A TERM PAPER REPORT

ON

EYE RING TECHNOLOGY

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Submitted By: **Under the Guidance Of**

SANJEET (9915102108)   **JYOTI VYAS**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY, NOIDA (U.P.)

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CERTIFICATE

This is to certify that the term paper report entitled, "EYE RING TECHNOLOGY" submitted by Sanjeet (9915102108) in partial fulfilment of the requirements for the award of bachelor of technology degree in Electronics and Communication Engineering of the Jaypee Institute of Information Technology, Noida is an authentic work carried out by him under my supervision and guidance. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Ms Jyoti Vyas

ECE Department,

JIIT-128,

Noida- 201301

ABSTRACT

Generally, Visually impaired people are dependent on audio feedback to get data on electronic devices like mobile phones, tablets, radio, etc. Finger-worn interfaces are still unexplored, regardless of the way that our fingers and hands are normally utilised for referencing and communicating with nature. In this paper I present structure rules and execution of a finger-worn I/O gadget, the EyeRing - a device for visually impaired people, which use the widespread and regular motion of pointing. This paper presents use instances of EyeRing for both outwardly debilitated and located individuals. This is about beginning responses from outwardly debilitated clients which recommend that EyeRing may in fact offer a progressively consistent answer for managing their prompt surroundings than the arrangements they as of now use. It additionally give an account of a user contemplate that shows how EyeRing decreases exertion and interruption to a located client. We presume that this exceedingly encouraging structure factor offers the two gatherings of people upgraded, consistent association with data identified with items in the condition

A Visually impaired client worn this gadget on forefinger. A client single tick the pushbutton switch in favor of EyeRing with his thumb. Immediately, depiction of an picture is taken and exchanged by means of Bluetooth to the cell phone. The cell phone Analyze a picture. In the wake of examining the picture information,

cell phone dependent on Android OS utilizes a Content to-Speech module to peruse the data utilizing Headset. Additionally we can give verbal order by double tapping the pushbutton. We reason that EyeRing innovation Inspires outwardly disabled individuals and furthermore decreases exertion and disturbance to a located client.

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CHAPTER 1

INTRODUCTION

In spite of the consideration finger-worn association gadgets have gotten throughout the years, there is still much room for imaginative structure. Prior investigations of finger worn cooperation gadgets might be isolated into a couple subspaces as indicated by how they are worked: Pointing, Tapping, Gesturing, Pressing/Clicking OnDevice. Our framework depends on performing Free-air Pointing (FP) signals, and also Touch Pointing (TP) signals. TP signals use the regular touch sense, anyway the activity trigger did not depend on contact affect ability of the surface, rather on an outer sensor. As of late Chi et al gave Seeing Your Hand, a glove contraption that utilises TP signals. The haptic component of TP signals is fascinating particularly on account of assistive advancements for the outwardly impeded. This empowered them to get extra criticism on the question they need to cooperate with.

EyeRing is the finger-worn gadget that permits utilising a directing motion or contacting toward access advanced data about articles and the world which is self-sufficient, remote, and incorporates a solitary catch to start the interaction.It opens up a universe of conceivable outcomes for taking care of everyday issues for the outwardly weakened and the located alike. EyeRing applications are in fact instinctive and consistent. Our first target gathering of people would be outwardly impeded individuals (primarily in created nations) who are quick to investigate new kinds of Assistive gadgets. It tends to major difficulties looked by outwardly hindered individuals and encourages them to satisfy their essential security and assurance needs while enhancing their confidence and self actualisation. EyeRing achieves a leap forward in

assistive innovation gadgets for the outwardly impeded by utilising generally accessible innovation in a considerably more conservative, advantageous frame. The EyeRing a finger - worn gadget comprise of JPEG Camera, AVR processor, Bluetooth module, Polymer Lithium-particle battery, and push catch switch. 'These segments are appends onto ring-formed Plastic piece. The EyeRing idea chiefly dependent on the Pointing Gesture, Computer Vision and Text to Discourse Synthesis advancements. The Pointing signal is principal to human conduct. In Pointing signal innovation there are two sorts of motion: Free-air Pointing (FP), and Touch Pointing (TP). TP motions use the common contact sense, anyway the activity trigger isn't in light of touch affect ability of the surface. FP motions are utilised for demonstrating a place or a thing in space-a uninvolved activity. Anyway enlarging FP for data recovery is an intriguing expansion. This framework depends on both pointing gestures. The PC vision innovation is in light of extraction of data from pictures or on the other hand recordings. This field incorporates techniques for getting, preparing, dissecting, and understanding pictures and, as a rule, high dimensional information from this present reality so as to create numerical or emblematic information. In EyeRing innovation first we catch a picture then PC vision strategy remove the data from that picture. The content to-discourse synthesiser is utilised to give sound criticism furthermore, is additionally a less problematic cooperation for located and visually weakened individuals alike. At the point when utilised out of the blue, EyeRing must be matched with the cell phone or PC application; in any case, this is done just once and hereafter a Bluetooth association will be consequently settled. Remembering that the gadget should bolster both located and outwardly hindered clients, we totally depend on non visual communication for all utilisation of the framework. An ordinary association begins when the client plays out a solitary

