Eye For You

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Abstract: A software programme called Eye For You uses the camera on a wearable device to give the user information about their surroundings in real time. The programme activates the live stream and processes the data to identify things in the stream using object detection algorithms, in particular the You Only Look Once (YOLO) technique. Results are generated by a pre-trained model running in the background and are presented on screen and proclaimed by the app utilising voice feature for proper pronunciation. Children and those who are vision impaired are the application's main target demographics because they can both gain from knowing their surroundings. The software asks for permission to use the camera on the device to track objects using deep learning or machine learning models.

Keywords - ***Machine Learning, Deep Learning, Object Detection, Recurrent Neural Network, Application, You Only Look Once***

INTRODUCTION

The goal of this application is to develop a mobile app that enables users to use technology to improve their comprehension and obtain a better grasp of their surroundings by using commonly available devices like cell phones.
Additionally, our software can be used by youngsters who are blind or visually challenged to learn about things in their local environment. The programme asks for access to the camera and uses deep learning or machine learning models to find adjacent objects. We gather the information, which is then presented to the user in two different ways: orally and as written text that is displayed on the screen.

Algorithms:
1.Object Detection & RCNN:
The process of finding and classifying items in a picture is known as object detection. Rectangular region suggestions and convolutional neural network features are used in a deep learning technique called Regions with Convolutional Neural Networks (R-CNN). The R-CNN detection method is a two-stage process in which the first stage selects a subset of regions inside an image that may contain an object, and the second stage categorises the object in each of those regions.

R-CNN object detectors can be used for a variety of things, including:

- Autonomous driving
- Smart surveillance systems
- Facial recognition

2.YOLO:
The real-time algorithm called YOLO, which stands for "You Only Look Once," is used to identify objects in photos. The object detection algorithm used by YOLO generates class probabilities for the detected items, acting as a regression problem.
YOLO uses Convolutional Neural Networks (CNN) to quickly recognise items. The YOLO approach only needs one forward propagation through a neural network to detect objects, as the name would imply.
The YOLO algorithm uses a single run to conduct prediction throughout the full image. Along with the CNN, it simultaneously predicts multiple bounding boxes and class probabilities. Tiny YOLO and YOLOv3 are two of the many variations of YOLO.

LITERATURE SURVEY

1. Object Detection with Transformers - Carion et al. (2021)

The DETR (DEtection TRansformer) architecture is a recently introduced object detection method based on transformers. Instead of the traditional two-stage object detection approach, DETR employs a transformer encoder-decoder structure to directly forecast class labels and object bounding boxes, while also achieving quick inference times. This new architecture has shown to be competitive with earlier object detection techniques.

2. End-to-End Object Detection with Transformers - Zhu et al. (2021)

In this study, Deformable DETR was presented as an enhancement to the DETR architecture, which

includes deformable attention mechanisms to effectively manage object deformations and occlusions. Deformable DETR demonstrated outstanding performance on various object detection benchmarks, setting a new standard in the field.

3. Leveraging Spatiotemporal Relationships in Object Detection - Wang et al. (2021)

The paper described a method for identifying objects in video sequences called Spatio-Temporal Detectors (STD). It makes use of spatiotemporal interactions between objects, characteristics from a 3D CNN, predicted bounding boxes for objects, and class labels from a 2D CNN. This method has been proven to be successful at detecting objects in videos.

4. Feature Pyramid Transformers for Object Detection - Cai et al. (2022)

For better performance on the COCO object detection benchmark, the proposed article established Feature Pyramid Transformers (FPT), an object detection architecture that combines transformer-based encoders and feature pyramid networks (FPN).

5. Gated-S2S Attention Networks for Object Detection in Remote Sensing Imagery - Li et al. (2022)

In this paper, a novel object detection method for remote sensing photos was presented. This method models the spatial and contextual interactions between objects using gated sequence-to-sequence (S2S) attention networks. In comparison to earlier techniques, the suggested strategy performed better on the NWPU VHR-10 dataset.

Process:

- The algorithm's initial task involves establishing a connection with the camera, subsequent to which it captures a still image frame with a slight delay.
- The algorithm identifies and highlights several objects in the frame by creating rectangular outlines around them, while also providing details such as the name of each object.
- The algorithm will provide information about the object's identity, its location within the frame, and a confidence score indicating the degree to which the algorithm believes it has correctly identified the object.
- In addition, the algorithm will audibly announce the relevant information about the identified object and provide additional assistance to visually impaired individuals by indicating the object's location within the frame.

