SAHARA

A SMART CANE FOR THE BLIND

~BY TEAM FUZION

Ps No. RK773

Department of Electronics and Communication Engineering

GAUHATI UNIVERSITY

Team Members

Dhruba Jyoti Sarma

Bishal Hazarika

Kalpajeet Boruah

Kaustav Kaushik

Subhankar Mazumdar

Parismita Barman

Mentors

Mr. Arunabh Bora

Dr. Lachit Dutta

Outline of the Presentation

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Introduction

➤ It is observed that normal white cane has limited use for visually impaired persons and it has difficulties in tracking obstacles and harmful objects in their surroundings.

➤ Moreover, the range of tracking is very less which depends on the cane length.

➤ Thus a better alternative is required to track obstacles and harmful objects, and to warn the user at the earliest time possible.

➤ Therefore we Propose a solution :

The Smart Cane − **Sahara /सहारा**

Review of Literature

Methods	Obstacle Detection	Person Identification	Anti-Theft Alarm	GPS based Location Tracking	Scope to Identify User Behavior and Offer Support
[1, 2]	✔	✖	✖	✖	✖
[3, 4]	✔	✖	✔	✔	✖
[5, 9]	✔	✖	✖	✔	✖
[6, 8]	✔	✔	✖	✖	✖
[7]	✔	✖ (Text detection available)	✖	✖	✖
This Work	✔	✔	✔	✔	✔

Salient Features of the Proposed Solution

01 Making a **smart cane** with various features. The main feature is to detect obstacles and objects even from a distance of **1 to 3 meters**.

02 **SOS button** so that the person using the cane can send emergency message to his family. It will send the warning to his/her family along with the current live location.

03 **VIBRATION** sensor to warn the person if anyone tries to steal the cane. It can be turned on by the person when required

04 Face Detection Feature that is used to identify family and known persons so that the person can be aware with whom they are talking with.

05 Also the most important part, making this featured cane in the most affordable way so that it can reach each and every needy around the world.

Approach and Technology

Particulars	Pictorial View	Specifications	Purpose
Ultrasonic sensor (HC-SR04)		5 V DC, 2-400 cm, 2 mA	Obstacle Detection
Vibration Sensor (SW420)		5 V DC, 15 mA	Anti-Theft Warning Signal
Speaker (boAt Stone Grenade)		5 W, 10 m	To Alert the User
Buzzer		5 V DC	To Alert the User
Camera (Raspberry Pi 5MP)		5 MP, 25x23x8 (LxWxH) mm, 3.3 V DC	For Person Identification
Buttons	-	-	To Turn ON/OFF the Circuits
Power Source (MI Power Bank)	-	10000 mAh	Powering the Smart Cane
PCBs, wires and Fittings	-	-	Electrical Connections
PVC Pipe	-	-	Material to build the Cane

Approach and Technology   contd...
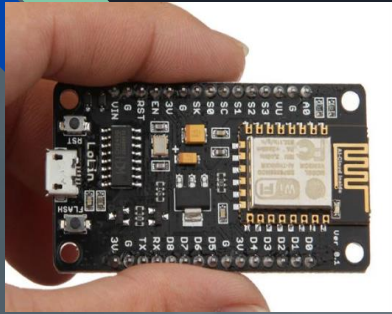
ESP8266, 3.3V DC, 32-bit MCU

Atmega 328P, 5V DC, 8-bit MCU

Mobile Based GPS Tracking

3.3 V, Quad Core 1.2GHz Broadcom BCM2837 64bit CPU
1GB RAM
BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board
40-pin extended GPIO
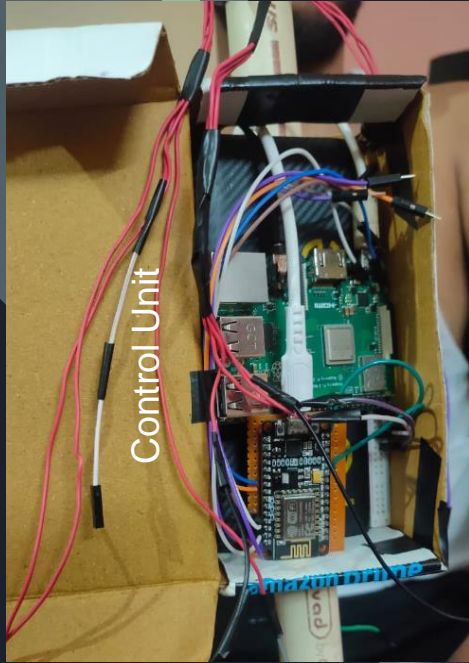CSI camera port for connecting a Raspberry Pi camera