tap on the push catch switch situated in favor of the ring utilising his thumb. The kind of examination and comparing reaction that pursues rely upon the chose application (cash, tag, insert, etc.)The user may change to a different application by double clicking the push button and giving the system a brief verbal command that names the application, for example 'insert' (to insert some pictures previously taken into some online document),'currency'(to recognize the value of a dollar bill), 'tag' (to recognize a price tag), and so on.

CHAPTER 2

LITERATURE SURVEY

Finger-worn connection gadgets got important consideration throughout the most recent couple of years from HCI scientists and experience fashioner. Investigations of finger-worn association gadgets might be partitioned into various classifications as indicated by how they are worked. These finger signals incorporate Pointing, Tapping/Touching,Gesturing, Pressing/Clicking On-Device. Remotely controlling articles in nature by pointing with a wearable gadget was executed in the Ubi-Finger and FieldMouse ventures. Endeavours to join and recover data from physical articles were executed and as of late utilising IR reference points and coded surfaces. Anyway these applications frequently require nature to be instrumented with sensors and markers, which restrains the associations to instrumented situations. Handheld, straightforward AR structures which present sound-related analysis and overlay information over a customer's field see are likely the closest related work to EyeRing's convenience. FingerSight gives a visual material substitution system by changing over visual information into information, which is in like manner exemplified in the sort of correspondence proposed by EyeRing.

CHAPTER 3

COMPONENTS

Equipment structure :

The gadgets which are utilized in EyeRing innovation are:

• Microcontroller

• Image procurement module

• Wireless module

3.1 Microcontroller

Atmel 8-bit AVR (ATmega32U)

EyeRing just requires fundamental peripherals :

i. Computerised I/o - this stick is designed as an I/p and associated with a push catch for client communication.

ii. Two UART communication(universal non concurrent collector/transmitter).

a) picture securing module

b) setting up Bluetooth correspondence channel UART is kind of inserted interface.

A UART is generally an individual (or part of a) coordinated circuit utilized for sequential interchanges over a PC or fringe gadget sequential port. UARTs are presently generally incorporated into micro controllers that deciphers information among parallel and serial structures.

3.2 Image acquisition module

The EyeRing design is based on the Image acquisition model in which they use the C329 UART JPEG compression module (Lossy compression) acts as a video camera. User can give the snapshot command to capture full image with the help of OV7725 VGA CMOS sensor and the OV529 JPEG engine. This module has a power saving mode characterised adjustable Resolution. The C329 is a color VGA camera module which performs JPEG compression and can attach to a host via a RS232 interface. Users can send a Snapshot command from the host in order to capture an image. The image is then compressed by the board, stored in and internal buffer and transferred to the host through the serial port. Sensor used is a 1/4" OmniVision VGA sensor with an 8-bit YcbCr interface and 3.8 V/(Lux Sec) sensitivity. The OV529 Serial bridge contains an Embedded JPEC CODEC and controller chip that can compress and transfer image data from the Camera Sensor to an external device. The OV529 performs all imaging function like white balance, downsizing and compressed image storage. A Serial EEPROM provides the program code that gives the OV529 it's interface and command set.

3.3 Wireless module

RN-42 Bluetooth module. In this design consideration they use wireless (unguided) communication protocol. Bluetooth is wireless technology standardised as IEEE 802.15.1 which is used for exchanging data over very short distance having frequency spectrum of 2.4GHZ to 2.485GHZ. so, the wireless communication between EyeRing and mobile device is done through a Roving Networks RN42 Bluetooth module is low power, high performance with shorter length and delivers up to a 3 Mbps data rate for distances up to 20 meters.

