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Review: an AI-Powered Smart Device for Enhancing Mobility and Independence in Visually Impaired Individuals

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Abstract: Physical disability has affected many people's lives across the world. One of these disabilities that strongly affects a large category of people is visual loss. Blind people often face difficulties moving around freely, such as when crossing the street, reading, driving, or socializing. They often rely on using certain aid devices to reach certain places or perform any other daily activities, such as walking sticks. There is ongoing scientific research into rectifying blindness, but it must go a long way to achieve the solution. Also, there is research that unleashes the ideas of assisting the blind but lacks in technological aspects of implementation. This research project aims at helping blind people of all categories achieve their day-to-day tasks easier using a smart device. By using artificial intelligence and image processing, this smart device can detect faces, colors, and different objects. The detection process is manifested by notifying the visually impaired person through either a sound alert or vibration. Additionally, this study presents a palpable survey that entails visually impaired people from the local community. Subsequently, the project uses both OpenCV and Python for programming and implementation. This project prototype investigates the algorithms that are used for detecting objects. Also, it demonstrates how this smart device could detect certain physical objects and how it could send a warning signal when faced with any obstacles.

Keywords: AI, biomedical field, blindness

I. Introduction

There are modern technologies that help people practise their activities easily. We focused on the special needs categories, which include blind people. The third blind eye is a stick that makes blind people’s lives easier. It helps them to walk and carry out their daily activities in an easy and safe way by using the Internet of Things (IOT) and Artificial Intelligence (AI). [1][2][3]. Critics are calling for the decolonization of AI (artificial intelligence). The problem is that this technology is marginalising other modes of knowledge with dehumanising applications. What is needed to remedy this situation is the development of human-centric AI. However, there is a serious blind spot in this strategy that is addressed in this paper [4] [5]. A more radical or substantial proposal is advanced in this discussion that is known as community-based design [6] [7] [8]. This alternative makes a theoretical manoeuvre that allows AI design to be directed by human agency, thereby introducing a safeguard that may help to prevent colonisation by this technology [9] [10] [11].

II. Deep learning Fashion Assistance Solution for Blinds

Fashion is an industry that never appears to slow down, and it would be incredible if the blind could participate in this growing trend. By 2050, nearly 120 million individuals are expected to be vision impaired. In this paper, the proposed Vision4All model assists users in identifying colours, clothing categories, textures, fabric, style, graphic, and text-based content on clothes. We enhanced FashionNet, a deep model that learns clothing characteristics by predicting garment qualities and categories together [12], [13], and [14]. To improve prediction accuracy, the ResNet34 architecture replaced the obsolete VGG16 design. A Fine-Grained multilabel classification model was trained by tackling the noisy data problem for attribute prediction. For identifying the range of graphical content printed on clothes, we use Pythia's modular re-implementation of the bottom-up, top-down approach. Our solution allows users to navigate through speech, eliminating the requirement for users to rely on their vision. [15][16][17]. Vision4All is the first complete solution to align with Fashion assistance for the visually impaired.

III. Decolonization of AI: a Crucial Blind Spot

Critics are calling for the decolonization of AI (artificial intelligence). The problem is that this technology is marginalising other modes of knowledge with dehumanising applications. What is needed to remedy this situation is the development of human-centric AI. However, there is a serious blind spot in this strategy that is addressed in this paper. The corrective that is usually proposed—participatory design—lacks the philosophical rigour to undercut the autonomy of AI and thus the colonisation spawned by this technology [18] [19]. A more radical or substantial proposal is advanced in this discussion that is known as community-based design. This alternative makes a theoretical manoeuvre that allows AI design to be directed by human agency, thereby introducing a safeguard that may help to prevent colonisation by this technology [20].

IV. Artificial Intelligence Autonomous Vehicle for the Blind

Artificial Intelligence Autonomous Vehicle was aimed as a new mean of transportation for blind or visually impaired people, to help them become more independent in their daily life. This vehicle was designed based on a simple electric scooter configuration that is easy to use. Artificial Intelligence was utilized for car recognition, traffic light recognition, and voice recognition. With autonomous features driven by Simultaneous Localization and Mapping technology (SLAM) and real-time anti-collision sensors along with a 3D depth camera, the scooter provides dependable self-driving vehicle to transport a blind person to a mapped location accurately and safely [21][22]. The vehicle can be operated in both autonomous and manual modes. A prototype was developed and tested. The test result showed that autonomous vehicles can be safely operated at 35% full speed.

