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Smart Stick for Blind Person using Internet of Things

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Abstract: ***The major sensory organ of a person is their eyes. One glimpse around us is enough to make us realize the importance of visual. There are a limited number of accessible activities for the visually impaired persons; these problems can be solved by means of technology which helps visually impaired persons to access the world through their own. The trending technology "Internet of Things" will help to resolve this problem of visually impaired persons. The smart blind stick is an embedded system which makes use of the internet to assemble the existing technologies such GPS tracking system, sensor (ultrasonic, fire, moisture), mobile application etc. into a single stick. The smart blind stick is easily accessible with little much of knowledge about existing technologies, and it is within the budget of the person.***

Keywords: sensory organ, GPS tracking system, Smart blind Stick, Internet of Things, Visually Impaired person, Microcontrollers, UltraSonic sensor, fire sensor, Smart Stick.

I. INTRODUCTION

Visually impaired persons do lead a normal life with their own style of doing things. But they definitely face problems due to inaccessible services and social challenges. The main challenge faced by the visually impaired persons is to navigate around places. They can solve this problems by approaching their family members, it is good to be kind and help others but this can create problems for visually impaired person this will affect the mental health of that person. The most important thing for the visually impaired persons is to gaining the independent life without anybody's help they can do their own things by their own. Previously many researchers proposed the different systems to solve the different problems of the visually impaired persons. But, they failed to point out the major problems of the visually impaired persons that is navigation and safety. Proposed system combine the existing technologies and previous works of researchers to make a stick which will be smart enough to help the blind person to navigate the around places with keeping the safety of the person as prime concern. The smart blind stick make use the GPS tracking system for the navigation purpose and to locate the current location of the visually impaired person by their guardians in case of any emergency. The stick will be provided with different kinds of sensors to alert person about any danger coming in his way. The system also provided with the mobile application in both mobiles of visually impaired person and their guardian, which keep the guardian in touch with the visually impaired person. The system also included the TTS (text to speech) module which will convert the alert message into an audio format which will be listening by the visually impaired person through the microphone provided to him. The stick will be provided with the two buttons, in which one of the button can used for the ON/OFF purpose and other can be act as an emergency button. These all components are connected through the NodeMCU which in turn acts as a Wi-Fi module, mobile application in the guardian mobile and the smart blind stick of visually impaired person both are connected through free accessible cloud. Stick will be powered with the rechargeable battery supply. The smart blind stick is easy to access; light weight to carry and it is of low cost.

II. LITERATURE SURVEY

1) *Survey 1***:** MTLC (2018-19) team-2 (Naveen B M and Sai vandana) proposed a smart stick for blind people using UTLP kit and few interfaces, which is helpful for blind person to detect nearby obstacle. But it is focused on obstacle detection only and there are no audio alerts for the blind people.
2) *Survey 2***:** We conducted a survey at NAVAJEEVANA Rehabilitation center Ballari where we met visually impaired children and discussed with them about our project by asking them how they are struggling in their daily life to navigate and children answered all questions and they told our project will help them a lot if we implement.

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Fig 1. Conducting survey at Rehabilitation center Ballari [25/11/2019]



Fig 2. Survey with visually impaired children, Ballari [25/11/2019]



Fig 3. Survey with co-coordinators of Rehabilitation center, Ballari [25/11/2019]

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Fig 4. Survey with co-coordinators of Rehabilitation center, Ballari [25/11/2019]

III. PROPOSED WORK

The proposed system has been divided into two parts. The first part is about the hardware smart blind stick which is made for blind person contains the ultrasonic sensor, water sensor, fire sensor, Nodemcu (Wi-Fi model), toggle switch, speaker, and vibrator. The second part about the software where the application is developed for the care taker or guardian of the visually impaired person.

A. Part 1: Hardware part

1) Part 1 consists of NODEMCU, smart stick, ultrasonic sensor, moisture sensor, fire sensor, vibrator, push button and buzzer as shown in Fig5.

2) Nodemcu is used as a Wi-Fi model. It is connected to another NODEMCU in the other module which is with the person who care for you.

3) The smart stick is connected to the mobile through Wi-Fi model called NODEMCU. Nodemcu is connected to the all sensors we use in the project. The sensors act upon the obstacle.

