TEAM 047

Optimizing Traffic Signal Timings Using Drone Technology to Mitigate Congestion in Urban Areas

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Introduction/Background

Problem Statement:
Urban intersections suffer from inefficient traffic signal timings, leading to congestion and pollution. Fixed cameras lack mobility and adaptability.
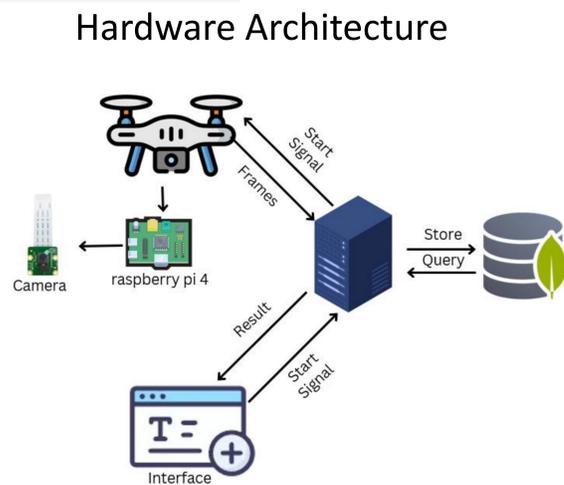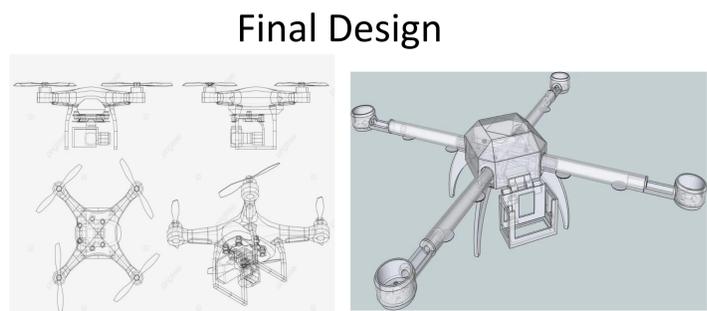
Constraints

Budget	Timeline	Comply
7000 SR	4 months	MOT
Comply	**Fly Time**	**Tolerance**
AASHTO	30 min	Stable

Specifications

Weight	Drag	Battery
3 – 5 kg	2.45 N	5200 mAh
Drag	**L/D Ratio**	**Thrust**
2.45 N	16	39.2 N
Resolution	**Frames**	**Accuracy**
1080p	30 fps	>95%

Prototype Design

Final Design

Hardware Architecture

Simulation with VISSIM

Testing / Validation

High detection accuracy for single frame

Metrics
mAP@50 — 87.0%
Precision — 92.7%
Recall — 82.0%
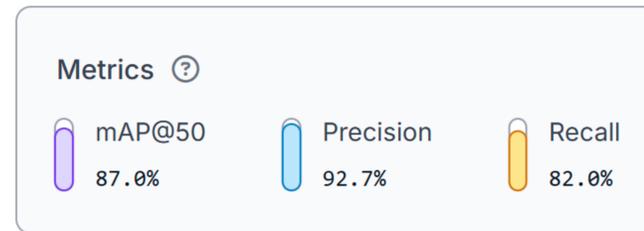
higher accuracy for frames tracking
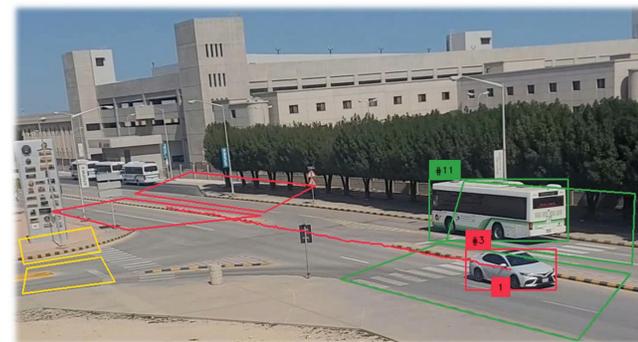
Model trained on local & online data for variant detection angles.
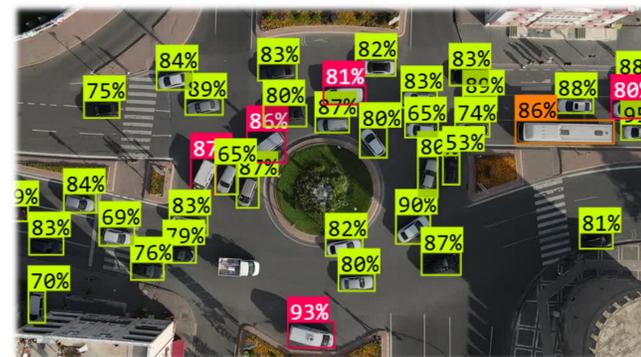
Conclusions

The drone-based system successfully optimized traffic signal timing using real-time aerial data and AI. It outperformed traditional fixed-camera methods in flexibility, accuracy, and response time. Validated through simulations and real-world testing, the prototype demonstrated its potential as a scalable, cost-effective solution for smart traffic management.