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Mobile Devices for Impaired Persons

Anatha Vishnu K G ; Janaki K ; Akshay S ; Yuvaraj C V ; Abdul Waris
Department of CSE - AI, Faculty of Engineering and Technology
Jain (Deemed-to-be-University), Karnataka 562112, India

Abstract:- The foundation for this project is an impaired person's mobile device application. Here, four algorithms are employed in accordance with the app's functionality. The algorithm is designed for Blind users; it will guide them to their destination by detecting potential hazards and sounding an alert. This algorithm is designed for Deaf users; it translates voice messages into text messages that are displayed on the screen. This algorithm is designed for Dump users; any text messages they receive will be translated into voice messages and played over the speakers. This algorithm is designed for Disable users; complete any necessary tasks by using their facial expressions, and the outcome will be neatly completed. In this work, we present an intelligent and successful All-in-One mobile application that can assist individuals with disabilities. It includes an AI bot and all four algorithms, making it a useful assistive technology for the disabled.

I. INTRODUCTION

People with disabilities now have more opportunities to move around the world independently thanks to mobile devices. These useful gadgets do, however, come with certain accessibility issues. We report on a formative study that looks at the choices, adaptations, and everyday uses of mobile devices made by individuals with visual and motor impairments. The advent of mobile technology occurred in 1973. However, no work has been done to assist the disabled. Currently, there are 285 million impaired people in the world, with 18.7 million of those being classified as blind or partially sighted in India. People with impairments may find that their quality of life is enhanced by mobile devices, which provide them more independence in carrying out daily duties. The goal of research is to improve the accessibility of mobile phones and other portable electronics through our auditory and tactile senses. Thus, translating text into voice and voice into text is not difficult. Pattern recognition and image processing are also significant fields. We review our research and innovation in the field of mobile assistive technology for the impaired in order to fully realize the potential benefits of these technologies. to develop a mobile application that offers assistance to individuals with impairments. Using cutting-edge technology to guide and support people with disabilities with their everyday needs.

II. LITERATURE SURVEY

The literature on mobile devices for people with disabilities highlights how important accessibility is becoming in technology and recognizes the variety of needs that people with disabilities, including those related to vision, hearing, and motor skills, have. Numerous studies have been done on the accessibility features built into well-known mobile operating systems, assessing how beneficial these features are for various types of impairments. Specialized mobile applications, such as screen readers and communication apps, that cater to particular impairments have become a focus, and evaluations of their impact and usability are still ongoing. Research on Human-Computer Interaction (HCI) explores the complex interactions that occur between mobile devices and individuals with disabilities, with a focus on the user experience across a range of user types. The potential of wearable and assistive technologies, which integrate sensors and haptic feedback, to improve mobile accessibility is investigated [1].

The difficulties and obstacles that people with disabilities encounter when using mobile devices have been identified, highlighting the gaps in accessibility. Surveys and qualitative research yield user perspectives that offer insightful information about preferences and experiences. A comprehensive picture of the current situation is provided by the literature, which also explores policy, standards, and emerging technologies. This opens up new avenues for future research in the field of inclusive mobile technology. They can search for destinations based on their current GPS location, have information about those destinations read aloud to them by a text-to-speech (TTS) synthesizer, and hear the distance and direction needed to get there. Downloading e-books is one of the most valued features of next-generation smartphones. This makes it possible for people with disabilities to use a screen reader or access digital talking books to read books at anytime, anywhere, even at home [2].

The INHOME project uses an INHOME terminal to send error and status messages, enable remote control and configuration of household appliances, and monitor people inside their homes. A shopping cart with robotic assistance that includes an RFID reader, camera, laser, and small robotic base, all mounted on a polyvinyl chloride frame. The robot can track its location and direct customers to their destination thanks to RFID tags placed throughout the store. One particularly fascinating area of accessible design and add-on hardware is the goal of making life easier for the hundreds of millions of people who use it globally. There has been little research on how people with disabilities access mobile

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phones and how mobile affects their lives, despite the growing recognition that mobile technology has the potential to provide services to those in need. Android users can, according to Google, scan the screen of their phone and choose a task by grinning, furrowing their brows, opening their mouth, or turning their head to the left, right, or up [3].