4) When obstacle is detected the buzzer which is connected to NODEMCU is ON and simultaneously notification is given on the other module also.

5) When nothing is detected the stick does nothing.

6) Toggle button is also available, if the blind person feels that he is in danger he can use it.

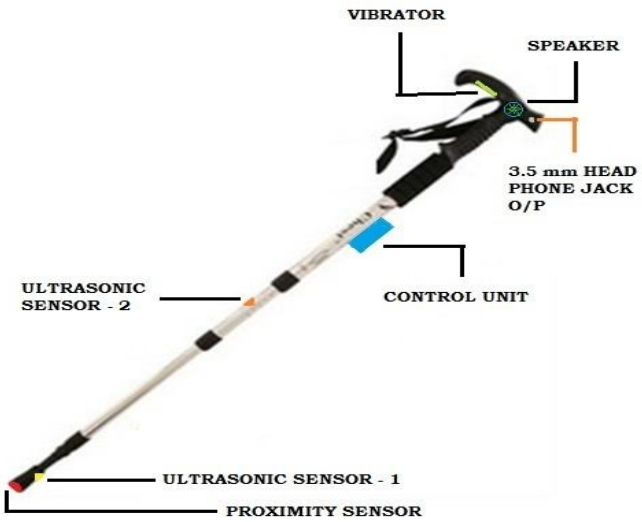


Fig 5. Smart blind stick

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B. Part 2: Software Part

1) Module2 consist of mobile which is installed with application software.
2) When the blind person pushes the push button the notification is received through mobile app.
3) A message and GPS location is received at mobile which is at care taker.
4) All the actions in the module 1 are reflected in module 2. So that the person who cares can have knowledge of the blind person whether he is safe or no.

IV. IMPLEMENTATION AND RESULTS

[3] Shows the implementation part of our project means the blind stick requires following hardware components:

A. Sensors (Water, Fire, Ultrasonic)
B. GPS module
C. NodeMCU
D. Buzzers
E. Vibrators

*1) Ultrasonic Sensor***:** In our project we used a ultrasonic sensor to detect any obstacle or any vehicles that are moving in front of blind person.

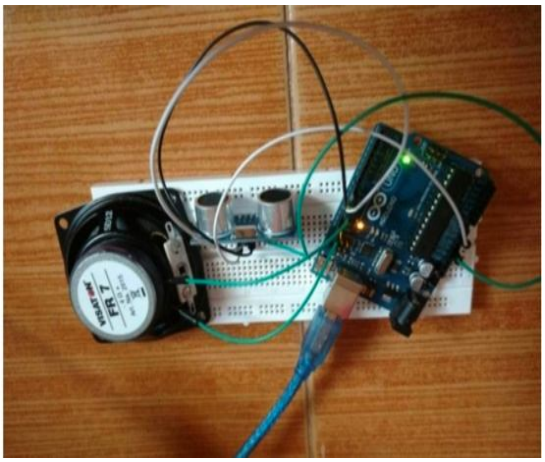


Fig6: Working of Ultrasonic sensor

2) Fire Sensor: In our project we used an Fire sensor to detect fire or flame that comes in front of blind person, and any heat items present in his way.

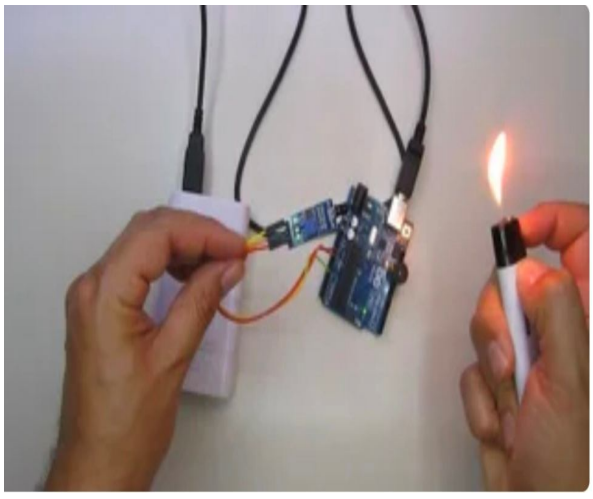


Fig 7: Working of fire sensor

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3) *Water Sensor (Moisture Sensor)*: In our project we used an water sensor to detect any moisture content in blind persons way, and to detect any puddles filled with water on the way where the blind person is walking.