Obstacle Detection and Anti-Theft Alarm

Control Unit

Ultrasonic Sensors

➢ The Obstacle detection is implemented using high accuracy Ultrasonic Sensor. It detects obstacles up to 3m with high accuracy. Apart from that a upper sensor also detects obstacles at a medium height.

➢ We also added anti theft feature that uses a vibration sensor. When the sensor is activated using a switch the stick will warn with buzzer if someone tries to steal the stick when the blind person isn't carrying it.

Person Identification

Pi Camera

> For a blind person the most important security issue is whether he/she is interacting with his family or known people or some scammers or unknown person. So to prevent this we integrated a Face detection feature using Object Detection model through Open CV. We implemented this model on our raspberry pi 3B.

> When some known person faces towards the stick the stick will detect the person and give feedback.
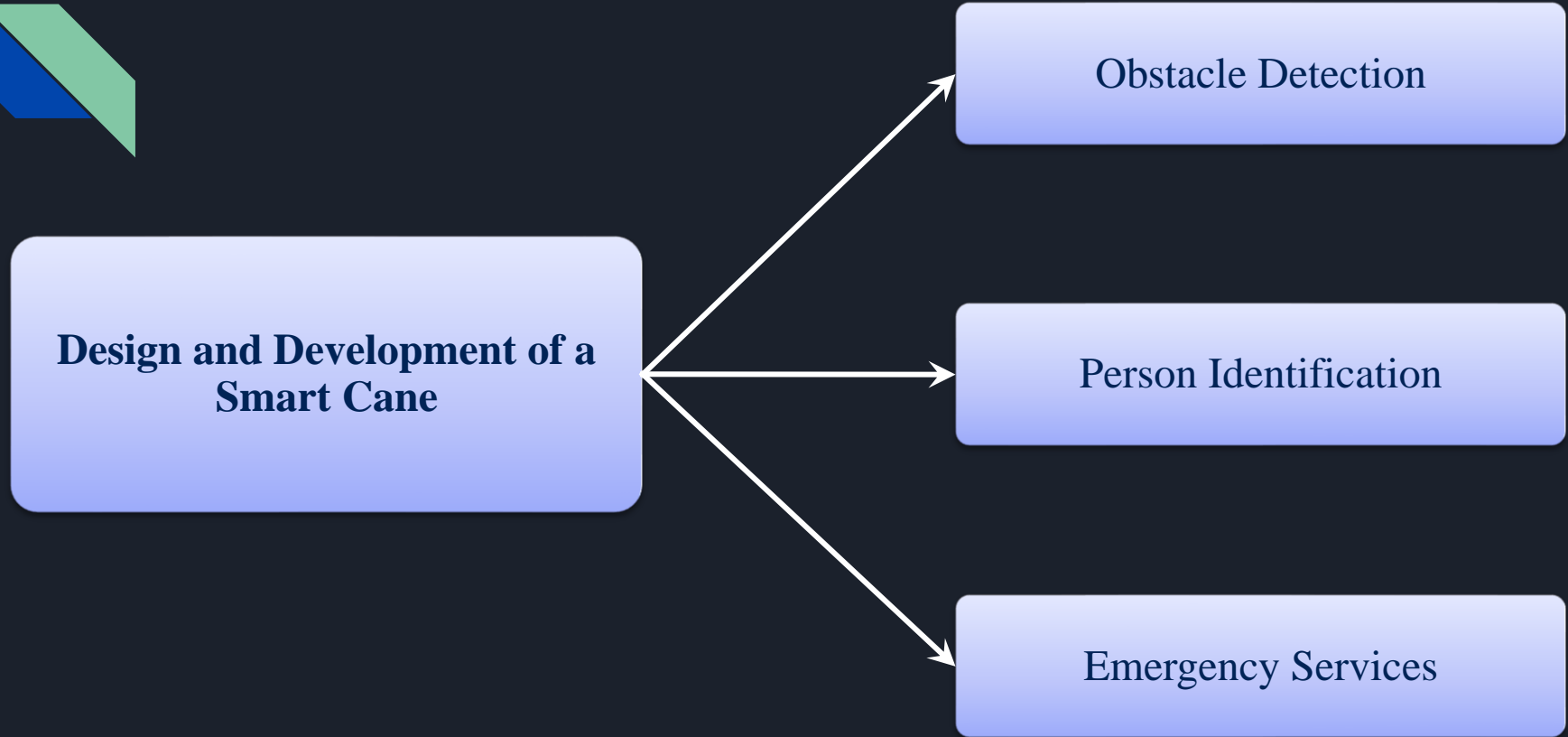
GPS SOS/ Emergency Button

