4

EYE-SEE:AI-DEVELOPED DEVICE FOR THE VISUALLY IMPAIRED

Mohamad Hafis Izran Ishak, Shafishuhaza Sahlan, Faiza Ullah, Muhammad Qayyim Bin Md Saleh, Mohd Hafiez Bin Abu Bakar, Ng Wen Da, Nurul Atikah Binti Abbas, Jameel Abdulla Ahmad Mukred, Juliza Jamaluddin

4.1 INTRODUCTION

In the 21st century, the need for the visually impaired to have a technologically controlled vision to assist in their daily life, is a necessity. Therefore, in this work, utilizing Artificial Intelligence (AI) technology, a software is developed to help the visually impaired to see the world better through the lens of the creation. The developed software is created to help the visually impaired lead a better daily life, hence they will not stumble upon obstacles anymore. The work involves the use of AI, controller, sensor, voiceover, and python programming. The sensors are utilized to monitor any obstacles in the path of the visually impaired, senses the obstacle and then send signals to the controller. The installed animated voice will then redirect the path by identifying the location of the obstacle, hence the visually impaired will be able to avoid the obstacle altogether. Visual impairment can limit an individual's ability to perform simple daily tasks with independence. Hence, with a successful implementation of the system will improve the quality of life of the visually impaired, tremendously.

Globally, a total of 1 billion people suffer from visual impairment (moderate or severe distance impairment or blindness) which could have been prevented or is yet to be addressed.

4.2 DESIGN: PROTOTYPE I

In this section, the features of the developed software, i.e. the proof of concept prior to hardware installation, is tested. The programming utilized is Deepsort YOLOv4 which extends the original SORT algorithm

[1] to integrate appearance information based on a deep appearance descriptor. In the demo, to host the directory of the project to prevent libraries and dependency confusion, Anaconda virtual environment is implemented. To write the code, notepad++ is used in the beginning and later switched to Microsoft Visual Studio (VSC) for better representation. However, the codes are run using Windows Command Prompt (CMD). Subsequently, the project was extended from the Deepsort YOLOv4 project from GitHub site by "TheAiGuyCode. The extension of the code is in the "object_tracker.py" from for object centre point calculations and region classification calculations, and various other configurations in the trained custom models. Figure 4.1 shows a flow of detection object system.

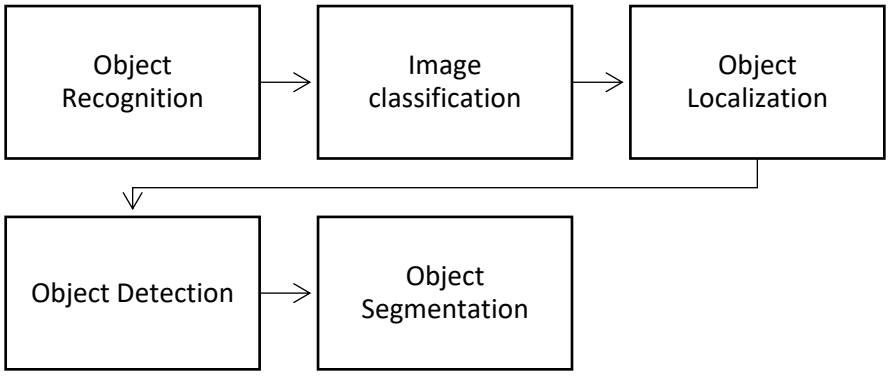

Figure 4.1: Flow of object detection

4.3 DESIGN: PROTOTYPE II

The next stage of the prototype design is to optimize the software so that it is compatible with portable devices; mobile phones or potentially a smart glass powered by a lightweight single board computer. Single Shot Detection (SSD) is utilized in this prototype, because when compared to the YOLO-tiny, SSD is significantly accurate in terms of detecting the right object with a high confidence level while keeping an identical performance in terms of speed of localization and object classification [2]. The platform used in this prototype is Flutter which is a very young platform by Google which allows developers to develop a

cross-platform mobile application using single-codebase, Dart language. Tensorflow lite (tflite) package available in the flutter platform is used to bring the still image object detection function into the flutter platform. The methodology for the real-time object detection is by saving one frame from the video for processing and box drawing, then the boxdisplayed one frame after the real-time video feeds. This allows the real-time object detection to achieve a lower processing power. However, depending on the processing power of the device and the storage speed of the hardware, the system appears to have some lagging. To give an indication of the detected object, beeping sounds were added. Hence, when the phone detects the object in the frame, the beeping sound is activated. Both prototype I and II were trained using the COCO object detection dataset [3]. Figure 4.2 shows an example of detected object and its location.

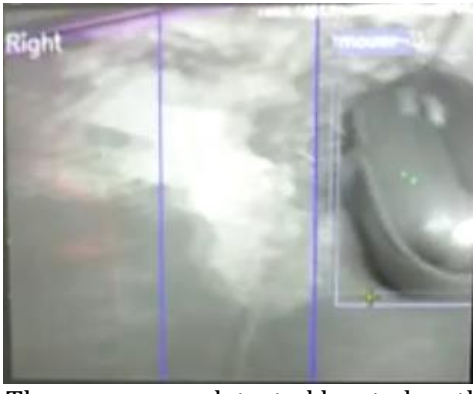

Figure 4.2: The mouse was detected located on the right side

4.4 FROM THE EYE OF THE VISUAL IMPAIRED

For a visually impaired individual, the most valuable thing would be independence. Small equipment which can help them lead a life independently can make their life less challenging, hence improving their quality of life. In this work, an equipment is developed to assist the visually impaired to live life with a little less hurdle than they already experiencing. For the developed equipment, the designed software utilizes image recognition to identify any object lost or when respective individual is searching for the lost object.