The RN42 is a small form factor, low power, Class 2 Bluetooth radio for designers who want to add wireless capability to their products. The RN42 supports multiple interface protocols, is simple to design in, and is fully certified, making it a complete embedded Bluetooth solution. With its high-performance PCB trace antenna and support for Bluetooth EDR, the RN42 delivers up to 3 Mbps data rate for distances up to 20 meters.

3.4 Software Design

EyeRing technology consists a Bluetooth communication model connected with mobile device (smartphone running Android V2.2) or notebook computer with operating system Windows 7. Also they are using a computer vision technology which is a discipline that studies how to reconstruct, interpret and understand a 3D scene from its 2D images in terms of the properties of the structures present in the scene. Computer vision software runs on the smartphone, while other applications run on the PC depending on the task at hand. Software design provides ease for development of different applications.

These modules get paired picture information from the ring, as well as catch click occasions. A portion of the PC vision calculations (e.g. cash acknowledgment, label acknowledgment) were created in-house, and we utilized an outsider programming for general question acknowledgment. Now a portion of our PC vision programming keeps running on the cell phone, while other applications keep running on the PC relying upon the job that needs to be done. We envision moving to a totally cell phone stage for all applications soon. The product engineering (correspondence module and vision motor) takes into account simple improvement of various applications.

3.5 Working

A user needs to match the finger-worn gadget with the cell phone application just once and from this time forward a Bluetooth association will be naturally settled when both are running. An outwardly hindered client demonstrated this as a basic component. Ordinarily, a user would single tick the pushbutton switch in favor of the ring utilising his thumb. Right then and there, a preview is taken from the camera and the picture is exchanged by means of Bluetooth to the cell phone. An Android application on the cell phone at that point examines the picture utilizing our PC vision motor. Kind of examination and reaction relies upon the preset mode (shading, separate, cash, and so on.). After breaking down the picture information, the Android application utilizes a Text-to-Speech module to peruse out the data however a headset. Users may change the preset mode by double tapping the pushbutton and giving the framework brief verbal directions, for example, "remove", "shading", "money", and so forth., which are therefore perceived.

When used for the first time, EyeRing must be paired with the smartphone or PC application; however, this is done only once and henceforth a Bluetooth connection will be automatically established. Bearing in mind that the device should support both sighted and visually impaired users, we completely rely on non-visual interaction for all usage of the system. A typical interaction starts when the user performs a single click on the pushbutton switch located on the side of the ring using his or her thumb. The type of analysis and corresponding response that follows depend on the selected application. The user may change to a different application by double clicking the pushbutton and giving the system a brief verbal command that names the application. The applications use a text-to-speech engine to provide audio feedback, hence providing a less disruptive interaction for sighted and visually impaired people alike.

CHAPTER 4

EYE RING ENABLED APPLICATIONS

The EyeRing framework opens up the possibility to assemble an extraordinary number of utilizations for individuals with vision impedances and in addition for located individuals. In the accompanying segments, we present itemized depiction of two proof-of-idea application situations: a shopping right hand, to expand the autonomy of outwardly debilitated people in a shopping situation and a work area application giving a consistent duplicate glue communication for located individuals. Over those, we tried different things with some of extra applications and use cases. One is an intuitive application for youngsters in a pre-perusing stage that bolsters arranged learning, by giving them a chance to peruse message without anyone else, before they can perceive letters in order or words. It has been demonstrated that pointing at words while understanding them so anyone might hear enables youngsters to learn quicker. At the point when a content comprises of numerous words, the EyeRing framework expect that the word they need read is the one at the tip of their finger. Another application right now being developed expands upon the possibility of I/O brush, where the ring is utilized as a 'paint brush' to catch a surface (for brush stroke) and to draw or paint around a screen or anticipated canvas. A large number of these kinds of uses may exist for iPads, iPhones or comparative gadgets, anyway the upside of EyeRing is that it makes them quick, requiring negligible exertion and decreasing movement of consideration.