The literature review on mobile devices for the disabled concludes that accessibility has come a long way, but the field is still dynamic and changing. A dedication to inclusivity is demonstrated by the development of specialized applications catered to different impairments and the incorporation of accessibility features into mainstream mobile operating systems. Studies on human-computer interaction provide insightful information about user experiences, and wearable and assistive technologies present exciting opportunities for future innovation. The recognition of obstacles and difficulties highlights the necessity of continuing research to close current gaps. The result of all this work is completely new ways that people with disabilities can use technology to interact with them [4].

III. PROPOSED METHODOLOGY

People with physical disabilities can live better lives by using this app, which has an intuitive and simple user interface. From advice on travel to accessibility tips to private dating. It has four different algorithms in it, all of which are connected to a mobile application. Figure 1 illustrates how a deaf person can receive messages from others and how signs can be translated into speeches or messages for the deaf. It also shows how a blind person can navigate a navigation system. Lastly, it displays how a mobile device will react to facial gestures made by an individual with a disability. Lastly, the UML diagram for the suggested system is displayed in Figure 1.

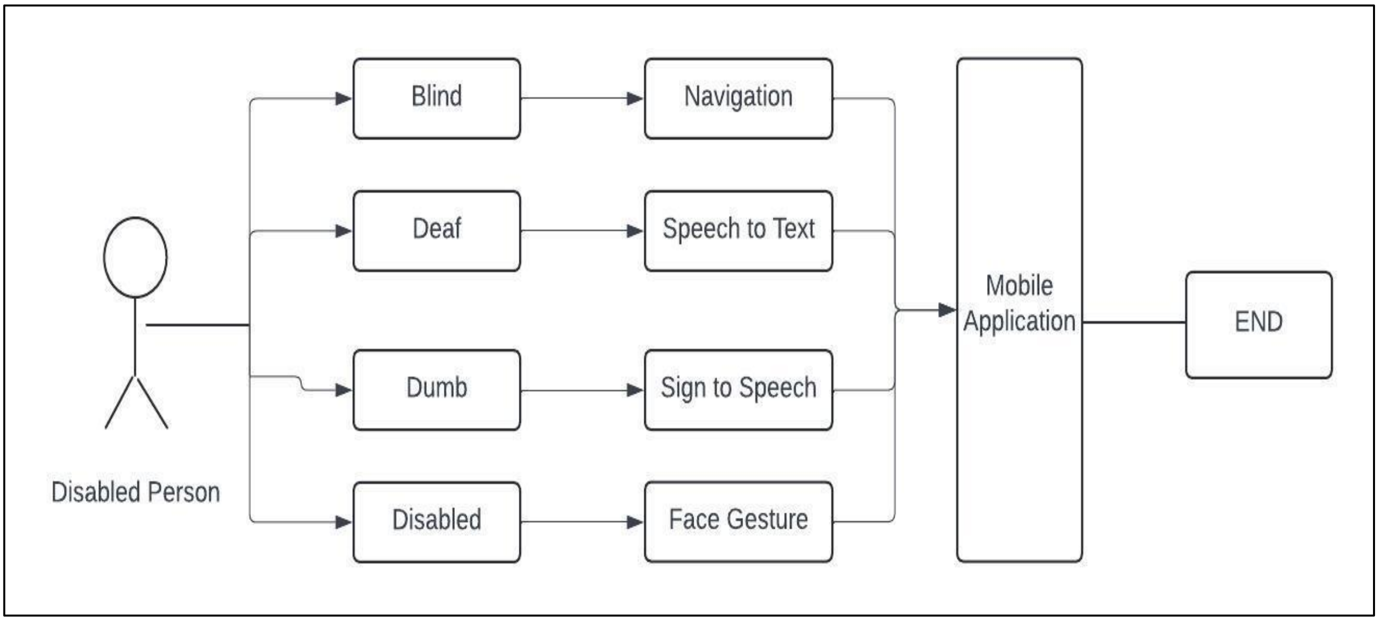

Fig 1: Proposed System for Mobile Device for Impaired Persons

The Algorithms used are;