There are few ways a blind person has to help his aesthetics at the moment. Several traits can be used for color recognition indirectly. In the

smartphone apps "Be My Eyesu" is a popular choice, which consists of a video chat service where someone is available to attend to it and support the blind in their field of view. This is an application, however, for IOS only.

Another IOS program that consists of having the RGB and HUE components of the medium color within the camera region through a screenshot is the 'Color Detector.' The color tone received can also be set by this application by sending a warning to know if the picture is beyond that tone. It is also used in this context to explain the color of clothing selected at the time.

Meanwhile, for the mobile gadgets, the 'Colorino' allows selecting fabrics, washing processes, and color variations, being able to differentiate between more than 150 colors and tones, as well as versions of tones of the same color.

The "Assistive Clothing Pattern Identification for Visually Disabled Persons" is contained in a literature analysis, which consists of identifying clothing patterns that can recognize 11 clothing colors and recognize 4 types of clothing patterns [2]-[3][4].[4]. The paper “Rotation and Illumination Invariant Texture Analysis” suggests a form of clothing combinations of complex patterns for visually impaired people [5][6]. The project described in the paper "Recognizing clothing patterns and colours for blind people using neural network" also helps a camera to identify the type of pattern of clothing by extracting its features [7]-[8][9].

The vision of this project was entirely directed at improving the blind people's biggest concern, i.e. not having a ‘vision’ to go through the days. Most of the time, the question the visually impaired needs to endure is locating the thing that they want to take or droped. The device can help to locate the object using the cameras, by applying or installing hardware on their body.

To identify the object in the field of vision, machine learning is used, and the vision received is filtered with a database to equate it with the object the device listed to find by the user. The device would then send a signal to the user where the angle or direction of the object is positioned.

The dream and reason for this project are due to the dilemma faced by most blind people in their everyday lives. For starters, they will typically use their hand on the floor when they drop items on the floor to feel and look for the object, and that shows trouble for them [3]. Secondly, there are several occasions where the color or the corresponding group of products such as socks [6] should be remembered. They can believe the

arrangement or the mood on their side is the same, but in fact, it is not in terms of colors. This initiative will concentrate on solving the challenges faced by blind people in their everyday lives and seeking to make their daily lives simpler.

4.5 CONCLUSION

In conclusion, this "Eyes for the blind" shows that the blind people can be helped in terms of finding the item they search at a particular time. The result shows by implementing machine learning on the system, it can generate a process that can identify a specific item mentioned by the user.

REFERENCES

[1] S. M. Metev and V. P. Veiko, *Laser Assisted Microtechnology*, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998. [1] D. Rocha, V. Carvalho, E. Oliveira, J. Gonçalves and F. Azevedo, "MyEyes-automatic combination system of clothing parts to blind people: First insights," 2017 IEEE 5th International Conference on Serious Games and Applications for Health (SeGAH), Perth, WA, 2017, pp. 1-5, doi: 10.1109/SeGAH.2017.7939298.

[2] K. Jafari-Khouzani and H. Soltanian-Zadeh, "Radon transform orientation estimation for rotation invariant texture analysis", IEEE Trans. Pattern Anal. Mach. Intell., vol. 27, no. 6, pp. 1004-1008, 2005.

[3] Z.-Z. Wang and J.-H. Yong, "Texture analysis and classification with linear regression model based on wavelet transform", IEEE Trans. Image Process., vol. 17, no. 8, pp. 1421-1430, 2008.

[4] S. Yuan and Y. Tian, Rotation and Illumination Invariant Texture Analysis, pp. 2643-2647, 2010.

[5] M. A. Akhloufi, W. Ben Larbi, X. Maldague and S. Member, Inspection of Industrial Products, pp. 1067-1071, 1965.

[6] J. J. R. J, Recognizing clothes patterns and colours for blind people using neural network, pp. 1-5, 2015.

[7] Y. Qian, M. Ye and J. Zhou, "Hyperspectral image classification based on structured sparse logistic regression and three-dimensional wavelet texture features", IEEE Trans. Geosci. Remote Sens., vol. 51, no. 4, pp. 2276-2291, 2013.

[8] X. Zheng and N. Liu, "Color recognition of clothes based on k-means and mean shift", Proc.-2012 IEEE Int. Conf Intell. Control. Autom. Detect. High-End Equipment ICADE 2012, pp. 49-53, 2012.

[9] M. Oproescu, G. Iana, N. Bizon, O. C. Novac and M. C. Novac, "Software and hardware solutions for Using the keyboards by blind people," 2019 15th International Conference on Engineering of Modern Electric Systems (EMES), Oradea, Romania, 2019, pp. 25-28, doi: 10.1109/EMES.2019.8795191.