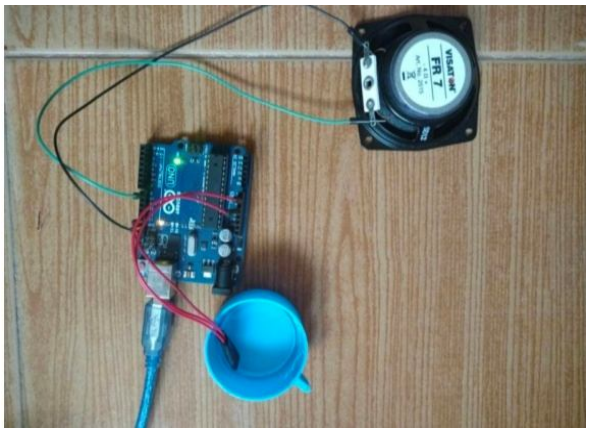


Fig 10: Working of Water sensor

4) *GPS Module:* In our project we used an GPS module to detect the location of a blind person and to observe his movements, this will help to the blind person guardian to observe his movements through the software application which we developed and the guardian can guide the blind person in proper way and save him if he is in danger.



Fig 11: Working of GPS module

5) *NodeMCU*: In our project we used an NODEMCU which is Wi-Fi module, we connected the all sensors present in our project to it and we are passing those values to buzzer, GPS module, and to the android application through Wi-Fi.

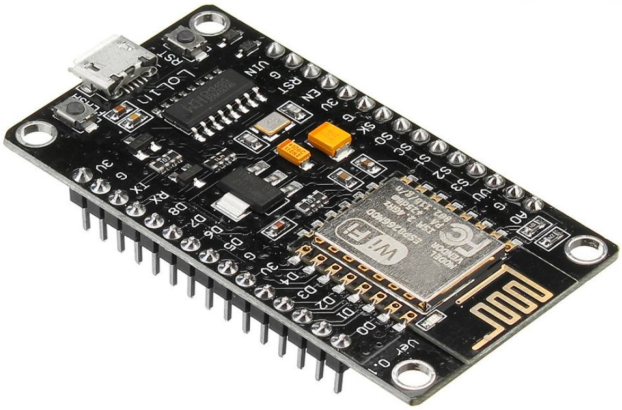


Fig 12: NodeMCU

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6) *Buzzer:* In our project we used an buzzer to alert the blind person about the danger, it works on the input value given from the nodemcu and produce a beep sound.



Fig 13: Buzzer

7) *Vibrator:* In our project we used an vibrator which will help if buzzer is not working means if buzzer fails to make sound or if the buzzer sound is not listened to blind person so the vibrator is an alternative part which will inform about danger to the blind person.



Fig 14: Vibrator

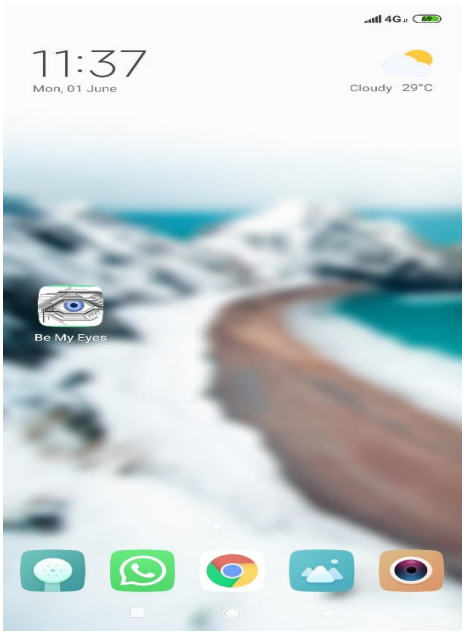


Fig15 : Be My Eyes Application

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a) As shown in the above fig15, The android application of our project named BeMyEyes looks like.
b) The user of this application has to click on the icon of our android application to use.