V. Artificial Intelligence (AI) in Teacher Education: Technology Binds or Blind

This participatory action research (PAR) project investigates the role of Artificial Intelligence (AI), Algorithmic Bias/Injustice integrating new technologies (ie Global Positioning System (GPS) in developing global competencies, geospatial intelligence, and computational thinking skills; offers creative strategies and possibilities integrating new technologies in teacher education programs [23][24]. The study explores wide range of meanings participants associated with experiential activities; the impact of new technologies in developing multicultural and multilingual apps that promotes transdisciplinary curriculum; the ways in which participants integrate geospatial and computational thinking skills into their learning; and how they gain alternative points of view on global issues and renewed interest and commitment to community service.

VI. The Way to Make Blind People Use the Email System: Voice Based Email Generating System Using Artificial Intelligence

People are becoming used to fake world and vocal communication as technology advances. There are a few ways to communicate with people online in this modern invention. Many individuals often choose and use the simplest form of reporting, namely email. The era of encrypted email allows users to communicate with other people by posting signals and facilitates cross-border corporate communication. Some individuals are unable to take advantage of this technology due to their ignorance or lack of the necessary visible screen ability. Therefore, a Speech completely messaging device is suggested using Py but instead Ai to save time for externally examined people. Its device gives those who have been evaluated on the outside some power of contact and considerably increases their sense of stability as objectivity. With the use of that invention, blind people will indeed be able to send out emails just like other regular citizens [25][26][27]. Voice-based messaging systems use cutting-edge technology to ensure their legitimacy to people who have been vetted on the outside.

VII. Towards an AI endowed visual neuroprosthesis for the blind: development and first-in-human implementation of a deep learning intracortical neural interface.

In this doctoral thesis, I aim to step further beyond state-of-the-art towards the development of a cortical neuroprosthesis for the blind. Currently, a fully working visual cortical neuroprosthesis able to help blind people to recover a form of vision is still a challenging ongoing project, although strong efforts are being made by research groups all over the world. This work is situated at the conjunction between neuroscience, neural engineering, and artificial intelligence [26][28].

VIII. Intelligent stick for blind friends

Eyes are one of the most precious blessings of nature. Blind friends face a lot of difficulty in doing normal life activities. A lot of work has been done to ease blind

people so that they can complete their tasks by themselves and not be able to depend on other people. Keeping this motivation in mind, in this article, we have proposed and developed an intelligent blind stick which uses sensors and microprocessor to help blind friends in walking.

IX. Virtual Vision for Blinds

As we know in this world, in our daily life we see certain people with disabilities, among them one of the major issues is loss of sight or blindness. By using the recent technologies, we are trying to make a project which is affordable to the common people having loss of sight, to help them in their daily life by offering them a virtual vision to have a better real-life experience. It will also help the people who are illiterate or unaware of the place (tourists), who can't understand the texts written in front of them. Along with them, it can be helpful for auditory learners like students, for memorizing notes in creative way. The objective of our project is to assist them in multiple daily tasks using the advantage of wearable design format in the form of glasses. As a proof of concept this project presents many example applications like text recognition technology that can help reading from hard copy materials which will then be converted to speech which will be audible to the user with the help of ear buds attached to the glass.

X. Deep convolutional neural network in smart assistant for blinds

Increasing pollution and changing lifestyles has severely affected human health, especially our sense organs. More exposure to screens has increased vision related problems even at a very early age of life. The developing technologies should be utilized to help people with no or very less vision to lead an independent life in society. Computer vision is one such field that can be utilized to develop some cost-effective products that can be very useful for these scenarios. The detection and recognition of text from natural image can be very useful for visually imparted persons as well as in various other applications like developing a smart system to help driver in getting voice signal for every road sign, and even warning if we did not follow the one. The proposed work uses deep convolutional neural network to implement a text detection and recognition system that is much simpler and faster as compared to traditional hand-crafted feature-based methods.

XI. Automatic-Cane-An Intelligent Tool for Blind with AI Techniques

Independence and confidence are building methodologies in achieving your dreams and goals in life [5][6]. Visually impaired people find themselves challenging to go out independently. There are about 12 million visually impaired or blind people in this world who are always in need of helping hands. For many years the white cane has been the most used travel aid by the blind. The biggest disadvantage is that the user must be trained a lot and the user is forced to scan manually the vicinity for obstacles [10][11].

XIII. Conclusion

The main idea behind the paper is to contribute our service to the blind society and help them with the little knowledge that we have. We feel that it is the duty of those blessed with the power of vision and knowledge to contribute and help the blind and other deprived people in their lives. This paper also deals with the next version of the I-Cane with a single-wheel design, the ultra-cane. The drawbacks of the I-cane lead to the invention of the Automatic cane. With little technology and flexibility for the users, there came an ultra-cane. A detailed explanation of the individual parts and Dos and Don'ts of it is discussed.

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