AI TO ENHANCE SAFE AND EFFICIENT FLOW OF MULTIMODAL TRANSPORTATION NETWORK

Caltrans Bay Area INNOVATION FAIR 2022

DIVISION OF TRAFFIC OPERATIONS

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Background:

Red-light runners are a national-wide problem. Their speed and unexpected impact make this kind of traffic incident deadly and a leading cause of all urban crashes. Federal Highway Administration estimates that more than 165,000 pedestrians, cyclists, and motorists are injured annually by red-light runners. Wrong-way drivers are also increasingly an issue that traffic engineers and transportation agencies in general are trying to eliminate. Caltrans District 4 Traffic Operations is actively looking at pilot projects to test innovative, emerging technologies in our mission to promote safety while connecting multimodal transportation network.

One of these pilot projects is NoTraffic Autonomous Traffic Management platform. Caltrans District 4 Traffic Operations in conjunction with NoTraffic have installed the platform at 4 pilot intersections on SR82 in Palo Alto to evaluate its detection and ATSPM capabilities, Connected Vehicle applications support and traffic optimization.

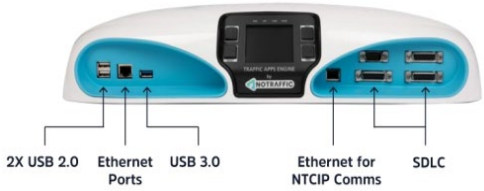

Figure 1. Control Unit with NoTraffic Management Engine

Figure 2. Sensor consisted of video, Radar, RSU unit, AI processors and algorithms

Theory of Operation:

NoTraffic platform is a type of Intelligent Transportation System consists of a control unit, see Figure 1, armed with NoTraffic Management Engine, and a sensor unit, see Figure 2, composed of video and radar along with sophisticated AI algorithms to identify rapidly and accurately any moving objects on the roadway in real-time. The app engine, using the information from the Sensor Unit, has the capability to calculate and dynamically adjust the traffic timing in a fractional of a sec to accommodate the most congested direction of travel based on the policy set forth by the local agency while still setting suitable time for pedestrians to safely cross the roadway. Similarly, with proper policy setting, control unit will be able to recognize EVP, Emergency Vehicle Preemption, for safe emergency passage, and TSP, Transit Signal Priority, to accommodate transit vehicles. The Sensor Unit with its sophisticated machine learning algorithms also has the capability to track the trajectory of moving objects and predict any potential incidents from occurring. With the sensor unit equipped with RSU, Road-Side Unit, it can warn the Connected Vehicles of any potential upstream hazard. This enables the drivers to take evasive maneuver and potentially avoid accidents or find alternate routes. Another capability of the Sensor Unit is its ability to detect an accident and relay this information to the Management Engine. The Management Engine will automatically trigger an alert to the TMC allowing local agency to rapidly dispatch emergency vehicles to assist with the accident.

Benefits:

The system has the potential to dramatically improve the urban mobility as population density rises in many of the largest cities. Unlike many detection systems, NoTraffic Sensor does not rely on set detection zones instead it relies on its advanced computer vision algorithms, which can dynamically and accurately identify any moving objects on the roadway while simultaneously tracking their trajectory. With its high precision capability, it can provide accurate vehicle counts, identify any near misses, identify wrong-way drivers, red-light runners, and real-time incident alerts. These data will assist the traffic engineers in identifying problematic area leading to implementing effective countermeasure to drastically reduce the incidents in the future. With the inclusion of RSU, the system is ready to engage with the changing landscape of future transportation network.