Effects of Cruise Control on Energy use and Phantom Jams

Work Research Group

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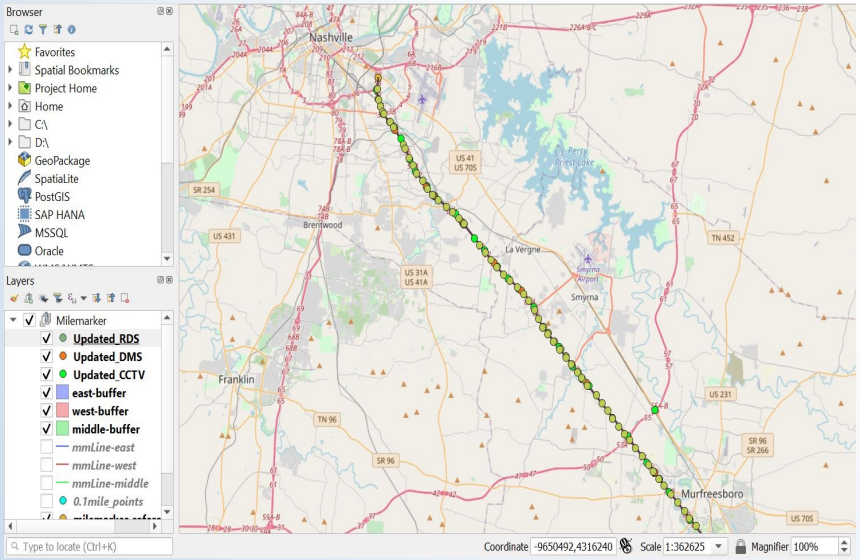
Introduction : CIRCLES

1. What is CIRCLES?
2. What does CIRCLES aim to accomplish?
    1. Strym – Python Package for real-time logging of Vehicle data.
    2. I-24 MOTION – Interstate highway testbed for Vehicle trajectory data collection.

I-24 MOTION : Preliminary Design

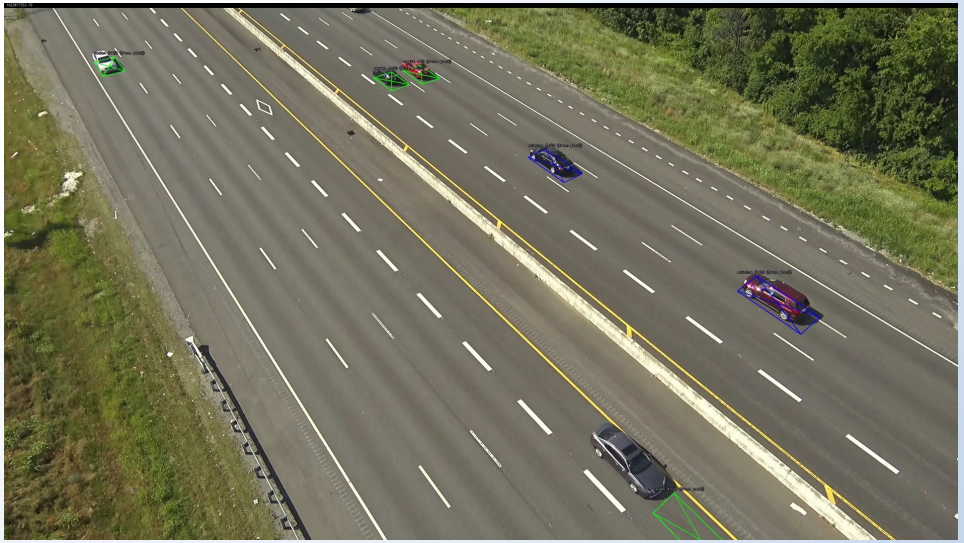
- Currently 3 poles are installed along the I-24 highway to gather traffic data.
- By 2022, 60 total poles are planned to be installed along a 6 mile stretch.
- It is crucial to know if there are any objects along the highway that causes occlusion in vision.
- Technology Used : QGIS, Internal Python Querying



I-24 MOTION : Computer Vision

Goals

- Refine the computer vision algorithm through existing footage so that it can be immediately applied when all poles are installed.
- Identifying the correct coordinates of vehicle footprints.