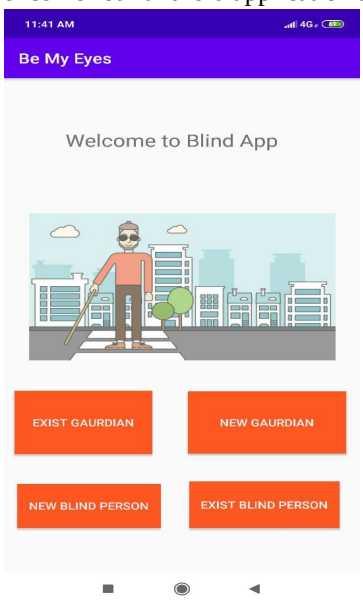


Fig16 : The first page of BeMyEyes android Application

c) After the user opens BeMyEyes android application the first page of the application looks as shown in the above Fig16.
d) The first page of our applications provides four option to the user 1.New Guardian 2.Exist Guardian 3.New Blind Person 4.Exist Blind Person.
e) There are two users are there for this application one who is the care taker of blind person (Guardian), second the visually impaired person.

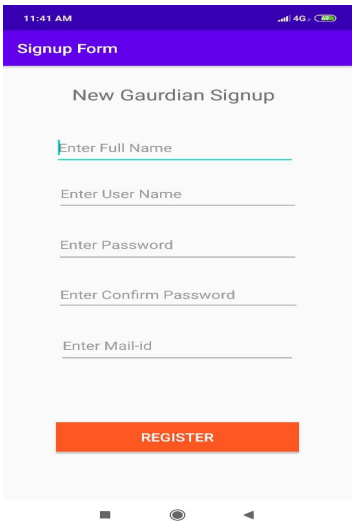


Fig. 17 Guardian signup page of BeMyEyes android Application

f) The new guardian as to do sign up or register to the application before using.
g) The new guardian has to enter registration details like Name, Username, Password, Confirm Password, Email-Id.
h) The user name and the password has some rules like user name should not exceed 8 and 16 characters, have letters and numbers and for password not have more than 7 numbers and any special characters (for example %, #, @).

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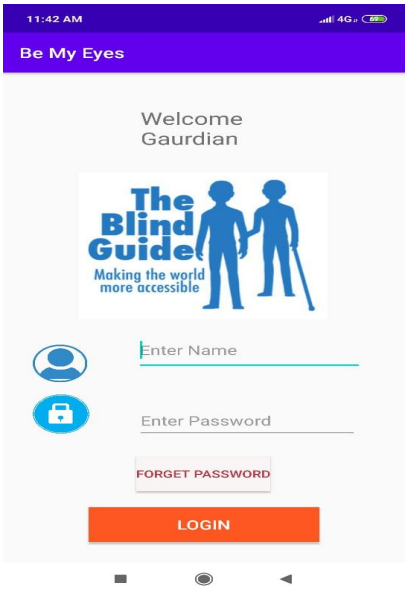


Fig18 : Guardian login page of BeMyEyes android Application

i) After the signup/registration of the new guardian he as to do login.
j) The login page of BeMyEyes application looks as shown in the above Fig18.
k) The credentials for login are username and password which the guardian has entered during his signup/registration process.
l) If he/she enters wrong username or password he/she will get the notification like “incorrect username” or “incorrect password”.
m) If he/she forgets his/her username or password, he/she has to click on the provided option called forget password. After clicking on forget password option he/she gets a new username and password to the email which he/she entered during signup/registration process.
n) If both credentials that is username and password are correct then login will successful.

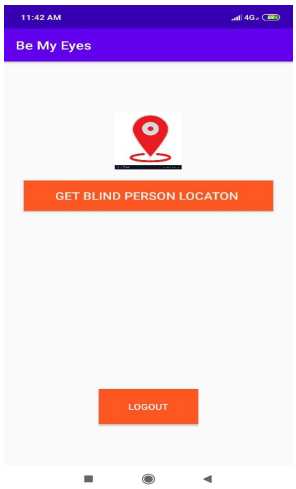


Fig. 19 Guardian observation of blind person movement page of BeMyEyes android Application

o) After successful login of a guardian the page as shown in above fig19 will open.
p) In this page there are two options one is get blind person location, second one is logout option.
q) If guardians do not want to observe blind person movements he/she can click on logout button.
r) If guardian wants to observe activities of blind person guardian has to click on get blind person location button, after clicking on this button the Google Map will open and it provides the location or movements of blind person.
s) Like this the guardian can observe the activities of blind person and if blind person going in wrong direction the guardian can call and guide him in a right way.

