International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 02 | Feb 2023 www.irjet.net p-ISSN: 2395-0072

IoT Based Assistive Glove for Visually Impaired People

Ms. P. Divya Jenifar[1],Ms. V. Harinitha[2], Ms. M.D. Harshini[3],Ms. A. James Christiya[4]

[1]Assistant professor ,Department of Biomedical Engineering, Sri Shakthi Institute of Engineering and Technology, Tamilnadu, India.
[2,3,4]Final year students, Department of Biomedical Engineering, Sri Shakthi Institute of Engineering and Technology, Tamilnadu, India.

Abstract - *The primary goal is to assist the visually impaired men and women navigate greater accurately. In particular, a portable, low-powered hand glove is designed that is cost effective and that imparting help to visually impaired folks to overcome their lack of vision. As they stroll and lift out their daily tasks, grow to be conscious of unexpected obstacles. It is designed to be compact and require little or no coaching for users. A easy layout is the most important aim of the project. Sensor sends the signal, detects obstacles, and let person understand via vibrating a motor and buzzer. It additionally tells the what kind of object existing . In case of any emergency situation, the person can ship the contemporary place to his/her guardian through GPS Module through press down the push button. In addition , the blind human beings can understand money through Image processing approach Using camera. Output will be in the shape of Audio.*

***Key Words*: GPS Module, Glove, Navigation, Sensors, Visually impaired people, Currency recognition, Audio.**

1. INTRODUCTION

Being blind is not something people experience for a short time, it's something people experience every second,every minute, and every day of their life. Whenever a blind person wakes up in the morning, his/her suffering and daily needs begin. People around blind people need to be near them so they won't suffer injuries. As a result of paying attention to them and giving them everything they need, they will be exhausted by the attention they receive. Blind people must therefore rely on themselves, so this paper proposes gloves that make it easier for them to do so.Blindness can be triggered with the aid of physiological, anatomical, or neurological dysfunctions. There are many methods to examine the extent of blindness.

As technology has become a phenomenon of the world, it cannot be separated from human life. A blind person's mobility can be defined as their ability to move through an environment without relying on others for assistance. The most common mobility aids used by the blind are canes and guide dogs. However, there are some problems with these navigation supports. Due to the limited preview provided by the cane, the user must be very cautious when walking and moving around. The training and coordination of guide dogs with blind people is a difficult task, and the results are minimal. A number of people have researched assistant devices for the blind in order to help reduce the limited abilities of the blind.

Visually impaired humans can advantage from assistive gloves that facilitate motion and enable them to feature independently barring relying too closely on others. By integrating HC-SR04 ultrasonic sensor, the glove will aid blind humans in shifting and alert them to boundaries inside a vary of 2 cm to 300 cm in the front and back of them. A design has been proposed that lets in visually challenged human beings to stroll greater confidently in order to assist them. Money changing is essential section in each and every human beings day to day lifestyles however blind humans discover difficulties in consciousness of currency values. The assistive glove assist them to understand the money values via voice command.

2. LITERATURE REVIEW

2.1 Smart glove for Blind

P.Mangayarkarasi and colleagues created a system in which an ultrasonic detector can detect a chain that is within 100 cm of the user and vibrate to alert them to the danger. Moreover, a palpitation detector is employed to monitor the user's heart rate. But, if any irregularity arises, the guardian of the stoner will be informed by a formal communication. In order to help visually impaired people overcome their challenges in day-to-day life without relying on others, the device's overall goal is to be accessible and safe.

2.2 Currency Recognition For The Visually Impaired People

Abilash CS et al., Create image-processing-based currency recognition systems. The task of linking Indian currencies is automated and solidified by this method using image processing. The Indian Rupee is then used as an example in this system to show how it works.

2.3 Smart Gloves for Visually Challenged

A system that consists of a simple walking gadget with sensors that provide environmental data is proposed by Rakshitha R et al., Their family members can easily

keep an eye on them via the use of GPS technology and a micro controller. This system includes an ultrasonic sensor, a controller, a battery, a vibrator, and a GPS receiver. The sensor's signals detect obstructions and vibrate a motor to inform the user.

2.4 Assistive Devices for Visually,Audibly and Verbally Impaired People

The Sign Language Glove that Ranjitkumar et al., propose will let persons who have any form of speech impairment communicate through gestures, allowing the user to make alphabet signals with just one hand. The glove will capture every gesture the user makes and translate those gestures into both visual and audible form.

