Object Detection and Tracking System for Industrial Robotics Using Raspberry Pi

Will Martin\(^1\), Phillip Deierling\(^1\)

\(^1\)The University of Iowa

UI College of Engineering Research Open House
November 5, 2020
Motivation and Goals

• In industry settings humans are still completing tasks that would require an advanced dynamic robot system

• Our goal - build dynamic robot vision system that is:
  • Low cost
  • Easily reprogrammable to handle new tasks and new objects
Methods

• The vision system will:
  • Use a machine learning model to detect objects of interest
  • Track detected objects between frames
  • Calculate basic information about detected object (velocity, size, etc.)

• Hardware
  • Total Price ~$130
  • Raspberry Pi 4 4GB Model B
  • Pi Camera Module
  • Coral USB Accelerator
    • Edge TPU coprocessor
Machine Learning Model

• What is a neural network based machine learning model?
  • Many simple algorithms connected in network can perform complex tasks
  • Training model on sample input data allows the model to make predictions

• MobileNet SSD v2
  • Light weight neural network model
  • Object-detection specific
Results: Example Video

- Algorithm (detection + tracking) runs at ~48 FPS
Conclusions

• A cheap, real-time object detection system has been made

• This system will be implemented on a KUKA KORE robotic arm to test its industry validity
Thank You!

- Presenter: Will Martin, Department of Mechanical Engineering, University of Iowa, will-martin-1@uiowa.edu

- Co-author: Phillip Deierling, Department of Mechanical Engineering, University of Iowa, phillip-deierling@uiowa.edu