- Navigation Detecting System for impaired persons
- Electronic Assist for Sign Interpretation Algorithm
- Assistive Technology for Speech Recognition Algorithm
- Face Gesture for Disabled Persons Algorithm

For testers, the inputs and outputs are more significant than the implementation or code of the software. They employ a variety of methods, including decision table testing, equivalency partitioning, and boundary value analysis, to find errors and make sure the system is operating as it should. Black box testing is useful in identifying errors that may arise from incorrect or unexpected inputs, ensuring that the system is dependable and functional from the end-user's point of view. A software testing technique called "white box" testing looks at the internal architecture of a system. It is sometimes referred to as structural testing or clear box testing. Testing professionals are interested in the code, how it is used, and how the system responds to this use. They use strategies like statement coverage, branch coverage, and path coverage to ensure that every line of code is executed and every possible result is considered. The tests, which are often automated, focus on brief coding segments such as functions or methods. By identifying errors early in the development stage, unit testing can reduce the amount of time and money required to fix issues later [5].

➢ *Navigation Detecting System for Impaired Persons:*

- STEP 1: To capture and identify images of the surroundings, a machine learning algorithm called R-CNN is combined with the BFS algorithm for navigational purposes.
- STEP 2: The suggested navigation system uses a smartphone to continuously take pictures of the surroundings in front of the user, process those images, and identify objects in order to provide the user with information.

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- STEP 3: Based on the image results, the user is able to identify the obstacle in addition to its approximate location and distance.
- STEP4: A user can now use a text-to-speech (TTS) synthesizer to hear the information about the distance and direction needed to get from their current location to their destination based on their current GPS location.

➤ *Electronic Assist for Sign Interpretation Algorithm:*

- STEP 1: DeepASL is the technology utilized. [NLP]
- STEP 2: It assists the user in transcribing the recipient's voice to text, which is then shown on the application.
- STEP 3: To shorten the intervals between interpretations, the user can add personalized signs or gestures to the database by using the customise feature offered by EASI.
- STEP 4: ASL-based avatar animations are kept in an application's central database. We assign two to five tags to each animation file.

➤ *Assistive Technology for Speech Recognition Algorithm:*

- STEP 1: The mute uses technology to translate text into voice by making hand gestures. [RESEARCH VITERBIUM].
- STEP 2: Requires the user to enter the message they wish to convey.
- STEP 3: The app translates the input, which can be either words or Morse Code, into audio so that the user and the recipient can communicate more easily.
- STEP 4: The cherry on top is that VOICE generates the audio by closely mimicking human speech after accounting for five different emotions: disgust, hate, anger, sorrow, and joy.

➤ *Face Gesture for Disabled Persons Algorithm:*

- STEP 1: Principal Component Analysis and Linear Discriminant Analysis are used to create this feature. [PCA]
- STEP 2: The system will identify the necessary face by identifying its constituent parts and obtaining information about its skin tone and facial hair.
- STEP 3: Then, by examining the movement of facial features like a smile or raised eyebrows, the device will identify a specific gesture to perform a specific task.
- STEP 4: The disabled user can now complete tasks assigned to them by registering their face and making the gesture.

