### Traffic Engineering Lab

**Traffic Vehicle counts**
- Number of vehicles passing through different locations.

**Purpose**
To develop a methodology for estimating the turning behavior (turning rates) of vehicles coming from one intersection approach by using probe and UW detector data.

### Simulation Set-up
Traffic simulation by AVENUE is done to see which of the assumed turning rates can best replicate the observed probe car travel times.

**Assumptions:**
- Detector and beacon have the same location.
- 10% probe cars

### Turning Rate Estimation Process
1. **Detector Data**
2. **Probe Data**
3. **Possible Turning Rate (per direction)**
   - Detected data to the IR beacons containing:
     - Vehicle ID
     - Passing time
     - Previous links passed
   - These data are considered as "probe" data.
4. **Modified Monte-Carlo Simulation**
5. **Simulated Probe Travel Time Trend**
6. **Simulated Average Probe Travel Time**
7. **Comparison by Probability Analysis**
8. **Turning Rate Estimation**

### Trends
The trends in probe car travel times are observed in this study.
Under heavy traffic, travel times exhibit an increasing trend. The slope of the trend line increases with increasing turning rate until capacity is reached.

### Average Probe Travel Time
At traffic conditions where Demand<Capacity, the average travel times do not significantly vary even if turning rates are increases.

Once Demand>Capacity, average travel times increase with increasing turning rates.

### Conclusion
Two methods for estimating the turning rate of vehicles from an intersection approach have been developed. The results show that Average Probe Travel Times and Travel Time Trend Lines are sensitive to changes in turning rates and can thus be used to estimate turning rates accurately.

The estimation method works well, having errors of 0-4% for the scenarios considered. However, bias exists from a) using synthetic data and b) simplifying simulation conditions. For future work, the methodology will be improved to minimize the bias caused by a) and b.

### Key words: detector, infrared beacon, turning rate

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