CPS: Synergy: Collaborative: TTP Option: Dynamic Methods of Traffic Control that Impact Quality of Life in Smart Cities (1544887)

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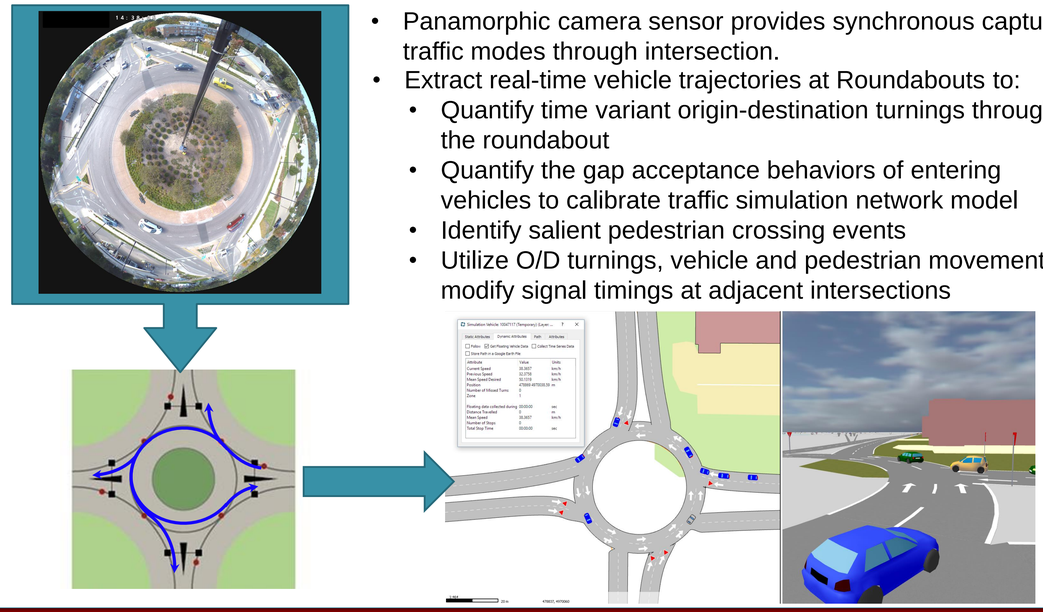
Overview

Traffic control management strategies have been largely focused on improving vehicular traffic flows on highways and freeways but arterials have not been used properly and pedestrians are mostly ignored. New urban arterial designs encourage modal shifts which gives further impetus to devise novel traffic control strategies to more quickly respond to changing conditions and salient events, while balancing safety and efficiency for all users.

An experimental framework is currently being developed to evaluate novel traffic control strategies through integration and deployment of actual sensors within an urban arterial network, as well as a traffic simulation model network of interconnected arterials and signalized intersections. Computer vision techniques are used to extract macroscopic traffic parameters and characterize detailed microscopic behaviors that can be used to identify salient events within and near urban intersections. The framework will be used to investigate traffic behaviors through the urban road network that includes a multiplicity of roundabouts which will soon replace signalized intersections between major urban arterials. Controlling and adapting traffic behaviors near the confluence of roundabout intersections, as well as accurately measuring the ensuing traffic behaviors introduces challenges that presents opportunities to develop traffic control and sensing strategies.

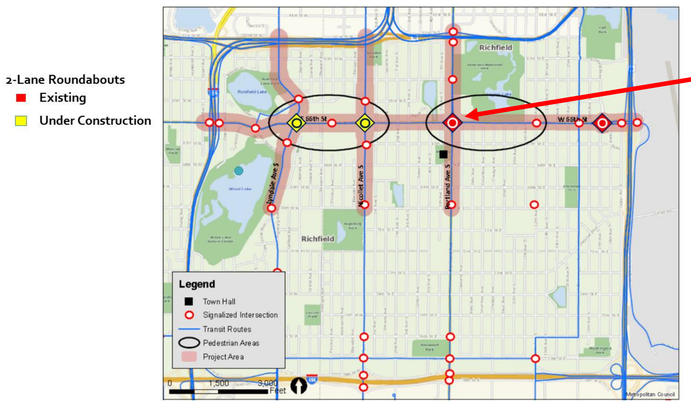
Traffic Simulation and Sensor Integration



- Panamorphic camera sensor provides synchronous capture of all traffic modes through intersection.
- Extract real-time vehicle trajectories at Roundabouts to:
  - Quantify time variant origin-destination turnings through the roundabout
  - Quantify the gap acceptance behaviors of entering vehicles to calibrate traffic simulation network model
  - Identify salient pedestrian crossing events
  - Utilize O/D turnings, vehicle and pedestrian movements to modify signal timings at adjacent intersections

Road System Network and Sensor Deployment

- Agreement reached with a first tier urban suburb and county to deploy traffic and signal sensor network along urban arterial corridor and intersecting streets. (City of Richfield ,population=36,125 within 7 square miles, 74 signalized intersections)



Roadside sensor system designed and deployed at existing roundabout within network

Future Work and Objectives

Future expansion of the sensor network within the area will then be used to form a more complete experimental test-bed to evaluate new traffic control paradigms. Sensor-in-the-loop simulation will be used to evaluate different traffic control strategies.

Next Steps and Ongoing work

- Deployment of detection systems to measure per lane vehicle flows at adjacent signalized intersections
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- Traffic simulation model calibration and incorporation of traffic signal timing plans
- Refinement of traffic detection, and installation plans for new under-construction roundabouts
- Deployment of detection systems to measure per lane vehicle flows at adjacent signalized intersections

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