2.5 A Smart Wearable Guiding Device for The Visually Impaired People

Venkat Vivek and some others, Using the proposed design as a bracelet or piece of fabric will enable blind people to navigate without the aid of a stick pretty precisely with little to no experience. A ringer is also incorporated, which generates vibration signals and makes a warning sound to alert the user to potential threats. With a buzzer that generates an audible alarm, a motor that creates vibration signals, and the capability to communicate notifications to the relevant person, the frequency of both sound and vibration signals rises as the distance between the elastic glove and barriers decreases.

2.6 Currency Detector for Visually Impaired

The proposed work by Gaurav Rasal et al., extracts various and distinctive features of Indian banknotes, including the central number, RBI logo, colour band, and special symbols or marks for visually impaired people, and then applies algorithms created for the detection of each and every unique feature.

2.7 iTouch – Blind Assistance Smart Glove

Intelligent gloves and cell phones were developed by V.S. Sooraj et al., and they include a variety of features including the ability to call, text, record video and audio, take pictures, detect objects, detect people, detect electricity, navigate using GPS, monitor heart rate, and much more. The Glove may be used to access mobile apps. One hand is sufficient because the thumb serves as the pointer.

2.8 An Intelligent Assistive System for Visually Impaired People

Using object, text, and money detection and recognition algorithms, Vrushali V. Kondhalkar et al., proposed an application that will assist users in understanding image/scene text and recognizing various things and currencies in real-time. This will improve the user's independence and comfort.

2.9 Assistive Devices: Technology Development for the Visually Impaired

Beingolea, Jorge Rodolfo et al., This work presents the developed assistive device kit in a thorough and didactic manner for usage by the visually impaired in indoor controlled conditions or outside metropolitan settings. The Smart Cane, Smart Cap, and Smart Glove are included in one affordable bundle.

2.10 Advance Glove for Blind

Girish Gajanan Mulye et al., provide blind persons with ultrasonic gloves so they can find their way to the proper roadways on their own. This can be accomplished by sending ultrasonic waves into the environment, having a detector in the gloves gather them, and then sending audio signals to the blind in order for them to be aware of their surroundings and be able to choose their own route without assistance from others.

3. METHODOLOGY

3.1 Working of the Glove

Through the use of two ultrasonic sensors, this project detects obstacles on both sides. On the front side of gloves, Ultrasonic sensors are placed to detect obstacles by using the vibration motor, whereas on the backside, Ultrasonic sensors are placed to detect obstacles by using a buzzer and Ultrasound waves can be used to accomplish this. The Ultrasonic sensors both emit ultrasonic sound waves to the surroundings, and the sensors receive the signal when an object is detected and create a vibration and buzzing sound. As a result, visually challenged people will be aware of their surroundings and can choose their own route and direction without the assistance of others. In addition the glove gives the information about the obstacles present through voice command. The device is connected to IOT and, in emergency situations, it can send the user's current location to his/her guardian using GPS. In addition, The blind people can recognize currency through Image processing technique . Output will be in the form of Audio.

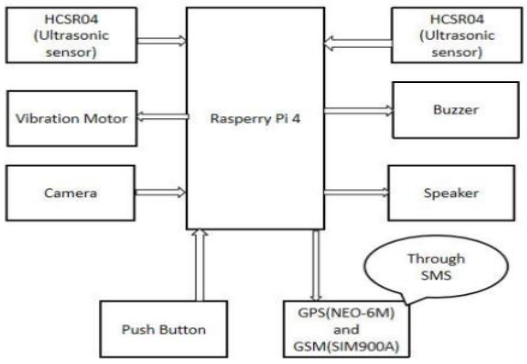

Fig 1. BLOCK DIAGRAM

3.2 Software and Technology used

- Software used
    1. Python IDE
- Technology used
    1. Open CV
    2. CNN
    3. GPS

3.3 Currency and Object Recognition

The glove consist of one Camera that capture the input images from the surroundings. Open source computer vision library is used for Image recognition and Identification. With the help of Open CV library we can process the images to identify the objects. Haar cascade is a Image processing technique which is used for currency and object recognition. Haar cascade is an approach where we used lot of positive and negative images to train the classifier to classify between the images. Positive images are contain objects which we want to be identified from the classifier. Negative images are do not contain any objects which we want to be identified from the classifier. Convolution Neural Network is a classifier that is used to classify the objects and Currency values. The numerical raw data converted to speech and output will be in the Audio form.