Finding mistakes in the way different modules interact with one another and ensuring that the system as a whole complies with design specifications are the objectives. There are several approaches to integration testing, such as top-down, bottom-up, or a combination of the two. The tests could be automated or manual, and they could look at various aspects of the architecture of the system. Integration testing is an essential step in ensuring a system is dependable and functional before it is made available to users. To ensure that it meets both functional and non-functional requirements, the entire integrated system is tested as part of a sort of software testing known as system testing. Verifying that the system functions as intended overall and that each part works well when used in tandem with the others is the aim. The objective is to confirm that after modifications, the system still operates as intended. At different testing levels, such as system, integration, and unit testing, regression testing can be done. Test automation is often used with regression test suites because they tend to expand with every defect discovered. Finding any performance bottlenecks is the aim, including those brought on by resource consumption, scalability issues, and slow response times [6].

Performance testing is necessary to make sure the system can handle the anticipated load and offer a positive user experience both during periods of normal and high load. Performance testing aims to assess data transfer velocity, processing speed, and application output. Finding errors that automated testing might miss or providing prompt feedback on recently added or rapidly changing features are the objectives. Instead of using a pre-established test plan, exploratory testing creates and runs test cases in real time based on the tester's imagination, experience, and subject matter expertise [7].

The suggested framework for a mobile device customized for individuals with disabilities aims to create a thorough and all-encompassing design based on universal design principles. The system prioritizes multi-modal interaction methods such as gestures, touch inputs, and voice commands in order to accommodate a wide range of impairments and enable users to personalize their experience. Extending sophisticated accessibility features like sophisticated screen readers and context-aware interfaces, the system utilizes artificial intelligence to offer tailored support and anticipatory features. The combination of GPS technology, augmented reality, and sensory feedback improves navigation and wayfinding capabilities and provides a comprehensive solution for users with visual or mobility impairments. The system is continuously improved by user feedback mechanisms, and it is regularly updated to reflect changing user requirements and new technological advancements [8].

