Weed Whisper: Smart Vehicle with Obstacle Avoidance and Weed Detection

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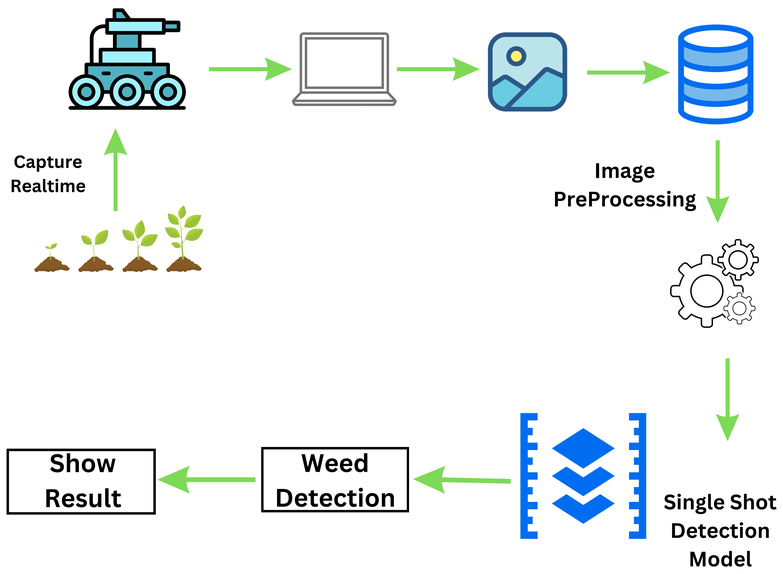
Abstract

The "Smart Vehicle with Obstacle Avoidance and Weed Detection" project introduces an innovative smart vehicle with adaptive obstacle avoidance and precision weed detection. Its modular architecture and user-friendly interface underscore a commitment to technical excellence and practical usability. Embracing agile development, the project exemplifies collaborative innovation, offering a glimpse into the limitless potential of interdisciplinary endeavors.

Introduction

The "Smart Vehicle with Obstacle Avoidance and Weed Detection" project introduces an innovative smart vehicle with adaptive obstacle avoidance and precision weed detection. Its modular architecture and user-friendly interface underscore a commitment to technical excellence and practical usability. Embracing agile development, the project exemplifies collaborative innovation, offering a glimpse into the limitless potential of interdisciplinary endeavors.

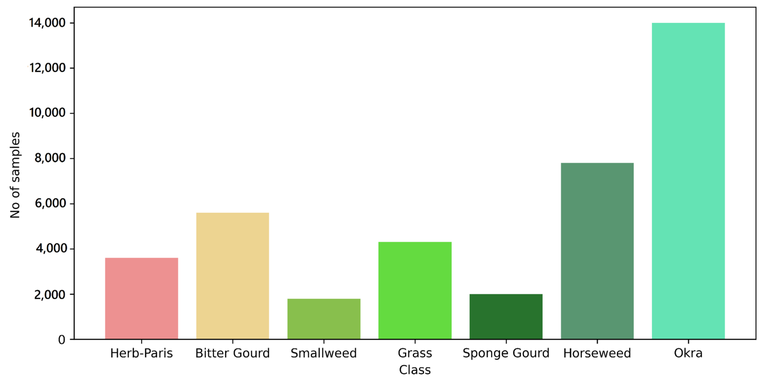


Methodology

To accomplish this task the following steps can be taken:

Dataset

The dataset was collected in the form of videos, and 12,000 frames were extracted from the videos acquired through a 60 fps camera. The resolution of the camera was 1280 × 1024. During data collection, the shooting distance was maintained at approximately 1 m. The images extracted from the video contained a top view of weeds and crops, which is ideal for autonomous weeding robots, as they will pass over the canopy of several crops in a row to detect weeds.

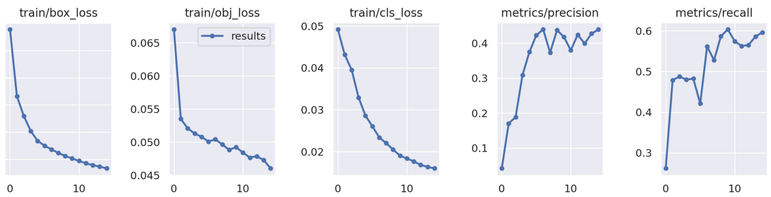


Preprocessing the Dataset

- Resizing the image.
- Data Annotation using Label Mg

Testing

After training the detection model, a dedicated testing phase is conducted to evaluate the performance and assess the accuracy.

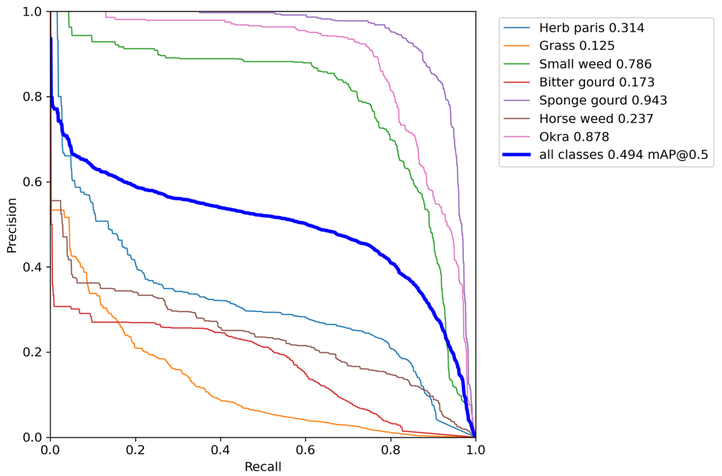


Deployment

Upon successful testing, the detection model is selected for deployment

Results

After Deployment the Results are as follow



Precsion & Recall Curve

Obstacle Detection & Avoidence

This project seeks to delve into the intricacies of obstacle detection and avoidance mechanisms in autonomous vehicles, aiming to elevate their performance and reliability. Focused on leveraging state-of-the-art technologies, including ultrasonic sensors and adaptive algorithms, the study aims to enhance real-time detection capabilities while ensuring dynamic adjustments to vehicle trajectories for seamless obstacle avoidance.

Conclusion

In conclusion, our project on obstacle avoidance has demonstrated the successful integration of ultrasonic sensors and adaptive algorithms, enhancing real-time detection and dynamic trajectory adjustments in autonomous vehicles. Simultaneously, the strides made in weed detection, utilizing the YOLOv5s model on a custom dataset, showcase the potential for precise identification and classification of various weed species.