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OBJECT DETECTION FOR BLIND PERSON

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ABSTRACT

Road accidents have become a dangerous everyday happening and their associated death toll is on a constant rise. To alleviate this problem, intensive research is being carried out in the field of blind persons in order to eventually replace distracted drivers from roads. However, blind people have a long way to go before they can achieve widespread acceptability. Their underlying technology is still not up to par with the standards of a safety critical application. This project aims to focus on one of the most important underlying components and pressing issues of a self-driving car: its object detection and tracking system. By exploring the use of recent advances in deep learning and cloud computing, the project aims to optimise the process of object detection and tracking in order to prepare blind pe ople to be able to adapt to ever changing road conditions.

1. INTRODUCTION

For breaking down and clarifying the visual environment, which explains computer vision in computer technology. Machines utilise deep learning models and digital pictures from cameras and videos to accurately label the items. Demonstrations in computer vision to identify edges and align the simpler objects with falling under categories such as circles and squares by the methods of initial neural networks that started in the 1950s. Optional character recognition for computer vision, which uses handwritten data as its primary trading instrument, was created in the 1970s. The illustrated data was developed primarily for the blind. People with visual impairments find it challenging to see even the slightest detail with healthy eyes. Anyone with a horizontal range of the 6/60 or 6/60 visual acuity.A pre-trained image classification network serves as the backbone model's feature extractor in most cases. Typically, a network like Resnet trained on ImageNet has been used in this situation, but without the final fully connected classification layer. Thus, what is left is a deep neural network that can preserve the spatial structure of the image while still extracting semantic meaning from the input image.

2. RELATED WORK

Extensive technological research is being done in the field of blind people to solve this issue and make roads safer, and many of the world's top automakers are investing a significant amount of money to enhance this technology. For instance, Ford, one of the top automakers in the world, has already committed roughly a billion dollars and intends to test its blind person in Washington, DC, early in the following year [2]. Blind people may help to decrease the frequency of traffic accidents and the resulting death toll [3]. Road accidents are caused by human mistake in over 90% of cases.

The following technical ideas are crucial to the project and are repeatedly brought up in this document.

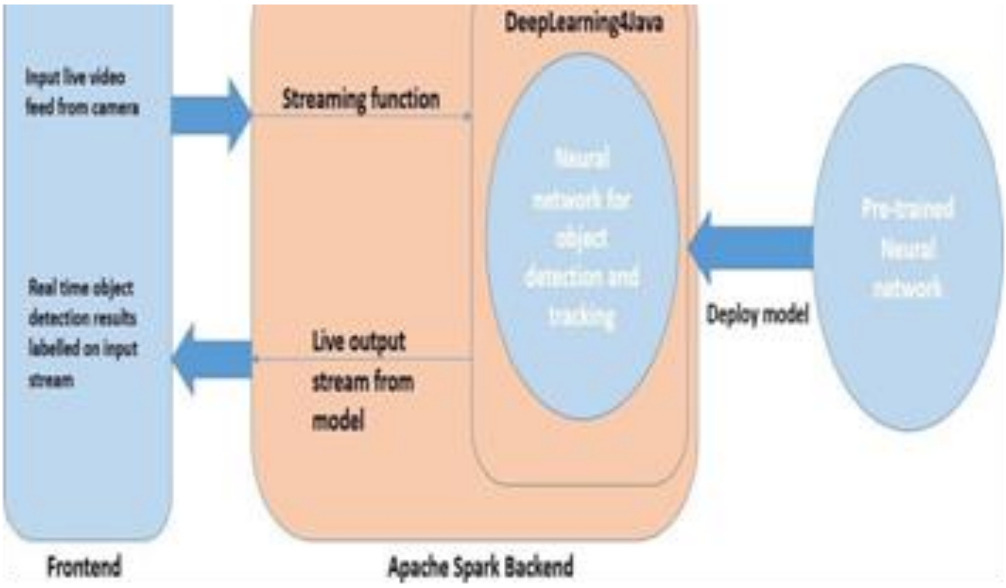
An area of artificial intelligence known as "machine learning" is based on the idea that systems may learn by spotting patterns in data and taking actions without human intervention.

Deep learning is a subfield of machine learning that focuses on how the human brain represents data.