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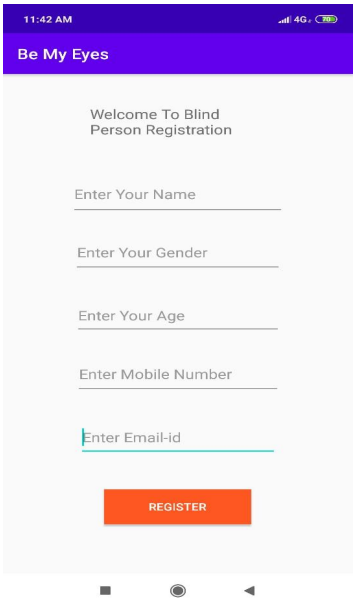


Fig. 20 Blind person registration page of BeMyEyes android Application

t) The new blind person as to do sign up or register to the application before using.
u) The new guardian has to enter registration details like Name, Gender, Age, Mobile number, Email-Id.
v) The mobile number which is entered here is used to get blind person location by the guardian.
w) After entering the details as shown in the above figure he/she as to click register button after clicking he/she gets a successful registration message.



Fig. 21 Blind person emergency button page of BeMyEyes android Application

x) The exist blind person has to click on the button called exist blind person as shown in fig.
y) After clicking on the button the page which is shown in fig will get open.
z) The page contains a button like click anywhere on the screen to send an emergency message to the guardian.
aa) If blind person feels danger or feels he need to call to guardian he/she can touch anywhere on screen to send emergency message to guardian.

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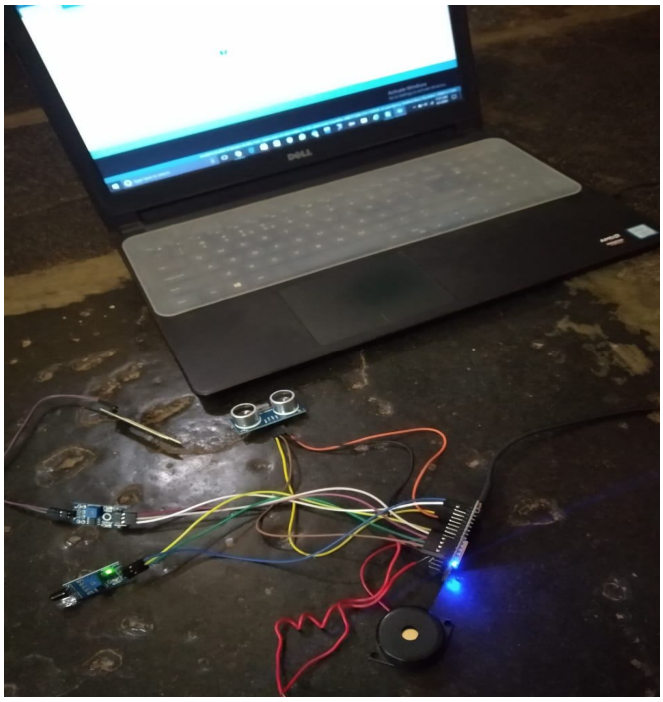


Fig. 22 Implementation of project

bb) The fig shown above is the developing of project.

cc) In the above figure we have three different types of sensors like ultrasonic sensor for obstacle detection, Moisture sensor for water detection, Fire sensor for fire detection.

dd) Along with these sensors we have NODEMCU as a wifi module to send the sensors data from stick to guardian mobile.

ee) We have buzzer to inform bout danger to blind person and toggle button to send emergency notification to guardian.

V. CONCLUSION

The blind stick which we are developed is very helpful to the visually impaired person to see the world independently without the help of any of his guardians like parents, dogs, friends. This stick protects him from the dangers or problems he is facing in the society in a proper way and it will save him by alerting him with a buzzer and vibrator.