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➢ *Algorithm Flowchart*

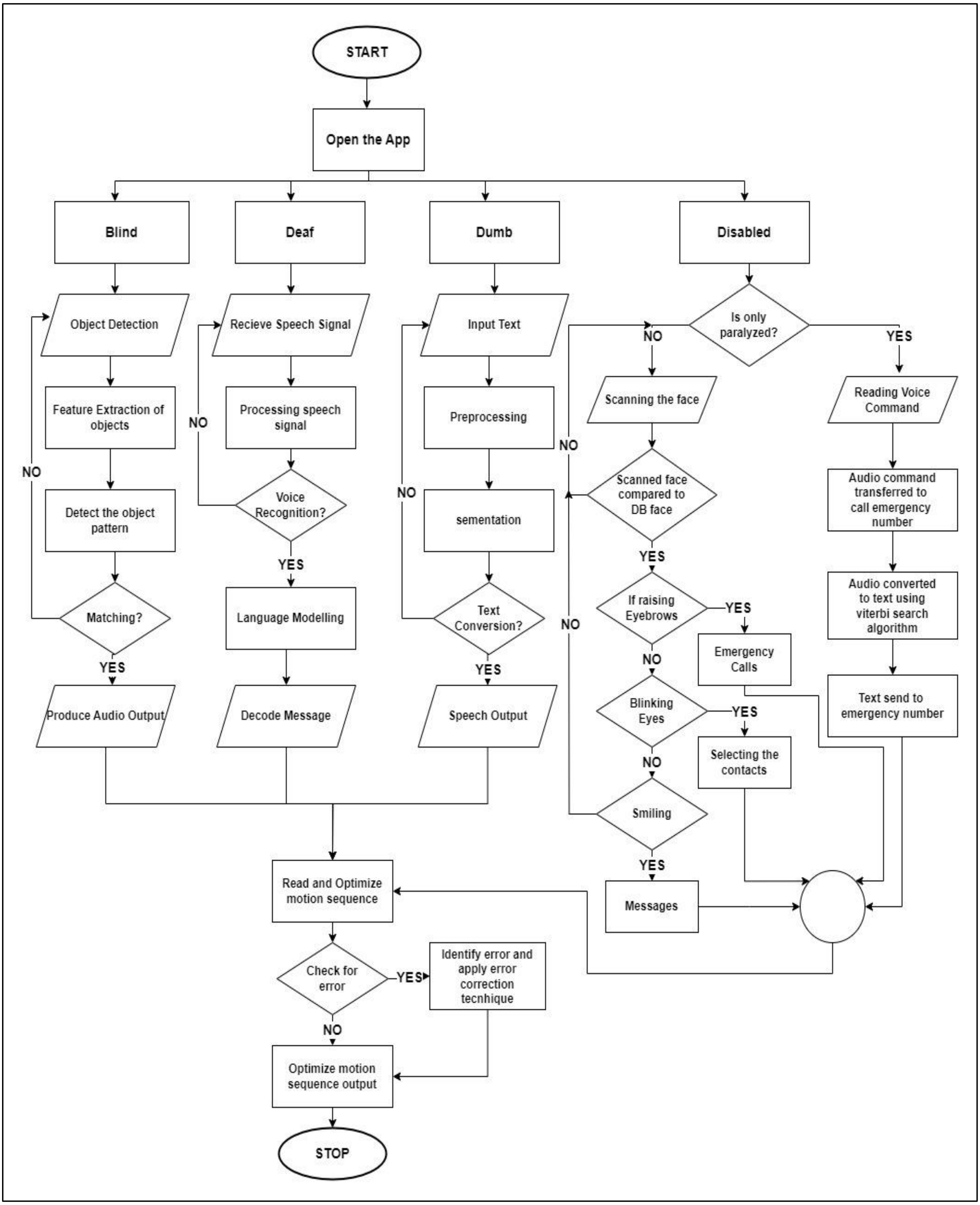

Fig 2: Flowchart of Overall Algorithms Used in Project

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IV. RESULT ANALYSIS

❖ *Output Screenshots*

➢ *Interface of the App*

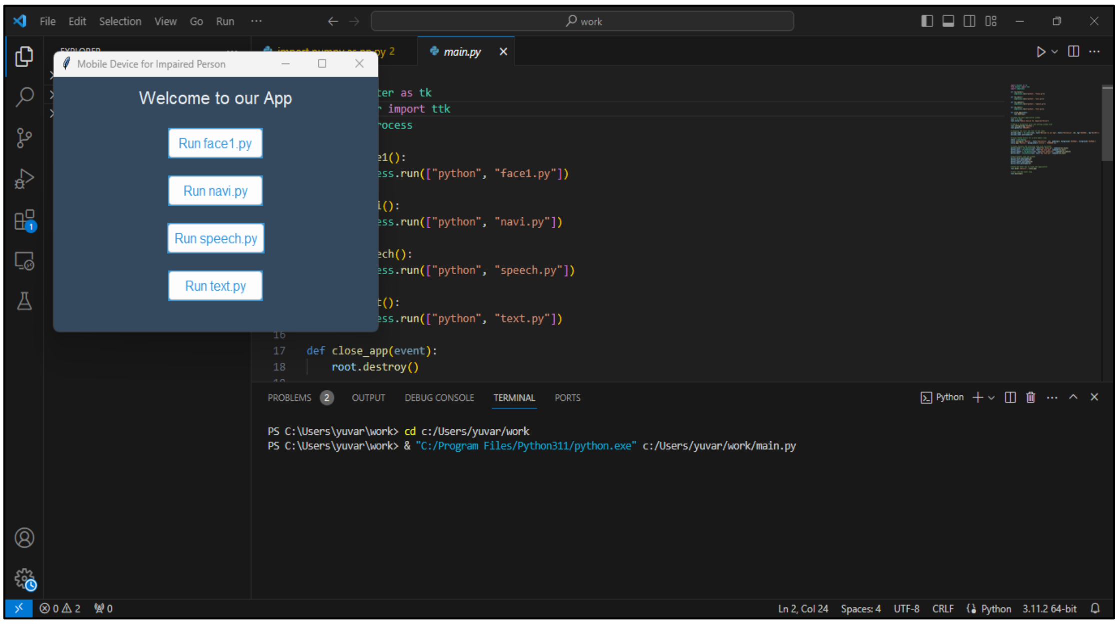

Fig 3: Output of the app interface

The output for the app interface is shown in the figure 3. As we run the input a page will pop out in the front and it shows all the four tasks that we want to use according to us. We can perform this by clicking the wanted option from the menu. By clicking it will take us to the next page, where we perform the operations.

