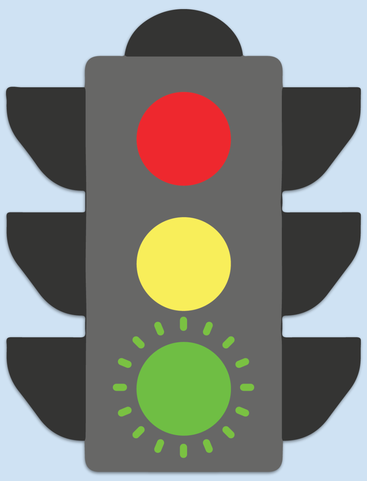

Smart Traffic

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Abstract

Due to the high volume of cars traveling on the road every day, traffic is a phenomenon that many people are familiar with. Traffic can specifically cluster at intersections and cause unnecessary wait times for drivers. In this project, our group aims to alleviate the delays caused by traffic, defined here as the amount of time cars spend at intersections.

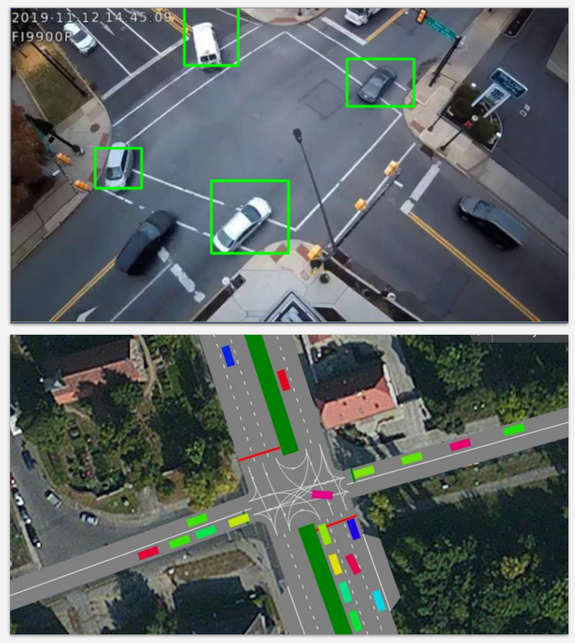
Our solution decreases traffic wait times by leveraging machine learning and advanced algorithms to reduce traffic intersection congestion.

The system operates in three phases:

① Detection
Use object classification to identify new vehicles entering the intersection

② Tracking
Every frame we use an object tracking algorithm to record updated position and velocity for each vehicle

③ Decision
Using vehicle tracking data and the intersection layout we make intelligent decisions to control traffic efficiently.



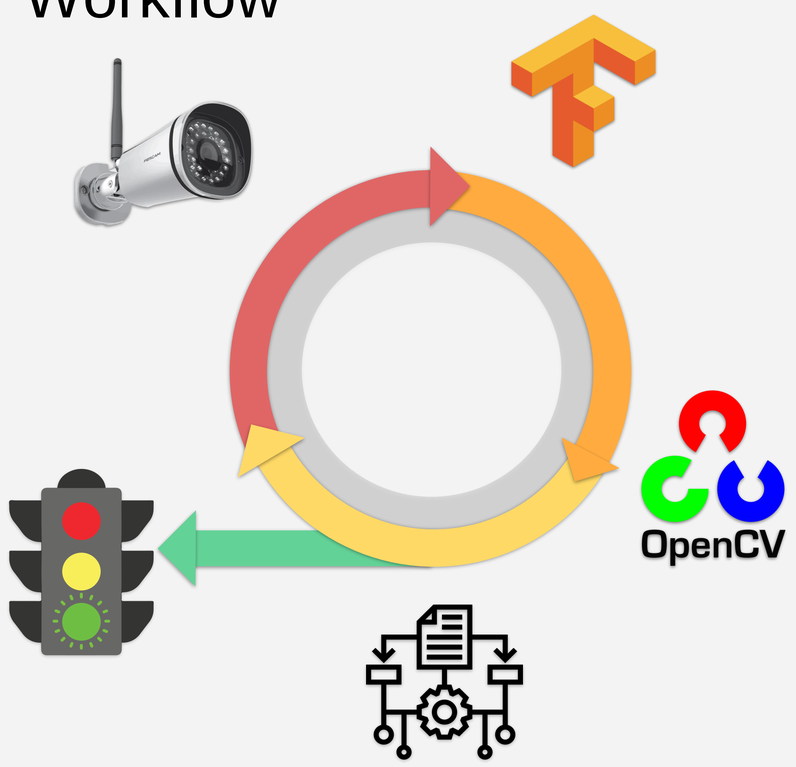
Motivation

Traffic systems in the United States are outdated, and result in a loss of time and energy. The aim of Smart Traffic is to enhance existing motor vehicle traffic solutions with modern technology as a means of providing efficient, sustainable, and potentially scalable improvements. Efficient traffic systems would result in a reduced environmental pollution, decreased delays for commuters, lower accident rates, among other benefits. Our solution aims to be adaptable, cheap, and easily implementable.

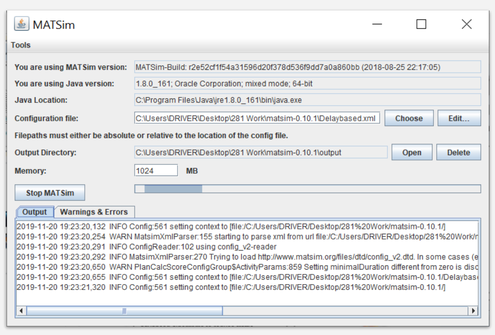
Goals

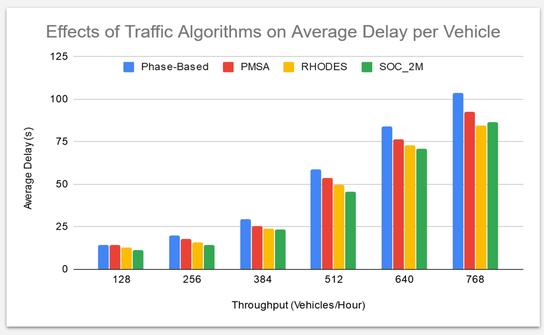
- Save Time
- Scalable
- Reduce Traffic
- Maintainable
- Inexpensive
- Flexible

Workflow



- **Camera** - Captures live data from intersection
- **TensorFlow** - Takes video frames, identifies cars and other agents via Machine Learning
- **OpenCV** - Tracks identified cars and outputs position related information as XML
- **Traffic Algorithms** - Using positions of tracked cars, makes calculated decisions on traffic signals
- **Traffic Signal** - Output an automatic, efficient traffic signal to the intersection.





Future Directions

Our project only focused on a four-way intersection, but there are many other traffic patterns: construction flaggers, entrance ramps could benefit from smarter systems. Another important consideration with traffic is scalability; we worked on a single intersection. In reality however, traffic is a complex system of intersections that, ideally, would all be working together. Additionally, we could implement a machine learning-based tracking algorithm to allow the software to adapt to unique intersections.

Results

Our project achieved a significant decrease in average vehicular delay and minimized the amount of stops each car experiences at an intersection.

- 2 sec/frame car detection using Tensorflow
- MOSSE object tracking using OpenCV
- PMSA and others for intersection simulation
- 1920×1080px 60fps live webstream
- 20.1% waiting time reduction over timed systems

Conclusions

Our project demonstrates the effect that well-implemented technology can have on our everyday lives. We were able to achieve a system which makes intelligent traffic control decisions with limited resources. While we were not able to control a traffic signal with our system, it serves as a proof of concept.