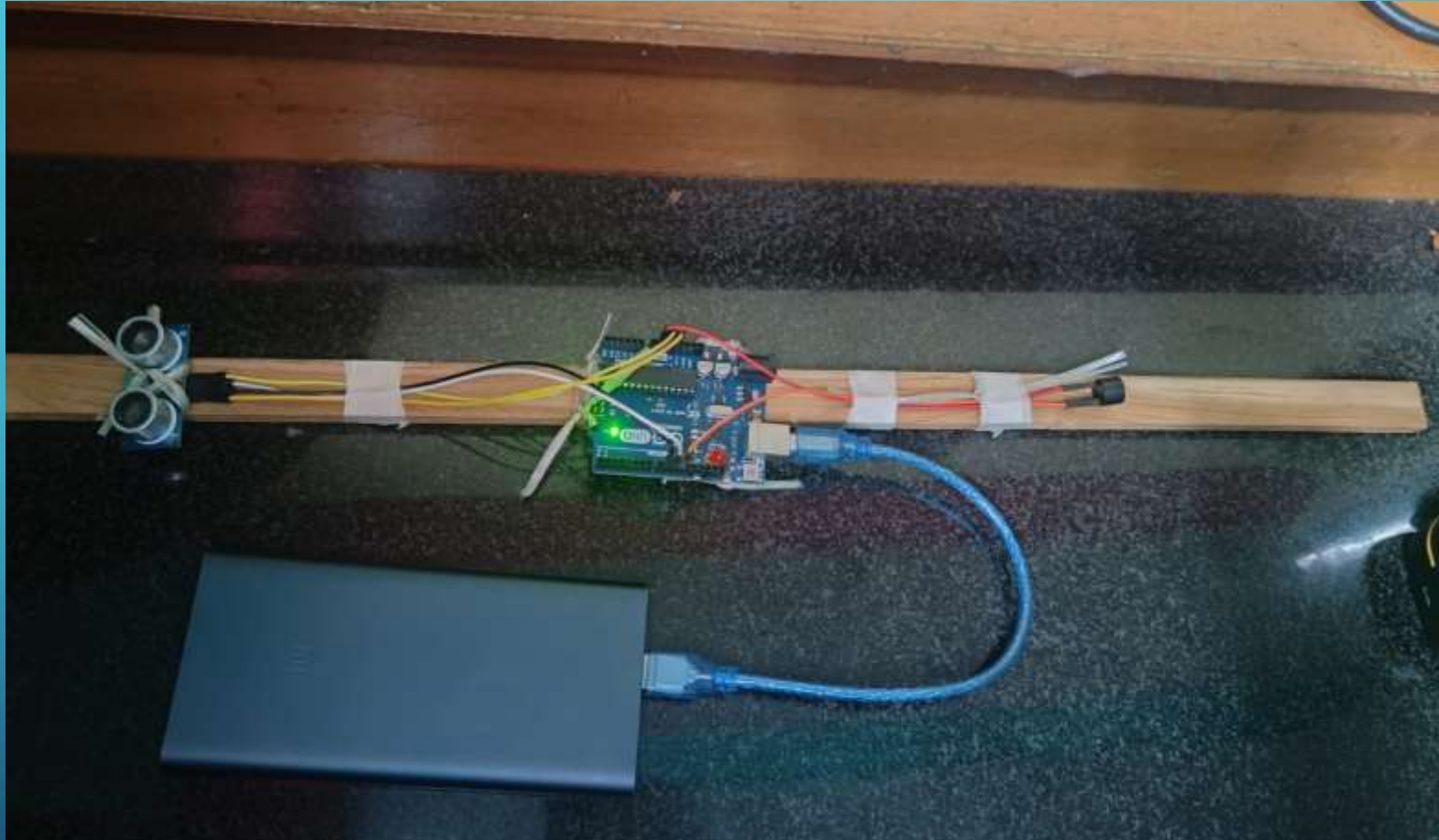
A vibratory motor is actually a motor that's improperly balanced. In alternative words, there's an off-centered weight attached to the motor's rotational shaft that causes the motor to wobble. The amount of wobble may be modified depending on the amount of weight can be attached, the weight's distance from the shaft, and the speed at which the motor spins



