

Chapter 8

Real-Time Object Detection and Audio Output System for Blind Users: Using YOLOv3 Algorithm and 360 Degree Camera Sensor

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ABSTRACT

This chapter aims to create a real-time object detection and audio output system for blind users using the YOLOv3 algorithm and a 360-degree camera sensor. The system is designed to detect a wide range of objects, including people, vehicles, and other objects in the environment, and provide audio feedback to the user. The system architecture consists of a 360-degree camera sensor, a processing unit, and an audio output system. The camera sensor captures the environment, which is processed by the processing unit, which uses the YOLOv3 algorithm to detect and classify objects. The audio output system provides audio feedback to the user based on the objects detected by the system. The project has significant importance for blind users as it can help them navigate their environment and recognize objects in real time and can serve as a foundation for future research in the field of object detection systems for blind users.

INTRODUCTION

The ability to perceive and understand our surroundings is essential for human survival, and our senses of sight and hearing play a critical role in this process. However, for people with visual impairments, the world can be a challenging and often isolating place. Blindness is a complex condition that affects people in different ways, but one of the most significant challenges faced by blind individuals is the in-

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ability to see and navigate their environment independently. In this context, technology can play a vital role in enhancing the independence and quality of life for blind individuals.

Real-time object detection and audio output systems have emerged as a promising technology for aiding the mobility of visually impaired individuals. These systems use camera sensor to detect objects in real-time, which are then translated into audio signals that can be interpreted by the user. This allows blind individuals to navigate their environment safely and independently, improving their quality of life and increasing their sense of self-reliance.

Overall, the real-time object detection and audio output system developed in this project has the po-

Figure 1. Illustration of the overall system architecture



tential to significantly improve the quality of life for blind individuals by enabling them to navigate their environment safely and independently. The use of YOLOv3 algorithm and 360-degree camera sensor offers a powerful and effective solution for real-time object detection.

One of the most popular and effective object detection algorithms is YOLO (You Only Look Once), which has been widely used for real-time object detection in various applications. In this project, we aim to develop a real-time object detection and audio output system for blind users using the YOLOv3 algorithm and a 360-degree camera sensor. The system will be able to detect and identify objects in the user's environment and provide audio output to the user.

The use of a 360-degree camera sensor in the system allows for a comprehensive view of the user's environment, enabling the detection of objects from all angles. This feature is particularly useful in environments with obstacles or complex layouts, where traditional cameras may not provide sufficient coverage.

BACKGROUND

Object detection has been an active research topic in the field of computer vision for several years. One of the most popular and successful object detection frameworks is YOLOv3 (You Only Look Once), which is known for its speed and accuracy. YOLOv3 uses a deep convolutional neural network (CNN) to detect objects in an image, and it is able to perform this task in real-time on a variety of hardware platforms.

Several recent studies have explored the use of object detection to assist visually impaired individuals. For example, the paper by Sai Nikhil Alisetti et al. proposed a predictive object tracking system based on deep CNNs for guiding and navigation of blind people (Alisetti et al., 2019). Similarly, the work by Maid

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