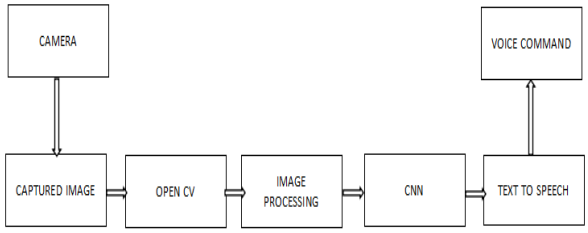

Fig 2.Currency and Object Recognition

3.4 System Architecture

The existing system provide alertness only one side of human i.e. front side. Visually Challenged people face some difficulties if there is any obstacles in backside of them. The existing system measures the distance to things and translate that into pressure on the wrist and in some existing device provides alertness in the form of sound. And also visually Impaired people find difficulties in recognize the currency values.

The proposed system overcome the disadvantages of existing system.This glove comprises of obstacle detection ,Object recognition and currency detection. The technologies used in this glove are GPS for sharing location ,Open CV and CNN are used to recognize objects and currency values. This glove has added advantages of detecting obstacles on both side of visually impaired person. In addition this system provides the information about the types of obstacles present using voice command. At extremity situation the user can use the push button to notify their guardians about their current venue. Also if the user wants to know the currency value ,the system can help them in recognize the currency via voice module .

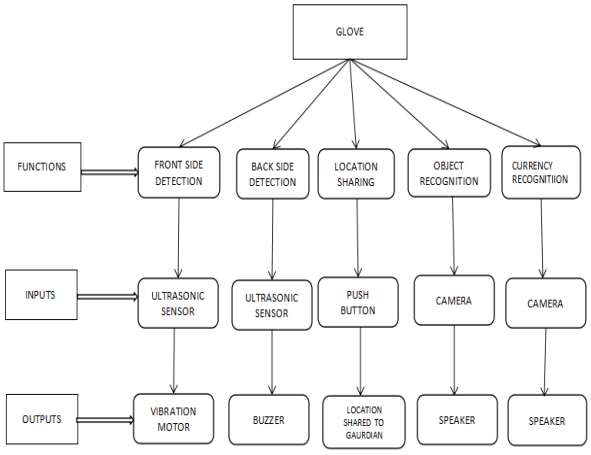

Fig 3.System Architecture

4. HARDWARE DESCRIPTION

4.1 Ultrasonic sensor

An ultrasonic sensor is a technological device that utilizes ultrasonic sound waves to measure a target object's distance and then turns the sound that is reflected into an electrical signal. The speed of audible sound is higher than the speed of ultrasonic waves (i.e. the sound that humans can hear An ultrasonic sensor primarily consists of the transmitter (which produces sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

The sensor tracks the time that passes between the transmitter's sound emission and its contact with the receiver in order to determine the distance between the object and the sensor. The formula used for calculating is

$$D = \frac{1}{2} T \times C$$

D is the distance

T is the time

C is the speed of sound

4.2 Vibration motor

Electric or pneumatic (air) energy can be used to power vibration motors, which produce vibration. Due to the eccentric weights that are fixed to the rotor shaft,

vibration motor is also known as vibro, vibro motor, vibration motor, vibrator motor, or vibrator motor—generate vibration energy by the rotation of the rotor of the powered motor.

4.3 Piezoelectric buzzer

The piezoelectric buzzer creates sound by vibrating a metal plate using pulse current and the piezoelectric action of piezoelectric ceramics. Multi-resonator, piezoelectric plate, impedance matcher, resonance box, etc. are the major components of a piezoelectric buzzer. Integrated circuits or transistors make up the multi-resonator. When the power supply is turned on, the multi-resonator oscillates and emits an audio signal at a frequency of 1.5 to 2.5 kHz (1.5 to 15V DC operational voltage).

4.4 GPS

A navigation system based on satellites is called GPS (Global Positioning System). Wherever on or close to the surface of the planet, a GPS receiver can use it to receive time and location-based information. As long as there is a clear line of sight to four or more GPS satellites, GPS can operate in any weather. The user's internet connection or phone signal are not required for a GPS to function. But having them around makes GPS positioning more accurate.