CIRCUIT DIAGRAM





PROTOTYPE



Aeiou canvas & mind mapping

- Activity

Activities		GROUP ID: <u>401452</u>	PROJECT ON: <u>SMART BLIND STICK</u>
		DATE: _____	SHEET NO. _____
General Impressions / Observations	<div>Sketch/ Photo - Summary of activities</div> 		
<div>USER FRIENDLY</div>	<div>EASY TO FOLD.</div>	<div>LIGHT WEIGHT</div>	
<div>SIMPLE IN USE</div>	<div>PROVIDE LONGITUDE & LATITUDE OF LOCATION</div>	<div>DIG IN RU.</div>	
<div>FAST RESPONSE</div>	<div>GPS LOCATION (IT'S PROVIDE)</div>	<div>FAST RESPONSE IN AVERAGE DISTANCE</div>	
Elements, Features and Special Notes	<div>DETECTING OBSTACLES.</div>		
<div>EFFECTIVE</div>	<div>DETECT WATER</div>		
<div>PORTABLE (EASY TO HANDLE)</div>		<div>LOW POWER CONSUMPTION</div>	

- Environment

Environment GROUP ID: 401452 PROJECT ON: SMART BLIND STICK
DATE: _____ SHEET NO. _____

General Impressions / Observation:
(Style, materials & atmosphere)

POLLUTION FREE
WELL MAINTAINED
ELECTRIC POLES
PEACEFUL SURROUNDINGS
COULD NOT PARTICIPATE IN SOCIAL ACTIVITIES
DIFFICULTIES IN OUTSIDE WORLD.


Elements, Features and Special Notes

TRAFFIC
LESS ACCIDENTS WILL BE ACCURED FOR BLIND PEOPLE
TREES
MANHOLE
ROADS



Floor plan





Scene





Interaction

Interaction		GROUP ID: 401452	PROJECT ON: SMART BLIND STICK
		DATE:	SHEET NO.
General Impressions / Observations (Who is interacting with whom, what?)	<p>DIRECTIONS ASSISTANCE WITH SOUND.</p> <p>HIDDEN OBSTACLES SUCH AS DOWNWARD STAIRS, HOLES WITH BLIND PEOPLE.</p> <p>COLLISION WITH OBSTACLES.</p> <p>SENSORS DETECT DISTANCE A/W OBSTACLE.</p> <p>OBSTACLES DETECTION SENSORS WITH ENVIRONMENT.</p> <p>DETECT WITH</p>	<p>Scene of Interaction (How it is being done)</p> 	
Elements, Features and Special Notes	<p>ULTRASONIC FREQUENCY (700 MHz) FROM SENSORS.</p> <p>SMART ASSISTIVE FEATURES OF THE BLIND STICK.</p> <p>WATER RECOGNITION.</p> <p>STICK WITH VIBRATING MOTOR.</p> <p>OBSTACLE A WITH BUMP.</p>		

- Object

Objects		GROUP ID: <u>401452</u>	PROJECT ON: <u>SMART BLIND STICK</u>
		DATE: _____	SHEET NO. _____
General Impressions / Observations (How components are involved?)	Inventory of Key Objects (Prepare a list here of 'THE THINGS' involved)		
<div>ARDUINO NANO</div> <div>BATTERY</div>	<div>SWITCH</div> <div>VIBRATING MOTOR</div> <div>VIBRATE</div>		
Elements, Features and Special Notes (How objects are relating to the activities?)			
<div>ULTRA</div> <div>WIRES</div>	<div>WOODEN STICK OR PLASTIC STICK</div> <div>SUPPORT STRAP</div>	<div>BUZZER (SOUND)</div>	

- User

Users		GROUP ID: <u>401452</u>	PROJECT ON: <u>SMART BLIND STICK</u>
		DATE: _____	SHEET NO. _____
<p>General impressions of people (Who is present? Roles & responsibilities?)</p>	<p>Scene of users in context</p>		
<p>VISUALLY IMPAIRED (BLIND PEOPLE)</p> <p>CHILDRENS WITH LOW EYE SIGHT</p> <p>ENGINEERS</p>			
<p>Inventory of people (List of identified people involved)</p>			
<p>OLD PEOPLE WITH LOW EYE SIGHT</p> <p>PEOPLE OF AGE GROUP (WITH LOW SIGHT)</p>			

AEIOU SUMMARY

DOMAIN NAME: OBSTACLE DETECTION SYSTEM FOR BLINDS

ACTIVITIES:

- USER FRIENDLY
- EFFECTIVE
- PORTABLE (EASY TO HANDLE)
- LOW POWER CONSUMPTION
- SIMPLE IN USE
- FAST RESPONSE
- EASY TO FOLD
- DETECTING OBSTACLES

OBJECTS:

- WOODEN STICK / PLASTIC STICK
- ARDUINO NANO
- ULTRASONIC SENSORS
- BUZZER
- BATTERY
- SWITCH
- VIBRATING MOTOR

ENVIRONMENT:

- LESS ACCIDENTS WILL BE ACCRUED FROM BLIND PEOPLE
- POLLUTION FREE
- WELL MAINTAINED
- PEACEFUL SURROUNDINGS

INTERACTIONS:

- DIRECTIONS ASSISTANCE WITH SOUND
- OBSTACLES DETECTION SENSORS WITH ENVIRONMENT
- HIDDEN OBSTACLES SUCH AS DOWNWARDS STAIRS, HOLES WITH BLIND PEOPLE
- ULTRASONIC FREQUENCIES(500 MHz) FROM SENSORS
- SENSORY ASSISTING FEATURES OF SMART BLIND STICK .