➢ *Navigation Detecting System for Impaired Persons*

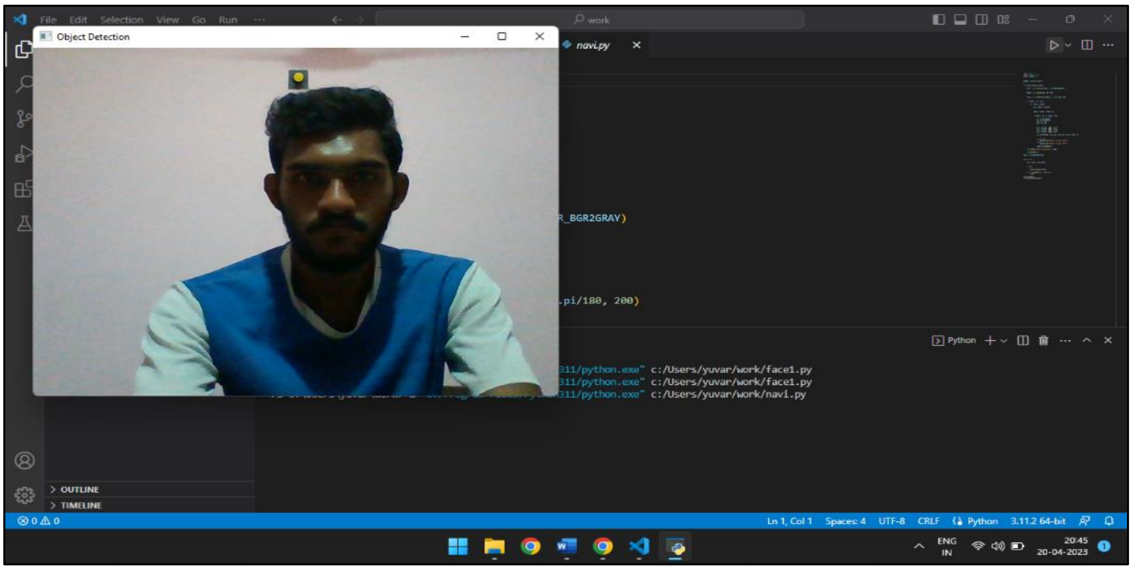

Fig 4: Output for Navigation Detection Algorithm

The output of the navigation system's algorithm, which was used to locate obstacles in the path, is shown in Figure 4. When we run the input, the device's camera will open. In the event that it detects any obstructions, the gadget will sound an alert and show the outcome on the screen.

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➢ *Electronic Assist for Sign Interpretation Algorithm*

