Applications of Traffic Signal Priority Technology for Transit Service

Professor Haitham Al-Deek, Ph.D., P.E. (UCF Principal Investigator)
University of Central Florida

Dr. Omer Tatari, LEAD Assistant Professor (UCF Co-Principal Investigator)
University of Central Florida

Frank A. Consoli, P.E.
City of Orlando

John Rogers, P.E.
City of Orlando

Dr. Mohammed Hadi, P.E., Associate Professor, FIU Co-Principal Investigator
Florida International University

University Transportation Center (UTC) Conference for the Southeastern Region, April 4-5, 2013
Presentation Outline

• What is Transit Signal Priority (TSP)?
• Background
• Project location
• Current UTC funded research project on TSP in Orlando
• Testing schedule and data collection
• Modeling
• Summary
• Future TSP projects in Orlando
• Transit Signal Priority (TSP) is a safe and secure transit strategy that provides preferential treatment for in-service transit vehicles, such as a bus, a streetcar or light rail, when travelling through traffic-controlled intersections.

• Unconditional Priority allows for the bus with TSP to be granted early green or truncation of red whether or not the bus is behind schedule.

• Conditional Priority allows for the bus with TSP to be granted early green or truncation of red only if the bus is behind schedule by a predetermined amount of time.
Transit Signal Priority (TSP) demonstration project for 2011 ITS World Congress.

Cooperative effort between the City of Orlando and LYNX (Transit Agency).

Demonstrated on International Drive (October 2011):

- Seven intersections between Universal Boulevard and Touchstone (now called Fun Spot Way).
- Most of signalized intersections in the City of Orlando have GPS systems (Opticom or Infrared).
- 16 GPS Opticom equipped buses on Link 8 similar to City of Orlando fire trucks equipped with GPS Opticom for signal preemption.
Universal Studios
7 signalized intersections equipped with GPS Opticom between Universal Boulevard and Fun Spot Way (formerly Touchstone)

International Drive
Universal Boulevard
Fun Spot Way
Route Link 8

Additional stops are located approximately every two blocks along each Link.
Completed literature review on TSP projects in the US and abroad in late Fall 2012.
The system architecture for (TSP) has been developed:
- GPS Opticom is connected to Automatic Vehicle Locator (AVL) via 25 foot cable.
  - LYNX has installed AVL on all buses in fleet.
  - With this connection it will be possible to determine if bus is on schedule or not.
  - If the bus is behind schedule (3 minutes) this will activate GPS emitter to activate TSP at equipped signalized intersections.
• Software development for conditional priority and connection of AVL to GPS Opticom were completed in January 2013 with one bus as a test.
• All 16 buses of Link 8 will have their GPS Opticom connected to AVL by early April 2013.
• Disable TSP for test runs and collect data during before study (before TSP becomes operational, see next slide).
• Repeat data collection for TSP unconditional and conditional phases.
Data collection is on going for the “Before Study.” Data included the following:

- **Traffic volumes** and vehicle classifications were collected in the corridor by pneumatic tubes in September and October 2012.
- **Turning movement counts** were collected using video cameras and Jamar.
- **Signal timing (split history)** was recorded at the City of Orlando Traffic Management Center (TMC).
- **Bus passenger Counts**
  - UCF research team collected data while on-board the bus from 3:00 PM to 7:00 PM for several days and will continue until sufficient data sample is achieved in Spring 2013. Data collected include boarding and alighting times, travel between stops, delays and passenger counts.
- Similar data will be collected for unconditional and conditional TSP.
Data Collection

Jamar Count Board for Turning Movement Counts

Counter for Vehicle Counts

Video for Turning Movement Counts

Pneumatic Tubes
• **VISSIM**
  • Will be used along with the data collected and geometry of roadways to simulate the traffic flow with TSP in the study corridor.

• **MOVES**
  • This EPA modeling program will be utilized to determine vehicle emissions in the study corridor.
• The three data collection phases and modeling will determine if TSP will:
  • Result in consistent travel times for the bus transit system in the selected corridor.
  • Improve transit schedule reliability and adherence to transit schedule.
  • Increase ridership and improve level of service.
  • Reduce emissions and improve air quality, therefore increasing environmental sustainability and being a greener technology.
Future TSP Projects in Orlando

- Expand TSP system to include:
  - Existing Lymmo downtown Orlando circulator.
  - East-west Lymmo to be operational in November 2013.
  - Parramore Bus Rapid Transit (BRT) to be operational in Spring 2014.
  - Orange Avenue (between Florida Hospital and Orlando Regional Health Hospital or ORMC)
- Purchase of ATMS TSP Module
  - Can remotely enable/disable TSP at any equipped signal from the City of Orlando TMC.
Questions
Contact Information

Professor Haitham Al-Deek, Ph.D.,
P.E. (UCF Principal Investigator)
University of Central Florida
407-832-2988
Haitham.Al-Deek@ucf.edu

Dr. Omer Tatari, LEAD Assistant Professor (UCF Co-Principal Investigator) University of Central Florida
tatari@ucf.edu

Frank A. Consoli, P.E.
City of Orlando
407-246-2703
frankaconsoli@cityoforlando.net

John Rogers, P.E.
407-246-3295
John.rogers@cityoforlando.net