Hybrid Object Detection Using Domain-specific Datasets

This work describes a combination of color determination and object detection. It describes the creation of a hybrid system that would increase production and streamline the process of crop harvesting.

Introduction

- Artificial intelligence in today's world
- Perception of the world of robots by means of artificial intelligence
- Today's crop harvesting technology
- Potential of YOLO technology

Motivation and goals of work

- Seasonal work of crop harvesting
- Improve production of harvesting crops
- Study of object detection technology
- Working with image information
- Accelerate detection process

Object detection technology

- Collection of the necessary specific data set for training
- Mark a specific dataset with yolomark
- Bounding boxes using dimensional grouping
- Training a model with a domain-specific dataset of images

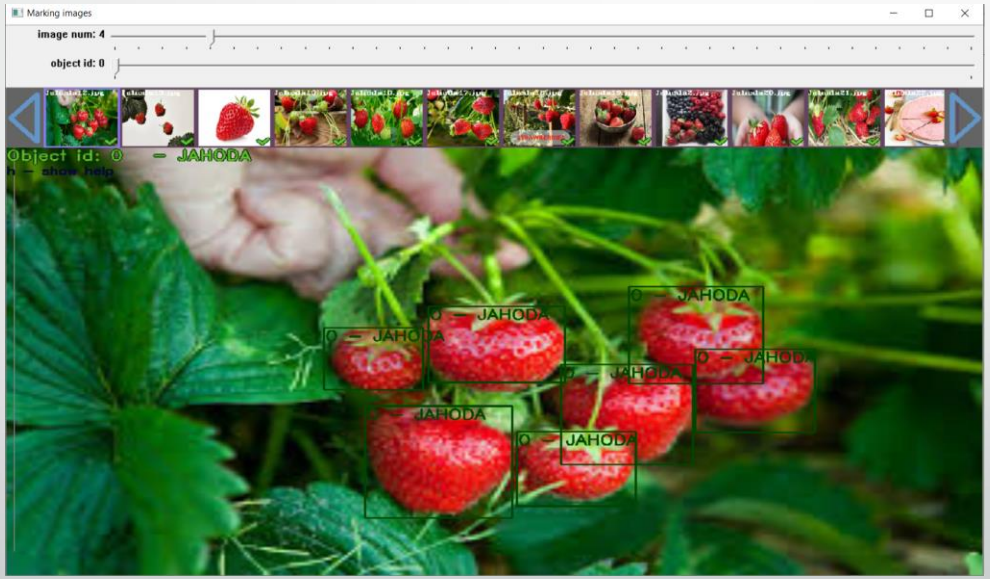

Fig.1 Bounding objects using the yolomark tool

Combination of color determination and object detection

- Using the OpenCV library to speed up the detection process
- Choose a range of color shades
- Marking potential crops using color determination
- Marking crops suitable for collection
- Connecting the color determination tool and the object detection tool
- Creating a continuous image processing process

Video of the created solution

The result of the achieved solution

Detection of	Amount/Time performed on RTX 2080Ti.		
Colors	10/0.032s	25/0.045s	48/0.072s
Objects	9/1.042s	22/1.832s	36/2.642s

TABLE I. TIME CONSUMPTION ACCORDING TO THE AMOUNT OF STRAWBERRIES IN DIFFERENT PROCESSED IMAGES

- simplification and acceleration of the whole strawberry harvesting process,
- improved strawberry selection through color determination,
- shortening the time needed to store and sort strawberries.
- prepared to be used by harvesting robots in the future.

CONCLUSION

- This work deals with the improvement and facilitation of strawberry harvesting.
- Determination of color before the actual detection of objects.
- Creation of a hybrid system for color determination and object detection
- Improving crop selection
- Increasing harvest production