4.5 GSM

Global System for Mobile is known by the abbreviation GSM .More than 800 million end users, spread across 190 countries, use GSM today, accounting for around 70% of the global digital wireless market. So let's check how it functions. In GSM, the geographic region is divided into hexagonal cells, each of whose side relies on the transmitter's strength and load (number of end-user). A base station with a transceiver (a transmitter and receiver combined) and an antenna is located in the middle of the cell.

4.6 Push Button

When held in, a push-to-make switch permits current to flow between its two contacts. The circuit is disrupted when the button is released. Normally Open (NO) Switch is another name for this kind of switch. Push buttons are utilized in this project to share locations with the guardian. The user's location is conveyed by messages integrating GPS and GSM technologies by pushing the push button. The message will be sent to the guardian as a link that connects to a Google map.

5. SOFTWARE DESCRIPTION

5.1 Open cv

An open source computer vision and machine literacy software library is called Open CV. A standardized structure for computer vision operations was created with Open CV in order to speed up the objectification of artificial intelligence into products. The Open CV, a C-grounded program that was latterly followed by Java and Python, entered the picture. It's compatible with several operating systems, including Windows, mac OS, Android, iOS, and Linux. further than 2500 optimized algorithms are available in the collection, including a wide range of both traditional and slice- edge computer vision and machine literacy ways. Python's Open CV library is a suitable tool for snappily prototyping computer vision issues. Computer vision is a field of technology that focuses on rooting data from digital input prints or vids to make prognostications analogous to what the mortal visual system can. Images will be used as input, and through colorful ways similar as image processing and machine literacy, the affair will be knowledge of the scene, including the capability to identify people, objects, and conditioning that are taking place there as well as their distance from the camera and bone another. Python comes with a number of libraries for recycling images and vids. Open CV is one among them. A large library called Open CV is helpful in furnishing a variety of styles for image and videotape operations. We can record videotape from the camera using Open CV. It enables to make a webcam videotape prisoner object which may use to record vids and also edit them according to how they fit.

5.2. CNN

Convolutional neural networks(CNNs) are a kind of deep literacy neural networks. Actually defined, consider CNN to be a machine literacy system that can take in an input image, give applicability(learnable weights and impulses) to colorful characteristics and objects in the image, and be suitable to distinguish between them. By removing features from the photos, CNN operates.

Every CNN includes the following

1. The input subcaste, which is an image in grayscale, .
2. The double or multi-class markers in the affair subcaste
3. A completely connected neural network, pooling layers, complication layers, and ReLU(remedied direct unit) layers make up the retired layers.

It's pivotal to realize that Artificial Neural Networks(ANNs), which are composed of several neurons, are unfit to prize characteristics from an image.

Then's when a convolutional subcaste and a pooling subcaste combination come into play. also, bracket can not be performed by the complication or pooling layers, hence a completely connected neural network is needed. CNN's job is to resize the images so that they're simpler to reuse without immolating details that are important for accurate vaticination. Since we need to make the system scalable to enormous datasets, this is pivotal.

5.2.1 Pooling

The pooling subcaste performs non-linear down sampling on the convoluted point, which is also known as the activation maps. This is primarily to reduce the computational complexity needed to reuse the massive quantum of data associated with an image. Pooling isn't needed and is constantly avoided. Pooling is generally divided into two types Max Pooling, which returns the maximum value from the portion of the image covered by the Pooling Kernel, and Average Pooling, which pars the values covered by a Pooling Kernel.

5.2.2 Image leveling

After pooling, the affair must be converted to a irregular structure that an artificial neural network can use to perform bracket. The number of neurons and the number of thick layers can vary depending on the problem statement. A drop out subcaste is constantly used to help the algorithm from over fitting. Dropouts ignore a subset of the activation maps during training but use all activation maps during testing. It prevents overfitting by lowering neural correlation.

5.2.3 How convolutional neural networks work

Several layers of a CNN are possible, and each subcaste trains the CNN to honor the numerous aspects of an input image. Each image is given a sludge or kernel to produce an affair that gets better and more detailed with each subcaste. The pollutants may begin as introductory characteristics in the lower layers. In order to check and identify features that specifically reflect the input item, the complexity of the pollutants increases with each fresh subcaste. As a result, the incompletely recognised image from each subcaste's affair, or convoluted image, serves as the input for the posterior subcaste. The CNN recognizes the image or object it represents in the final subcaste, which is an FC subcaste. The input image is reused through a number of different pollutants during complication. Each sludge performs its function by turning on specific aspects of the image, after which it sends its affair to the sludge in the posterior subcaste. The operations are repeated for dozens, hundreds, or indeed thousands of layers as each subcaste learns to honor colorful features. Eventually, the CNN is suitable to honor the full object after recycling all the picture data through its numerous layers.