USERS:

- VISUALLY IMPAIRED (BLIND PEOPLE)
- OLD PEOPLE WITH LOW EYE SIGHT
- PEOPLE OF ANY GROUP AGE (WITH LOW EYE SIGHT)
- ENGINEERS

AEIOU SUMMARY

AEIOU summary Group ID: 401452 Date: version:

Domain name:

Environment:	Interactions:	Objects:
WELL MAINTAINED	COLLISION WITH OBSTACLE	AROUND HAND
PEACEFUL SURROUNDINGS	ULTRASONIC (SOUND) FREQUENCIES	ULTRASONIC SENSORS
POLLUTION FREE	DIRECTIONS ASSISTED WITH SOUND	WOODEN STICK

Activities:	Users:
EFFECTIVE	BLIND PEOPLE
DETECTING OBSTACLES	OLD PERSON (WITH LOW EYE SIGHT)
USER FRIENDLY	
PORTABLE	
LOW POWER CONSUMPTION	

AGE GROUP NAME	AGE RANGES
INFANTS	0-3
CHILDREN	3-16
YOUNG PEOPLE	17-20
ADULTS	21-ABOVE

Empathy mapping


Version	
USER	STAKEHOLDERS
BLIND PEOPLE	DEVELOPERS
PEOPLE WITH LOW FYE SIGHT	OPERATORS
ACTIVITIES	
DETECTING OBSTACLES	EASY TO FOLD
LOW POWER CONSUMPTION	LESS COLLISION
STORY BOARDING	
HAPPY A blind person can cross the road with the help of blind stick - so they are independent by themselves, not rely on others 😊	
HAPPY By using smart devices like blind stick, or vision electronic glasses etc they can solve their small problems by themselves - so they will be emotionally happy 😊	
SAD blind people dealing with sight less have to face isolation and cannot interact with other people 😞	
SAD Blind people cannot navigate around places by themselves, as they need some external help by the people to navigate from one place to another - so they are dependent on others. 😞	


Ideation canvas


The Ideonaut Ideation Canvas


Project: SMART BLIND STICK

Team:

People:  PEOPLE

Activities: 

Situation/Context/Location: 

Props: 

VISUALLY IMPAIRED.	OLD PEOPLE	PEOPLE OF ANY AGE GROUP	ENGINEERS	HELPERS.					
PORTABLE	LOW POWER CONSUMPTION	NAVIGATION FEATURES	DETECTING OBSTACLES	LOSS OF VISION	INFERIORITY COMPLEX	NAVIGATE AROUND PLACES	ANXIETY	DEPRESSION	FACING SITUATION WITH ELECTRONIC APPLIANCES.
WOODEN STICK	SWITCH	BUZZER	BATTERY	AROUND HAND	ULTRASONIC SENSORS.	VIBRATING MOTOR			

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Mind map

Mind Mapping Canvas

Group ID: 100000
Domain Name
Date: _____
Version: _____

SMART WALKER

INTRODUCTION

- In future, blind people use a white stick as a tool for direction, when they move in road.
- Now, we develop a tool which can serve as a blind stick being more efficient and helpful than the conventional one.

ADVANTAGES

- Obstacle detection with indication alarm.
- Big information with indication alarm.
- Auto detection.
- Auto planning system.
- Full functional system.

DISADVANTAGES

- Limited and fixed route to follow daily routine.
- Till now, GPS can't attend in it due to them to change coordinate as to flow the path.
- Little sensor support in these fields.

APPLICATIONS

- Helping blind people to easily walk to destination.
- Help blind people for obstacle detection.
- Alert blind people about dog.

FUTURE SCOPE

- GPS can help blind people to receive and destination route information.
- GPS can help to find the shortest and best path as according to traffic flow way based on real time coordination.
- GSM attachment can help in future for any immediate casualty help.

