**1. Structure**

Abstract

- short description of the approach and results

1. Introduction

- context and motivation

- objectives

- structure of the paper

2. State of the art

- discussion on the current methods used in object detection and line detection

3. Theoretical foundations

- descriptions of the basic concepts used

4. Design and implementation

- description of the proposed solution

5. Experimental results

- description of the dataset used

- hyperparameter tuning

- performance evaluation

- comparison with other methods

6. Conclusions and future work

- summary of the solution

- critical analysis of the solution

- future improvements

References

Application lifecycle

1. Application is opened

2. User chooses auditive or visualization mode using a voice command

2.1. In auditive mode, the live object detection automatically starts, and information is provided to the user in an auditive manner

2.2. In visualization mode the user can load an image and perform detection on it or can start object detection on the live feed from the camera

3. Application is closed by voice command or through a button

Functionalities

- choose auditive mode or visualization mode using a voice command

- auditive mode: perform live object detection on cars, busses, and license plates and based on the results of detection, provide auditory clues that guide the user towards the detected car or bus. If the detected object is a bus, then provide information about the location of the doors and the line of the bus (if available). If the detected object is a car, then provide information about the location of the doors and the license plate (if available)

- visualization mode: display the results of object detection on an image or on the live feed from the camera

- close the app using a voice command

Original contribution

The application aims to help the visually impaired persons by using computer vision and line detection to provide spatial information about public transport such as busses or ride sharing access. An object detector model will extract information about the vehicle and a line detector will analyze the part of the image containing the vehicle to extract information about the doors of the vehicle. This should eliminate the need for a dataset that has specific bounding box annotations for the doors.

**2. References**

- Authors. Title. Conference/Journal, [pages], year

1. Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi (2015) **You Only Look Once: Unified, Real-Time Object Detection**. In **2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)**
2. Wei Liu, Dragomir Anguelov, Dumitru Erhan, Christian Szegedy, Scott Reed, Cheng-Yang Fu, Alexander C. Berg (2016) **Single Shot MultiBox Detector**. In: Leibe B., Matas J., Sebe N., Welling M. (eds) Computer Vision – ECCV 2016. ECCV 2016. Lecture Notes in Computer Science, vol 9905. Springer, Cham. <https://doi.org/10.1007/978-3-319-46448-0_2>
3. Hoiem D., Chodpathumwan Y., Dai Q. (2012) **Diagnosing Error in Object Detectors**. In: Fitzgibbon A., Lazebnik S., Perona P., Sato Y., Schmid C. (eds) Computer Vision – ECCV 2012. ECCV 2012. Lecture Notes in Computer Science, vol 7574. Springer, Berlin, Heidelberg. <https://doi.org/10.1007/978-3-642-33712-3_25>
4. Jonathan Huang, Vivek Rathod, Chen Sun, Menglong Zhu, Anoop Korattikara, Alireza Fathi, Ian Fischer, Zbigniew Wojna, Yang Song, Sergio Guadarrama, Kevin Murphy **Speed/accuracy trade-offs for modern convolutional object detectors**. In: 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR); 2017: page
5. Akinlar Cuneyt, Topal Cihan. (2011). **EDLines: A real-time line segment detector with a false detection control**. In Pattern Recognition Letters. 32. 1633-1642. 10.1016/j.patrec.2011.06.001.