Video sequences with largely static background frames are the major application for background removal. It divides the sequences into foreground and background, with the foreground comprising dynamic objects like moving people and cars in a driver-time video setting and the background containing static objects like roads, buildings, etc

3. DESIGN AND PROCEDURE

The end-to-end deliverable includes a frontend whose main function is to take video streams as input data, as shown in Fig. 1.2 on the following page. The backend receives the input data after that. The deep learning object detection module receives streamed data that has been processed by the backend. Through the frontend, the object detection model displays detected objects with bounded boxes and name labels after processing the data in real time.



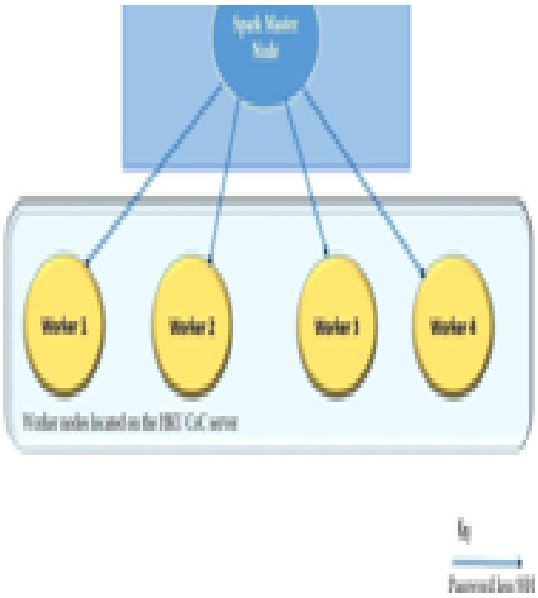
The Java 8-based object detection system must be operated and tested with a constant stream of real-time video data. A Logitech C922 Pro Stream webcam that can record 30 to 60 frames per second has been chosen for this project and attached to a 64-bit Linux computer using a USB terminal. The open source platforms of JavaCV and OpenCV 3.4.1 (Open Computer Vision) will be used to capture the video feed. These platforms offer simple-to-use APIs for both video stream and image capture, as well as frame separation for additional Java processing.

In order to handle live streams and choose parameters like the neural network to be used for object detection and the speed/quality settings to configure the neural network, a Java front end has been set up. This front end will serve as the user's control panel so they may start/test the system and investigate all of its capabilities. Additionally, it will be in charge of showing the live camera stream's data, complete with bounding boxes and name labels for any items that were spotted.

The project's capacity to efficiently manage a sizable and continuous stream of input video data, send it to the object detection module, and gather object detection findings is a key aspect.

Initially, Apache Flink, an open source data streaming technology, was proposed as a means of doing this. Because Flink can run dataflow programs in parallel and in a pipelined fashion, it can gather a ton of video clip data from a target source and feed it continuously into our object detection system. However, due to a lack of training resources, third-party libraries, and online academic and troubleshooting help, Apache Flink is not widely used.

Instead, Apache Spark was chosen as the project's platform. Spark uses a query scheduler, optimizer, and physical execution engine to achieve great performance for both batch and stream processing. Spark generally supports applications written in a wide range of computer languages, including Java, Scala, Python, R, and SQL, and is fairly simple to use. Being a more established open source project, Spark not only expedites the data entry process but also lowers the amount of computational resources needed because Spark can distribute data processing tasks to numerous computers and processors. Additionally, Spark has the capacity to store data that has been processed over time, making it simple to evaluate and test the performance of the deliverable.



While YOLO can generate output images with labelled detected objects, a self-driving car system needs to continuously detect and track nearby objects, so a static output is inadequate. The application includes a Java frontend component to display identified objects and track their coordinates as they move in a running video stream in order to produce a more intuitive output result.

4. CONCLUSION

The existing research gaps must be filled, and the subsystems must be improved to be fit for a highly safety-critical application, if blind people are to gain the public's trust and replace drivers on the roads.

One of the biggest challenges that autonomous driving systems must overcome in order to be ready for production is the optimization of the object identification and tracking process for blind people. This project uses a deep learning-based neural network dubbed YOLO implemented on the cloud computing platform Apache Spark to try and enhance the entire object detection and tracking process. Using deep learning techniques can significantly increase the speed and accuracy of these systems.

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