ECE434 Pedestrian Crosswalk Recognition

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Risk Significance

“In 2021 alone pedestrian fatalities in the United States alone numbered 7,388 while over 600,000 were injured, a 13% increase from 2020”

-National Highway Transportation Safety Agency

Mitigations

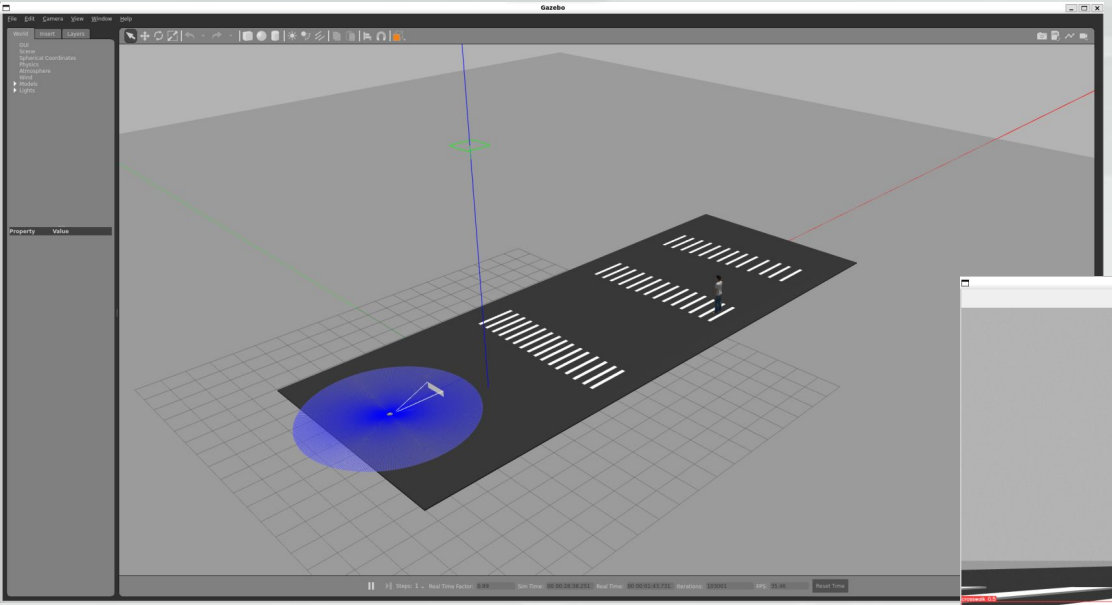
What can an autonomous vehicle do?

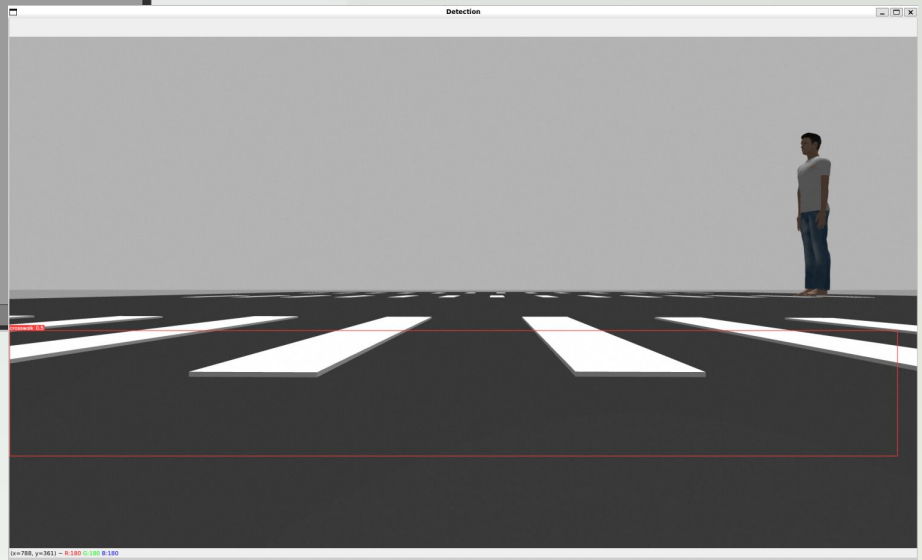
- Sense how far along a crosswalk the pedestrian is and control speed based on that
- Fully stop at crosswalk check for pedestrians then move
- Check a pedestrian light to see if red or green and move based off the status of that