6. RESULT

The present device measures the distance to matters and translate that into strain on the wrist. It has usually quick response time to shortly navigate complicated environments. It is designed to assist a imaginative and prescient impaired character to navigate complicated environments. Mounted to the returned of the hand, the pressure remarks potential it doesn't intervene with different help devices. Whereas the proposed device observe the impediment in each side(front and returned side) of the glove. The Sensor sends the signal, discover boundaries and let consumer is aware of through vibrating a motor and different phase Sensor send the sign ,detect boundaries and let consumer is aware of by way of Buzzer sound. In addition it will send the region to the respective individual and additionally it used to understand objects and currency values. It is clear that the proposed format can be developed in addition to be used as a handy and cheap journey useful resource for the visually impaired as it is fee nice and trouble-free

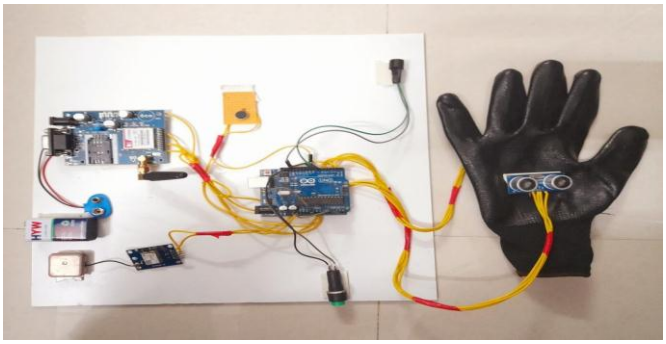

Fig 4. Result

Fig 5. Location tracking link

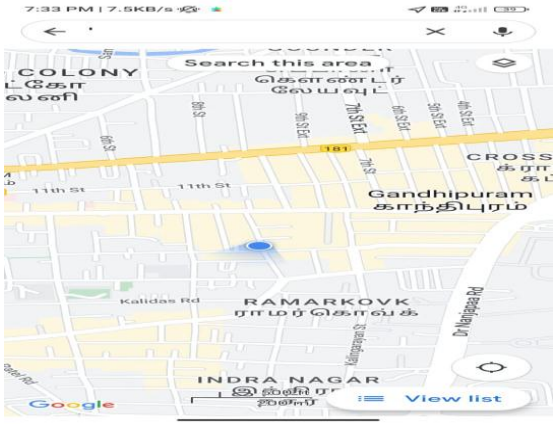

Fig 6. Location detected

Table 1- Analysis

Componentt	Operating voltage	Operating current	Range	Response time
Ultrasonic sensor (HCSR04)	4.8 - 5V	15mA	90-120cm	2-3s
Buzzer	1.5 - 12V	20mA	1-7KHz	5s
Vibration motor	2.4 - 3.5V	85mA	8-12KHz	5s
GPS/GSM module	2.7 -3.6V	45mA	Tracking Sensitivity-161dB	20 -30s
Currency Detection	4.75 - 5.1V	3A	Upto 20 cm	3-5s

7. CONCLUSION

Smart glove for the blind is designed to aid blind humans stroll and estimate the distance from obstacles. Main component for this design are Raspberry pi, Vibrator motor ,Buzzer,GPS /GSM Module and ultrasonic sensor. Based on the analysis that has been conducted, there are few advantages and limitations of this project. One of the benefits of this design is the use of ultrasonic sensor. This sensor is very touchy and will set off quicker when it detects obstacles. Besides that,the fee to increase this assignment is low and can be afforded by using blind people. The predicament of this challenge is the ultrasonic sensor used can solely become aware of the boundaries however can't illustrate the structure of the obstacles. Furthermore, this assistive glove can solely be used through blind humans however no longer the blind and deaf people.

REFERENCES

[1] P. Mangayarkarasi; R.J. Anandhi; JnanaJ; Monisha C; Pallavi V Kulkarni; Saloni K,"Smart Glove for Blind" Published in 2022 IEEE Delhi Section Conference (DELCON),20 April 2022.

[2] Abilash CS; Dinakaran M; Hari Vignesh R; A Anju,"Currency Recognition For The Visually Impaired People" in 2022 IEEE,20April 2022.