4.1 Currency Detector

In spite of the fact that cash recognition applications for visually impaired clients as of now exist for cell phones, these applications require numerous means to work. In particular, the client needs to discover the telephone, open the screen, peruse (utilizing a consecutive and subsequently moderate sound-related methodology) to the correct application, open the application, snap a photo, tune in for the appropriate response, kill the telephone and put it away. Conversely, EyeRing requires a less number of steps, essentially indicating a cash note and tapping the catch, while the other hand is allowed to hold the note. The framework produces manufactured discourse yield showing the money related estimation of the note. On the off chance that the cash isn't perceived, a blunder message prompts the client to snap another photo. Our EyeRing money finder application is planned to assist a client with identifying USA cash bills ($1, $5, $10, $20, $100), in spite of the fact that it is effectively extendable to different monetary standards. A location calculation dependent on a Bag of Visual Words (BoVW) approach makes a forecast on the sort of note from the information picture. Grayscale pyramid SURF highlights were utilized. At first, the vocabulary was prepared to be 1000 highlights in length and afterward decreased by credit determination to 170 highlights. A multi-class SVM (with RBF bit) was utilized for arranging. The preparation dataset comprises of 800 pictures under various lighting conditions and separations, 100 examples were waited for parameter tuning, and the rest were utilized in a 10-overlay cross-approval conspire. For testing, an extra 270 pictures were utilized. The general acknowledgment rate is generally 92% with a 0.905 kappa measurement.

4.2 Virtual Walking Cane

Contrasted with a steel stick, a finger worn gadget utilized for route is unquestionably less prominent, and also popular and engaging. The pith of this application is to give an inexact estimation of the unmistakable strolling space before the holder of the ring. Client needs to client FP signal to take two photos of the space before him/her by pointing the camera and clicking, with some movement between the shots. The framework obviously advises the inexact free space in front. For this application, we utilize the idea of Structure from Motion (SfM) from PC vision. After accepting the two pictures, a calculation to recuperate the profundity is performed. The general diagram of the calculation is as per the following: (a) the two pictures are filtered for remarkable component focuses, (b) the highlights in the two pictures are coordinated into sets, (c) for every point match we gauge the movement it experienced, and from that – the surmised 3D position, (d) we utilize a vigorous strategy to fit a model of a story to the inadequate information, and restore the separation of the reasonable strolling way between articles on it. By over and over taking photographs with movement, likeness moving a steel stick, we check the recouped 3D mapping of the floor and protests for any hindrances in the method for the client.

4.3 Color Detector

This application of EyeRing aids a visually impaired person to understand the color of an object. Again, the user interaction is simple; the user simply touch point (TP gesture) to an object and click the button to deliver an image for processing. The system analyses the image and returns the average color via audio feedback. We use a calibration step to help the system adjust to different lighting conditions. A sheet of paper with various colored boxes is printed, and a picture of it is taken. We rectify the region in the image so that it aligns with the colored boxes, and then extract a sample of the pixels covering each box. For predictions we use a normal distribution, set to the maximum likelihood of the perceived color.

4.4 Text Reader

Speech and content is the primary vehicle for human correspondence. A man needs vision to get to the data in a content. Anyway the individuals who have poor vision can assemble data from voice. So this gadget proposes a camera based assistive content perusing to help outwardly impeded individual in perusing the content present on the caught picture. The thought includes content extraction from filtered picture utilizing Tesseract Optical Character Recognition (OCR) and changing over the content to Speech by e-Speak instrument, a procedure which makes outwardly impeded people to peruse the content. This is a model for visually impaired individuals to perceive the items in genuine world by extricating the content on picture and changing over it into Speech. Proposed technique is completed by utilizing Raspberry pi and conveyability is accomplished by utilizing a battery reinforcement. In this manner the client can convey the gadget anyplace and ready to use whenever. After entering the camera see recently put away faces are distinguished and educated which can be actualized as a future innovation. This innovation enables a large number of individuals on the planet who to encounter a critical loss of vision.

SUMMARY & CONCLUSION

EyeRing recommends a novel connection technique for both outwardly disabled and located individuals. We base the connection on a human signal that is universal in any dialect and culture – pointing with the pointer. This has decided the nature and structure of the ring device, area of the camera and trigger. Primer criticism got from an outwardly impeded client underpins that EyeRing assistive applications are natural and consistent. Future applications will incorporate perusing non-Braille and we intend to stretch out EyeRing applications to areas past assistive innovation. We trust that including more equipment, for example, a mouthpiece, an infrared light source or a laser module, a second camera, a profundity sensor or inertial sensors, will open up a large number of new uses for this explicit wearable plan.

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APPENDICES

Python code for Text Reader

```python
# Import necessary libraries

from PIL import Image

import pytesseract

from pytesseract import image_to_string

from subprocess import call

from gtts import gTTS

import os

import subprocess

from os import system

from playsound import playsound

# printing the text converted from the image

print (image_to_string(Image.open('test1.jpg')))

txt = image_to_string(Image.open('test1.jpg'))

language = 'en'

# converting the text to speech file

tts = gTTS(text=txt, lang='en', slow=False)

# Save the file

tts.save("test.mp3")

# play the converted file

playsound('test.mp3')
```