➢ Blind person can fall in any kind of emergency like getting lost in his way, accident etc. So in such a condition he/she can send a emergency signal to his family members through the SOS button. This will send his current live location to the family members and they can help him.

➢ This is implemented using a cloud SMS service called 'Twilio'. We used the api to send SMS efficiently. The whole process is implemented on Raspberry Pi

Limitations and Future Scopes

➢ The primary limitations are the cost and time consumption in running the algorithms.

    ○ However the limitations can be mitigated to a great extent if large scale production is done.

    ○ More advanced processors (like Raspberry Pi 4) can be used to speed up the operations.

➢ In Future using the location tracking, the behavior of the user can be analyzed and suggestions in form of voice messages can be activated (like time for evening walk, medicines, yoga etc.)

➢ More number of canes will be designed for implementing user specific features.

Conclusion

Design and Development of a
Smart Cane

Obstacle Detection

Person Identification

Emergency Services

References

1. Vineeth, I., Sharan, Y. S., Karthik, Y., & Priya, B. K. (2021, June). Smart Cane for Visually Impaired Person. In *2021 International Conference on Intelligent Technologies (CONIT)* (pp. 1-6). IEEE.
2. Ghai, M., Gupta, R., Bhatia, S., & Gautam, D. (2022). Ultrasonic Sensor Based Cost Efficient Smart Cane. *Available at SSRN 4157259*.
3. Khan, M. A., Nisar, K., Nisar, S., Chowdhry, B. S., Lodhi, E., Khan, J., & Haque, M. R. (2021, October). An Android-based Portable Smart Cane for Visually Impaired People. In 2021 IEEE 15th International Conference on Application of Information and Communication Technologies (AICT) (pp. 1-6). IEEE. Chicago
4. Kramomthong, P., Pintavirooj, C., & Paing, M. P. (2021, November). Smart Cane for Assisting Visually Impaired People and the Blind. In 2021 13th Biomedical Engineering International Conference (BMEiCON) (pp. 1-5). IEEE.
5. Abu-Abdoun, D. I., Alsyouf, I., Mushtaha, E., Ibrahim, I., & Al-Ali, M. (2022, February). Developing and Designing an Innovative Assistive Product for Visually Impaired People: Smart Cane. In *2022 Advances in Science and Engineering Technology International Conferences (ASET)* (pp. 1-6). IEEE.
6. Narayani, T. L., Sivapalanirajan, M., Keerthika, B., Ananthi, M., & Arunarani, M. (2021, March). Design of Smart Cane with integrated camera module for visually impaired people. In 2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS) (pp. 999-1004). IEEE.
7. Flores, I., Lacdang, G. C., Undangan, C., Adtoon, J., & Linsangan, N. B. (2021, November). Smart Electronic Assistive Device for Visually Impaired Individual through Image Processing. In 2021 IEEE 13th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM) (pp. 1-6). IEEE.
8. Gladence, L. M., Goyal, K., & Pramoth, R. (2022, March). Smart Walking Cane for the Specially Abled People. In 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT) (pp. 1-6). IEEE.
9. Sharmila, K., & Boomika, D. (2021). Smart Walking Cane Using IOT. International Journal of Advanced Engineering Science and Information Technology, 4(4).

Thank You
for your kind attention......