Approach

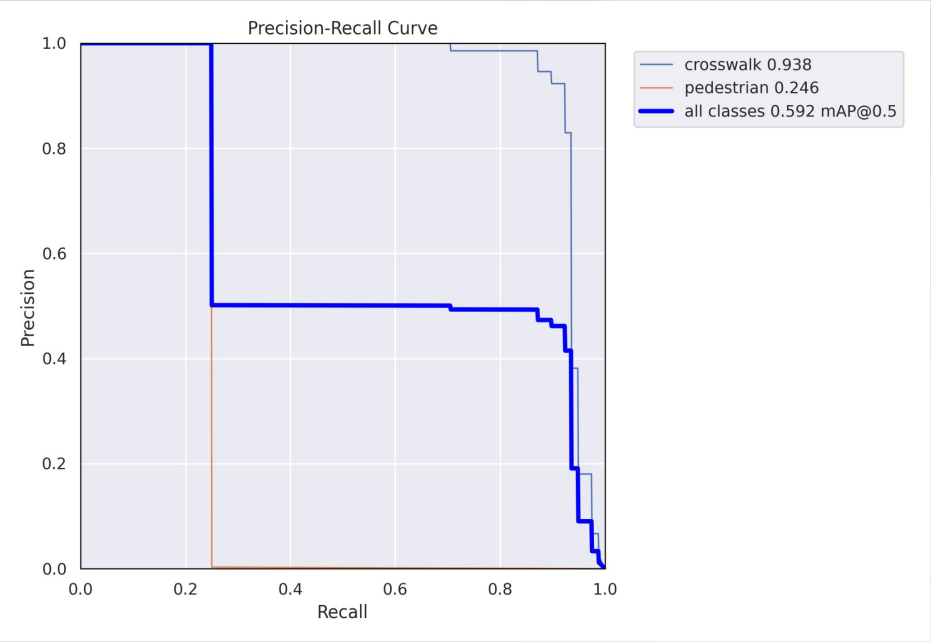
1. Create a world in gazebo to simulate crosswalk environment
2. Utilize images from environment to train robot on what is a crosswalk
3. Create ROS nodes which tell robot when to stop and go as well as determine light
4. Evaluate model to confirm performance

The World

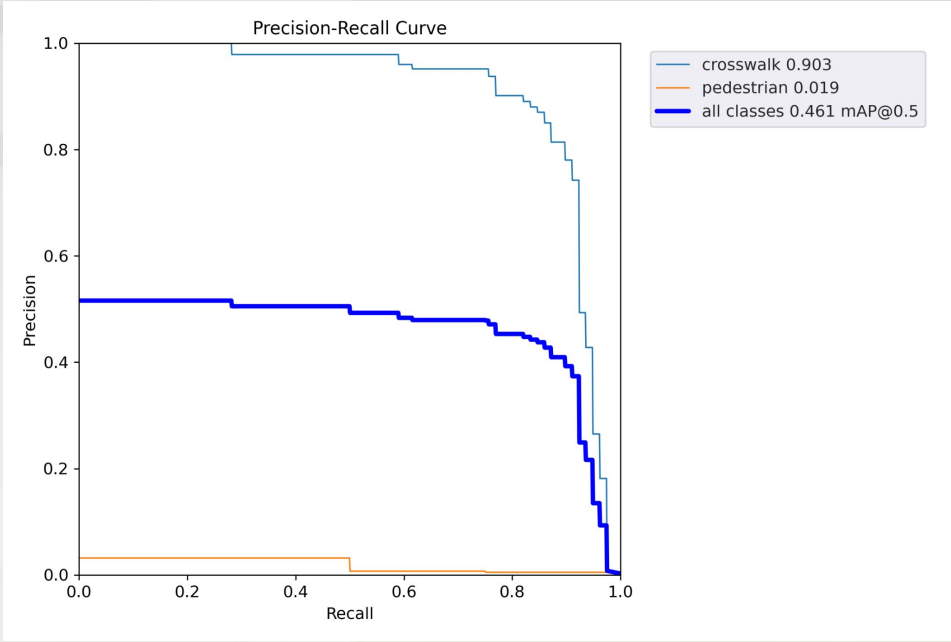




Training Sets



Real World



Virtual World

Robot Control Logic

```
    """
    Returns True if detects crosswalk
    """
    def crosswalk_cb(self, msg):
        self.detect_crosswalk = msg.data
        self.process_cb()

    """
    Returns True if detects stop signal
    """
    def signal_cb(self, msg):
        self.detect_signal = msg.data
        self.process_cb()

    """
    Drives the robot
    """
    def process_cb(self):
        twist_msg = Twist()
        twist_msg.linear.x = REGULAR_SPEED # 1.0

        if self.detect_crosswalk:
            if self.detect_signal:
                twist_msg.linear.x = 0.0 # stop
            else:
                twist_msg.linear.x = SLOW_SPEED # 0.3

        self.publisher_.publish(twist_msg)
```

Results

Conclusion

In a world where safety remains the top concern with autonomous vehicles, this model offers a successful answer on handling pedestrian safety