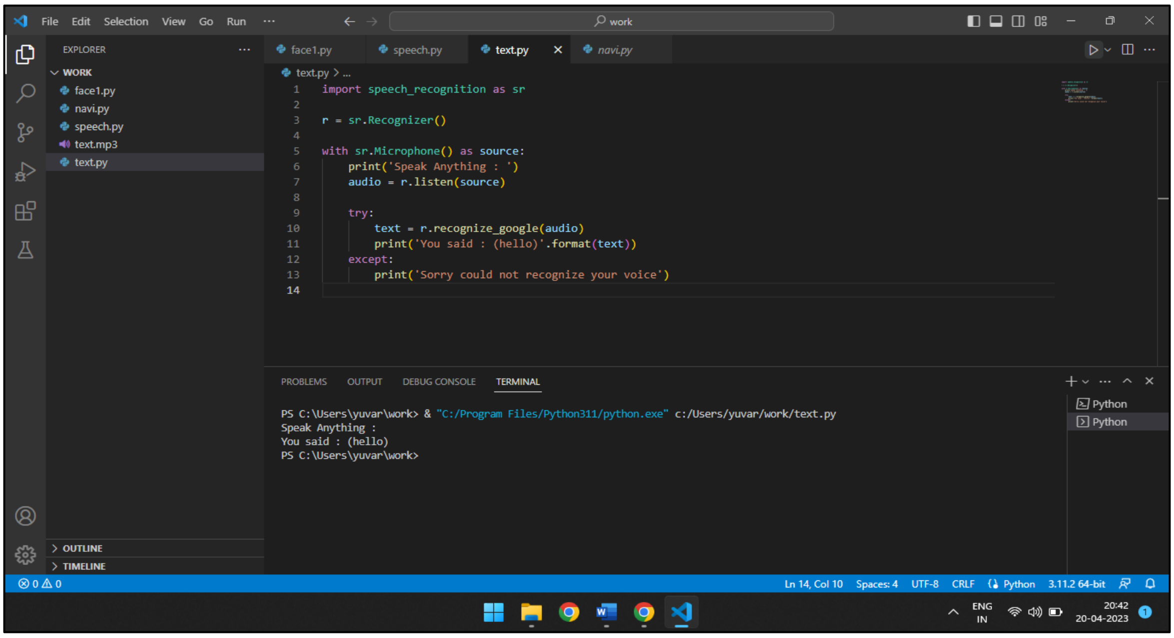

Fig 5: Output for Speech to Text Algorithm

The output of the electronic assist for sign interpretation algorithm is shown in figure 5. It is employed to translate spoken words into written language. When the code is executed, the screen will say "Speak Anything." After that, you can say anything you want, and the output will eventually appear.