[3] Rakshitha R,Mahalakshmi H N Naveen Kumar Priyanka L, Ranjitha D Sudheesh K V ."Smart Gloves for Visually Challenged" .International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by ICEI - Conference Proceedings ,Volume 10, Issue 11.Special Issue - 2022 .

[4] A. Bhagyashree, Akheelesh B Palled, Ranjith Kumar, Akshay Hegde, Saravana Kumar,"Assistive Devices for Visually, Audibly and Verbally Impaired People " IJRASET, July 2022.

[5] K P Venkat Vivek, J Vandana, K Sripooja , Abhishe Choubey ," A Smart Wearable Guiding Device for The Visually Impaired People",International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 10, Issue VI ,June 2022.

[6] Gaurav Rasal , Pratiksha Ganjave , Rushikesh Markad , Yash Kalekar, "Currency Detector for Visually Impaired ",IJERT Volume 10, Issue 11 ,NOVEMBER 2021.

[7] V.S.Sooraj;HemanJeevanMagadum; Lakshmaiah Alluri," iTouch – Blind Assistance Smart Glove", 10th International Conference on System Modeling & Advancement in Research Trends ,2021.

[8] Vrushali V. Kondhalkar, Ayesha R. Shaikh, Yogesh A. Chaudhari, Omkar R. Bhandar, Gaurav B. Katkar," An Intelligent Assistive System for Visually Impaired People", International Research Journal of Engineering and Technology (IRJET) ,Volume: 08 Issue: 04 , Apr 2021

[9] Jorge Rodolfo Beingolea, Miguel A. Zea-Vargas, Renato Huallpa, Xiomara Vilca, Jorge Rendulich," Assistive Devices: Technology Development for the Visually Impaired", Volume 5 Issue 4 , November 2021.

[10] Girish Gajanan Mulye,"Advance Glove for Blind" International Journal of Science and Research (IJSR) ISSN: 2319-7064 SJIF,Volume 10 Issue 7, 2020 .

[11] Dr.E.Punarselvam1,Mr.M.Dhamodaran2 ,S.Anandhkumar3 , P.Dinesh3 , S.Kaviyarasan3 , G.Makesh3, "smart gloves used for blind visually impaired "International Journal of Computer Techniques -– Volume 7 Issue 2, March 2020.

[12] Deeksha1 , Mridima Krishna , Narmatha , Shruthi , Arushi Adhar , Ramya , Annarose ," Hand Gesture based Assistive Technology for Blind, Deaf and Mute People", International Journal of Advanced Research

in Science & Technology (IJARST) Volume 7, Issue 2, July 2020.

[13] Devashish Pradeep Khairnar; Rushikesh Balasaheb Karad; Apurva Kapse; Geetanjali Kale; Prathamesh Jadhav," A Visually Impaired Assistance System", 3rd International Conference on Communication System, Computing and IT Applications (CSCITA),IEEE, July 2020.

[14] Marius Pandelea; Isabela Todirite; Mihaiela Iliescu," Customized Assistive System Design for Visually Impaired People"2020 Fourth World Conference on Smart Trends in Systems, Security and Sustainability (WorldS4),IEEE, October 2020.

[15] Anakha L V, Lavina S Vijay, Parvathy Ajayan, Souparnika V M, Ms. Manju Sreekumar," Smart Glove", International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 07 Issue: 07 | July 2020.

[16] P. Mohan, M. Mohan Raj, M. Kathirvel, P. A. Kasthurirngan, S. Musharaff, T. Nirmal Kumar,"Smart Speaking Glove for Deaf and Dumb" NCFTET Volume 8 – Issue 06,2020.

[17] A.Karmel,Anushka Sharma, Muktak Pandya, Diksha Garg "IoT based Assistive Device for Deaf, Dumb and Blind People",Published by Elsevier B.V.International conference on recent trends in advanced computing , 2019.

[18] Dr. D. Satish Kumar,"Iot Based Smart Gloves For Blind People", International Journal on Applications in Basic and Applied Sciences, 2019.

[19] Milon Islam, Muhammad Sheikh Sadi," Developing Walking Assistants for Visually Impaired People", IEEE SENSORS JOURNAL, VOL. 19, NO. 8, APRIL 15, 2019.

[20] Engdaw Ayalew Tessfaw; Bhupendra Ramani; Tadesse Kebede Bahiru, "Ethiopian Banknote Recognition and Fake Detection Using Support Vector Machine" IEEE,2018.