Fig. 1 – Object

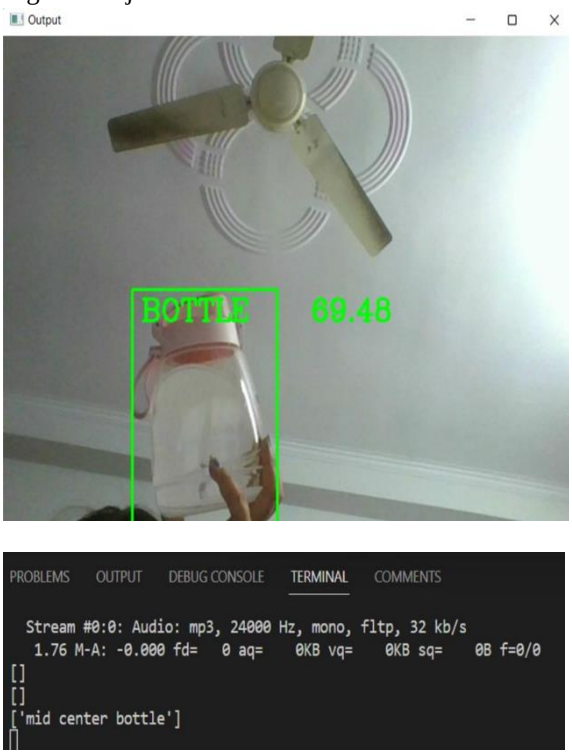

Fig. 2 - Object Detection

RESULTS

The Eye For You project is a groundbreaking initiative that has successfully implemented Object Detection algorithms to assist children and individuals with physical disabilities in exploring their environment more effectively. By leveraging cutting-edge technology, the project offers a range of visual and auditory cues that allow users to gain a more comprehensive understanding of their surroundings.

By combining the latest advancements in computer vision with innovative approaches to user interface

design, Eye For You has the potential to revolutionize the way we perceive and interact with our world.

It seems like a great project that could be very helpful for people who have trouble seeing or moving around. Object detection algorithms could make a big difference by improving their understanding of their surroundings and making it easier for them to get around.

The Eye For You project wants to create an interactive experience for its users by using both visuals and sounds. By identifying objects in real-time, the algorithm can give users audio descriptions of the objects and where they are located. To help users understand better, the project can also add visual cues like boxes or shapes around the objects.

The project has the potential to add more features such as facial recognition, navigation assistance, and text-to-speech functionality to improve the user experience. It's exciting to see how object detection algorithms can enhance the lives of individuals with visual and physical impairments. I wish the Eye For You project success in its development and implementation.

Moreover,

- Improved ease of use and freedom: The project aims to create a system that can help children and people with physical disabilities move around more easily and independently. This could greatly improve their quality of life by giving them more freedom and control over their environment.
- Location of an object and identification in real-time: The algorithm might be able to recognise items in real-time and give users understanding of the object right away via speech or video.
- Greater protection: The system could make the environment safer for everyone, including people with disabilities, by alerting them to any potential risk or obstacles they may face while in public or also at home.
- Interaction is easier: The system in future may have a user-friendly interface that includes clear and concise voice prompts or visual cues to make it easier for people with physical disabilities to use.
- Flexible and customizable architecture: The system will be capable of adapting to new features like talking with users in their language that will help user to feel comfortable.
- This project may encourage further research and development in the areas of object identification, which could have potential uses in various sectors such as healthcare, transportation, and education.
- This project is encouraged from a series called StartUp: It helped people with disability to not feel restricted and dependent, by creating an application that interact with them and give a learning of their surroundings from reading a book in front of it to describing a scenario.
- Integrating the project with currently available technologies for object detection: To provide users with a effortless and great experience, the system might be developed to work together with already existing assistive technologies, such as wearable gadgets, screen readers, or voice recognition software.
- Personalization: The system may be set up to let users change the language, voice prompts, or other options to better suit their requirements and preferences as per their comfort.
- Data gathering and analysis: The system might be built to gather and examine information about user preferences and behavior, which might be used to improve the system's functionality over time. For example, the user can enter the name of the person that appeared once in the system.
- Partnership will be required: To ensure that the system is developed with the target user group in mind and meets their requirements, the project might involve working with organizations that is already doing good for people of our user group. Organizations such as disability organizations, educators, and caregivers.
- Compliance with accessibility standards and laws: To maximize the system's accessibility for a wide range of users, it could be designed to comply with accessibility standards and regulations.
- The system's potential to improve the lives of people with disabilities and enhance accessibility in various sectors may also attract the attention of investors and companies, leading to the creation of new job opportunities and economic growth. The project could also lead to collaborations between companies and researchers, resulting in the development of new and innovative technologies and products.

FUTURE ADVANCEMENTS

1. Using audio feedback: After detecting an object, the algorithm provides an audio description of the object and the location of the object from the individual. For example, "A pole is located in front of you at a distance of 2 feet."
2. Utilize touch-based feedback: The algorithm could also provide touch-based feedback to the user by sending vibrations from the smartphone or device in a certain way to indicate the location of the object. For example, the device could vibrate twice when the object is to the right of the user or individual.
3. Provide directions: The algorithm could also provide directions to the user so that the user can navigate towards or away from the object like Google maps that helps users to reach a location. For example, "The door is located to your right. Turn right to reach it."
4. Use a combination of methods: Combining audio and touch-based feedback with directions could provide a more comprehensive and effective way of assisting the blind person in navigating their environment and interacting with objects.

It's important to note that the implementation of the above suggestions depends on the specific device and context in which the algorithm is being used.

CONCLUSION

In summary, the study proposes an effective approach to enhance the quality of life for visually impaired individuals by developing an object recognition system that utilizes advanced deep learning techniques such as YOLO. The system can detect and locate various objects, allowing visually impaired individuals to better understand their surroundings using a mobile device and voice feedback technology, thus reducing the risk of accidents. Additionally, there is potential for improving system accuracy and expanding compatibility with various convenient devices through further development of the Android operating system, creating opportunities for future advancements.

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