➢ *Assistive Technology for Speech Recognition Algorithm*

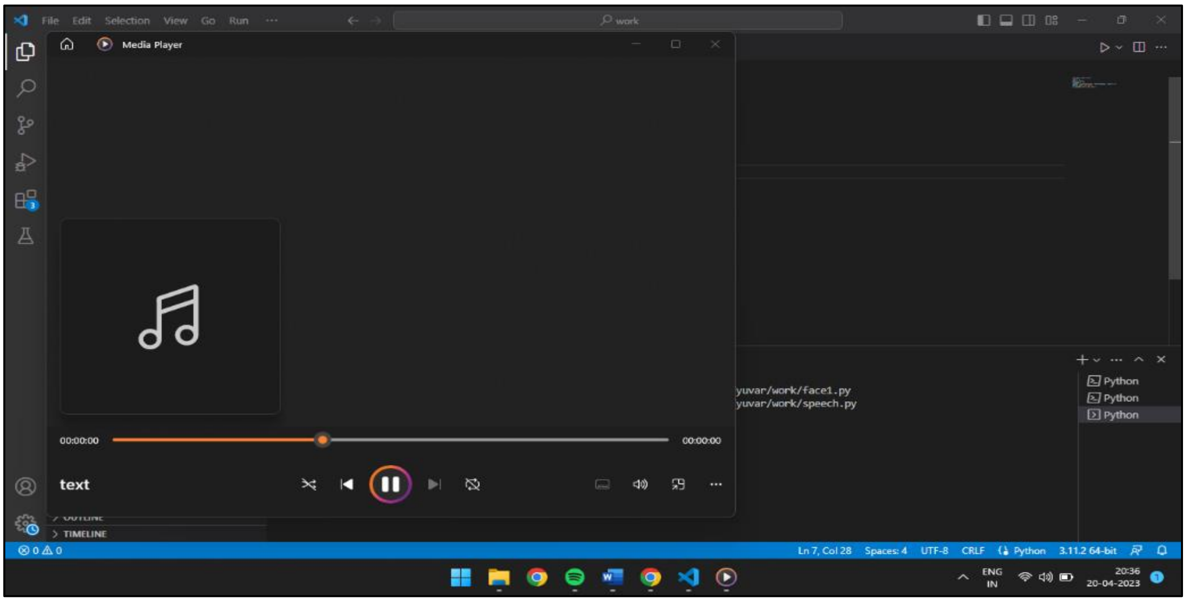

Fig 6: Output for Text to Speech Algorithm

The output of the speech recognition algorithm for assistive technology is shown in figure 6. It's employed to subtly convey text messages as spoken words. The text entry field will appear when the code is executed, and the output will then be audible through speakers.

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➢ *Face Gesture for Disabled Persons Algorithm*

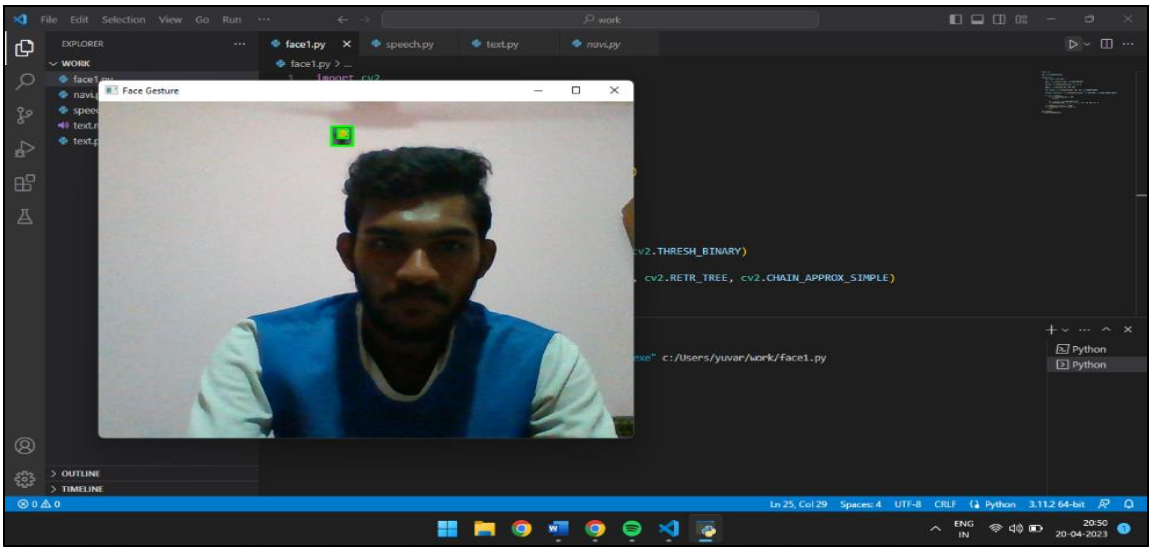

Fig 7: Output for Face Gesture Algorithm

The output of the face gesture for the disabled algorithm is shown in Figure 7. It is employed to carry out various tasks by using facial expressions. The code will open the camera when it runs, allowing us to work with expressions. Completing the tasks will finally produce the desired outcome.

V. CONCLUSION

In conclusion, the envisioned mobile device designed for impaired persons stands as a testament to the strides made in fostering inclusivity and empowerment through technology. The proposed system amalgamates a spectrum of innovations, from multi-modal interaction methods to AI-driven personalized assistance, aiming to transcend limitations imposed by various impairments. By embracing universal design principles and prioritizing user customization, this device promises a user-centric experience that adapts seamlessly to individual needs. Its specialized communication tools, navigation aids, and social connectivity features serve as pillars of support, fostering independence and facilitating social interaction.

The focus on ongoing user feedback guarantees a responsive, dynamic system that is constantly evolving to satisfy its users' shifting needs. In the end, this mobile device redefines accessibility by empowering people instead of just addressing barriers and creating a more inclusive digital environment where everyone can fully engage, communicate, and thrive, regardless of disability.

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