MDOT-MSU Traffic State Monitoring System

Phase I: Roadway Travel Time Estimation System

2nd Project Progress Meeting
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Outline

• Recap

• Milestones

• System architecture

• Demonstration

• Next Steps

• New research ideas
Milestones

• May-2018: 1\textsuperscript{st} Progress debrief meeting
  • Presented the researching findings in the experiment with respect to the wireless antennas
  • Decided to adopt a different wireless antenna configuration
    • Directional wireless antennas instead of omni-directional (Commercial Bluetooth)
  • Decided to compare with a commercial travel time monitoring system deployed at the same locations

• June-2019: MDOT created VPN of MDOT Intranet and allocated four IP addresses for this project

• July-2018: MDOT deployed four directional Wireless antennas along Highway 12 at Starkville for MSU project team and the field devices went live on the same day:
  • @Highway 25
  • @Airport road
  • @Patriot Ave
  • @Louisville Street
New Progress

• Completely re-designed the wireless sniffing hardware platform

• Designed and built the background database with MySQL

• Developed two computing routines
  • Parsing program
    • Import raw csv files into the background database every 5, 10 or 15 minutes
  • Travel time calculation program
    • Calculate travel times of road segments defined by users

• Developed the graphic user interface (ver 0.1)
  • Visualize travel time over time along a selected path
New features of this system

• An integral software-hardware solution

• Highly scalable
  • Maintain the same efficiency at various scales from a few locations to hundreds of locations

• Highly efficient
  • Generation of travel time samples generation is continuous rather than user-driven
    • The active tables will not grow over time

• High-fidelity
  • Responsive time could be reduced to 1 min;
  • Path-based travel time to identify delay locations
System Architecture

Background Server

- TT calculator Segment 1
- TT calculator Segment 2
- TT calculator Segment m

Database

- Parser 1
- Parser 2
- Parser n

Web Server

- Apache XAMPP free version

Sensor

- csv file
- MDOT Intranet

Sensor

- csv file
- csv file
- csv file

Sensor

- ......
System Scalability

• Parallel data log into database
  • The number of active parsers is equal to the number of sensors
  • SQL Database is suitable for simultaneous user accesses.

• Continuous travel time calculation as opposed to “user driven”
  • Active tables could be very concise (only the latest hour of raw data)
  • User-driven travel time calculation is complicated and possible time-consuming
    • Many repetitions
  • Algorithm parallelism is critical
    • Simultaneous calculation for each defined segment
Demonstration

• Pilot Study: On the MSU “Action Lab” Server right now
  • It will be closed and transferred to the MDOT virtual machine.

  http://actionlab.cee.msstate.edu:8080/wifi-sensor/home.php
Demonstration

• Background Database
Demonstration--front graphic user interface

• EB Travel time for a week (Oct-14~Oct-20)
Cross Comparison with Velocity®

- Oct-19-2018 (Friday)
Cross Comparison with Velocity®

- Oct-20-2018 (Saturday)
Next Steps

• A trend curve will be added

• MDOT preferences?

• Traffic signal event data log and visualization
  • MDOT favorite figures
    • Will discuss during the 3rd project progress meeting
New research needs?

• Any other research needs from MDOT?

• New Locations?

• Turning movement counts (O-D)?

• Traffic Safety performance monitoring?
  • A new investigation? Run light running, prevailing speed, dilemma zone protection?

• NCHRP idea submission (by AASHTO member states): ATC traffic signal system study?
  • Deadline: November-1st