Visual Following:
A Step towards Autonomous Driving

Kevin Tang

Kaiwen Geng

Motivation & Previous Work

- Simple yet robust method for autonomous driving
- Widely used in autonomous trucking industry
  - Tu Simple's first commercialized driverless trucks used this approach
- Part of most autonomous driving stacks

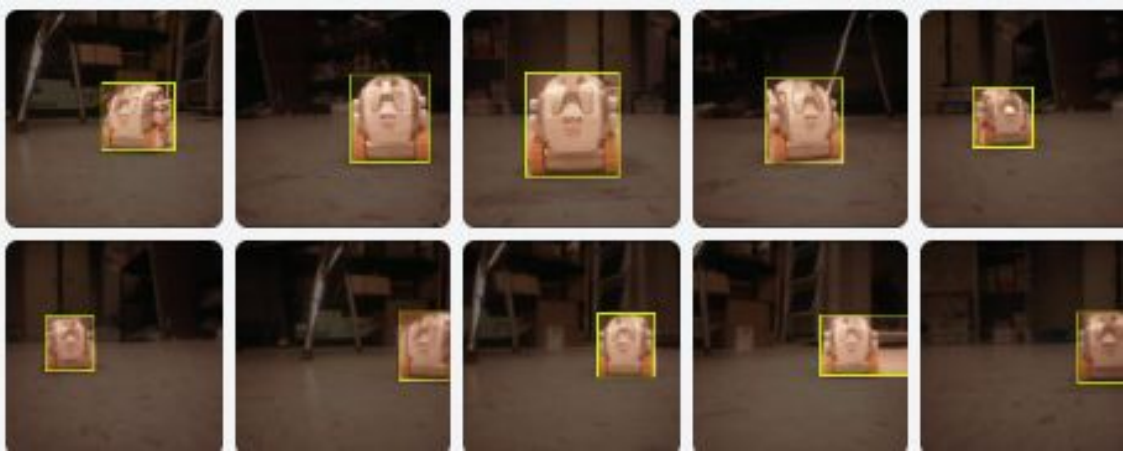
tu simple

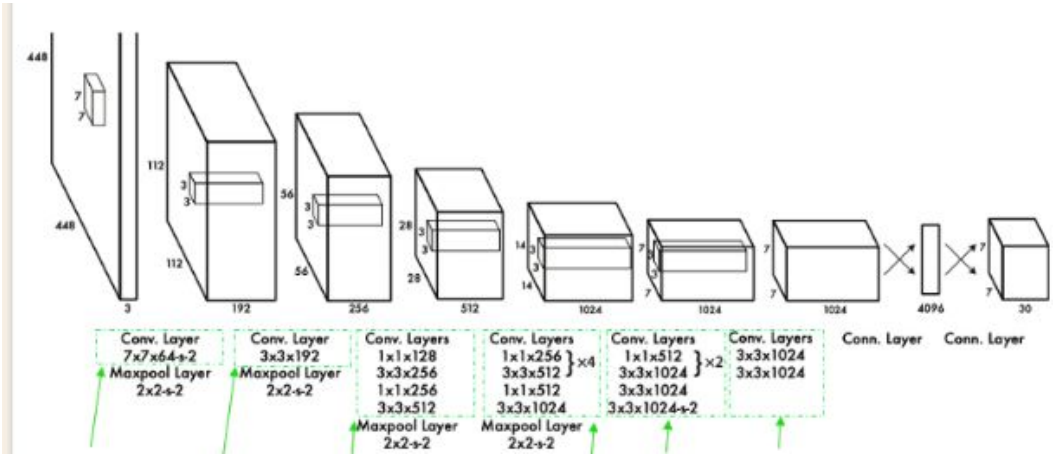
Challenges & Innovation

- Sensing and Perception
- Data Processing and Decision Making
- Control Systems

Implementation 1: Following Cozmo

- YoloV8 with self-trained model
  - Convolutional neural net for real time object labeling
  - Trained with 200 images of labeled images of cozmo
- Pros: Robust and accurate
- Cons: Cozmo only, needs retraining for other objects

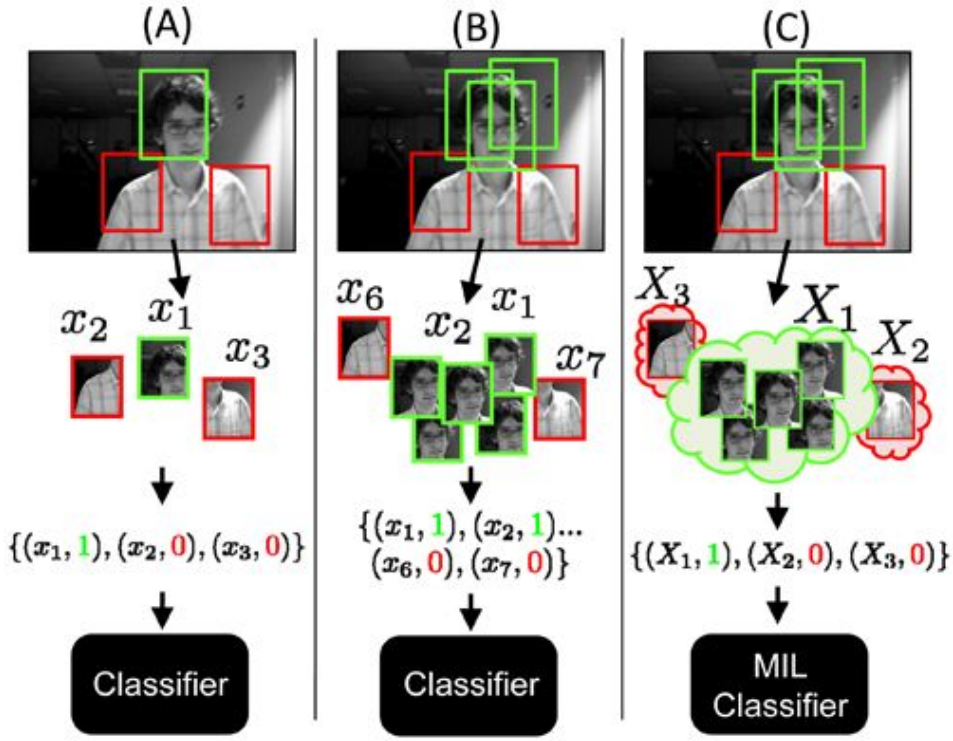




Demo1

Implementation 2: Following Arbitrary Object

- Based on Multiple Instance Learning tracker
  - Online learning
  - Start with 1 single image, by generating a bag of samples from a single image
- Pros: Can track any selected object
- Cons: Can't tell if target is loss, difficult to resume after losing track



Demo2

Future Work

For Yolo-based follow:

- Larger model with more samples in different environment
- More classes in object recognition
  - Enable Cozmo to respond to pedestrians, road signs etc.

For MIL based follow:

- Run detection in a thread separate from locomotion to improve performance

For locomotion

- Implement MPC or PID control for turns, instead of linear control