This solution not only helpful to the blind person it is also helpful to the guardian who wants to care him or observe him. The application we developed the guardian can install it in his/her android mobile and after registration process he or she can observe the movements of his/her be loved blind person and guide him if he is going in wrong direction and save him from the danger.

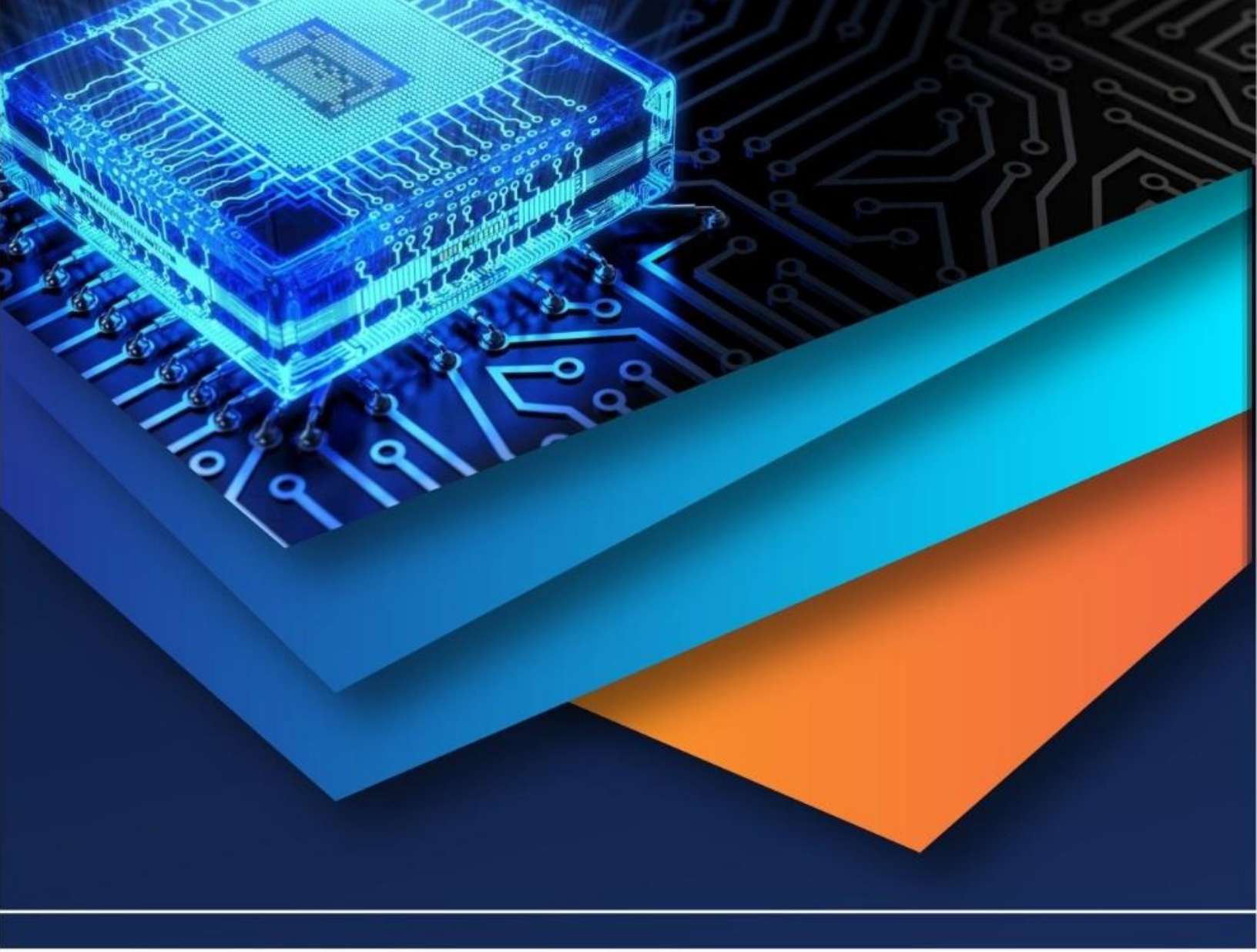
VI. ACKNOWLEDGEMENT

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