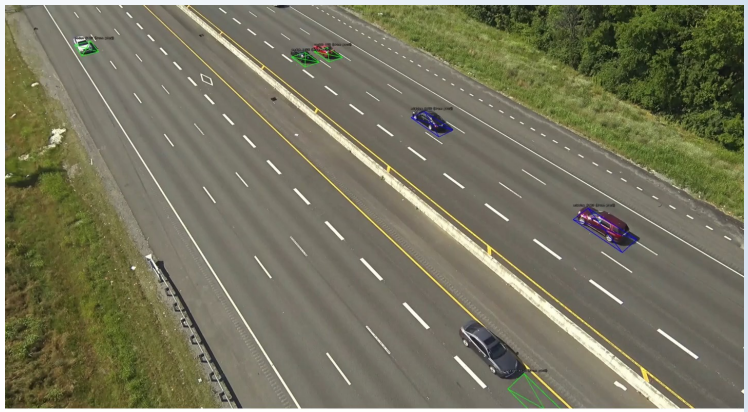


I-24 MOTION : Computer Vision

Data Pipeline

Frame #	Timestamp	Car ID	Object Class
0	1.62E+9	120	Sedan
1	1.62E+9	120	Sedan
2	1.62E+9	120	Sedan
3	1.62E+9	120	Sedan

Fbr_x	Fbr_y	Fbl_x	Fbl_y	Bbr_x	Bbr_y	Bbl_x	Bbl_y
151.1439	31.88932	151.1439	29.47524	155.5061	31.88932	155.5061	29.47524
150.1107	31.88932	150.1107	29.47524	154.4729	31.88932	154.4729	29.47524
149.0775	31.88932	149.0775	29.47524	153.4397	31.88932	153.4397	29.47524
148.0443	31.88932	148.0443	29.47524	152.4065	31.88932	152.4065	29.47524

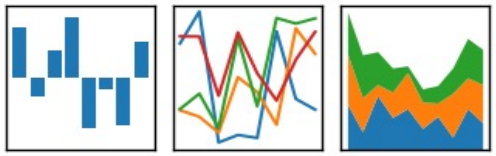


- The animation represents the large datasets of vehicle footprints in order to create feedback on the vision algorithm.
- Technology Used : Python, Data Science Libraries – Pandas, Numpy & Matplotlib.

I-24 MOTION : Computer Vision

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Car ID	Error Message	Time
1160	Vehicle is on the guardrail section	16:05:53
4160	Vehicle is higher than y=120	16:05:56
6150	Vehicle is on the guardrail section	16:05:53
10160	Vehicle is on the guardrail section	16:05:53
12160	Vehicle is higher than y=120	16:06:00
24160	Vehicle is higher than y=120	16:06:01
48160	Vehicle is higher than y=120	16:06:03
51160	Vehicle is higher than y=120	16:06:05
63160	Vehicle is higher than y=120	16:06:05
69160	Vehicle is higher than y=120	16:06:07
71160	Vehicle is higher than y=120	16:06:05
74160	Vehicle is higher than y=120	16:06:09
76160	Vehicle is higher than y=120	16:06:07
79160	Vehicle is higher than y=120	16:06:07
86160	Vehicle is higher than y=120	16:06:11
90160	Vehicle is higher than y=120	16:06:09
96160	Vehicle is higher than y=120	16:06:12
109160	Vehicle is higher than y=120	16:06:11
120160	Vehicle is higher than y=120	16:06:11
123160	Vehicle is higher than y=120	16:06:14
125160	Vehicle is higher than y=120	16:06:12
143160	Vehicle is higher than y=120	16:06:14
145160	Vehicle is higher than y=120	16:06:15
147160	Vehicle is higher than y=120	16:06:13
151120	Vehicle is on the guardrail section	16:06:03
161160	Vehicle is higher than y=120	16:06:14
184160	Vehicle is higher than y=120	16:06:13
202160	Vehicle is higher than y=120	16:06:15
212160	Vehicle is higher than y=120	16:06:16

Error Report System

- Instead of searching on the video itself to find outliers, created a program to detect if car coordinates were out of bounds.
- Largely accomplished through data manipulation using Pandas.

Conclusion

Lessons Learned

- Getting comfortable with picking up new technology quickly.
- Actively searching for new tools that could simplify some processes.

Challenges Faced

- Coming to the office physically after getting used to working remotely.

What went well

- Laying down a strong foundation to build upon this academic year.
- Getting to know everyone on the team!