BLOCK DIAGRAM

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graph TD
    A[Obstacle Detection Sensor] --> B[Android phone]
    B --> C[Power Supply]
    B --> D[Speaker]
  
```

The mind map also includes several small illustrations of people using canes, a dog, and a person with a cane and a dog.



Product development canvas

Product Development Canvas		Team/Date/Version
Purpose TO BE THE EYES OF BLIND PEOPLE. ULTRASONIC SENSORS TO DETECT OBSTACLES	Product Experience USER FRIENDLY SAFETY	Customer Revalidation EASY TO USE PORTABLE FAST RESPONSE
	Product Function EASY TO USE ADAPTABLE	
	Product Features OBSTACLE DETECTOR NAVIGATION	
People VISUALLY IMPAIRED.		Reject, Redesign, Retain RETAIN - MENTOR
ENGINEERS	ARMANDO NANO BATTERY	FUTURISTIC
HELPERS	ULTRASONIC SENSOR WOODEN STICK	

LEARNING NEED MATRIX

Learnings Need Matrix

Group ID: 401452 Date: _____

Tools/Methods/Theories/Application Process involved

During BE IV / Stage III

Applicable standards and design specifications/ Principles & Experiments

During BE III / Stage II

During BE II / Stage I

ULTRASONIC SENSORS ARE USED TO DETECT OBSTACLES.

Purpose / Product concept
SMART BLIND STICK
A DEVICE FOR THE BLIND PEOPLE

TO GUIDE THEM TO DESTINATION AND AVOID COLLISION

CODING FOR ARDINO NANO

WOODEN STICK, BUZZER BATTERY, SENSORS

ARDINO NANO SWITCH VIBRATING MOTOR

Software/Simulation/Skill/Mathematical Requirements

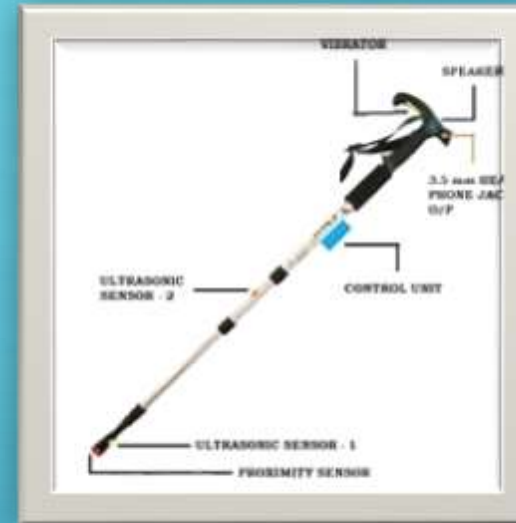
Component materials/ strength criteria (exploration - varieties/ testing requirements)

Version: 03

Establish connections among each other - Create Groups

Future scope

- It can be further enhanced by using VLSI technology to design the PCB unit
- using the global positioning system (GPS), and their current position and guidance to their destination will be given to the user by voice.
- GPS can help blind peoples to source destination route information.
- Adding voice assistance feature for guidance
- Adding vibrating motors to the circuit for blind and deaf people



Summary

- Humans are not disabled. A person can never be broken. Our built environment, our technologies, is broken and disabled. We the people need not accept our limitations, but can transfer disability through technological innovation.
- This system offers a low-cost, reliable, portable, low-power consumption and robust solution for navigation with obvious short response time. Though the system is hard-wired with sensors and other components, it's light in weight.
- After going through different stages of design engineering, we have learnt lot of things which has helped us in making our project in a very innovative and user-friendly manner . Through the process of empathy mapping, mind mapping , ideation and product development canvases, we have learnt about users' needs and their problems.

References

- Mohd Helmy Abd Wahab, Amirul A. Talib, Herdawatie A.Kadis, Ayob rohuri, A.Noraziah, Roslina M. Sidek, Ariffin A "Smart cane: assistive cane for visually impaired people" UCSI, Vol.8 Issue 4, July 2011
- Yuan, D.; Manduchi, R., "Dynamic environment exploration using a virtual white cane", in Computer Vision and Pattern Recognition, CVPR 2005 IEEE Computer Society Conference, 2005.
- F. van der Heijden, P.PL Regtien, "Wearable navigation assistance a tool for the blind" MEASUREMENT SCIENCE REVIEW, Volume 5, Section 2, 2005
- Larisa Dunal, Guillermo Peris Fajames, Victor Santiago Praderas, Beatriz Defez Garcia, Ismael Lengua Lengua, "Real-Time Assistance Prototype-a new Navigation Aid for blind people 978-1-4244-5226-2/10/526.00 2010 IEEE. 1998.

The background is a blue gradient. In the corners, there are white line-art graphics resembling circuit boards or neural networks, with lines and small circles connecting them.

THANK YOU!!!!