Decentralized Traffic Control Using Distributed Agents

Thanks to Darryl Phillips, Traffic department, City of Pittsburgh for help in getting the data and the layout for Penn Circle.

Project Team

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Traffic Intersections With Communicating Distributed Agents: Structure

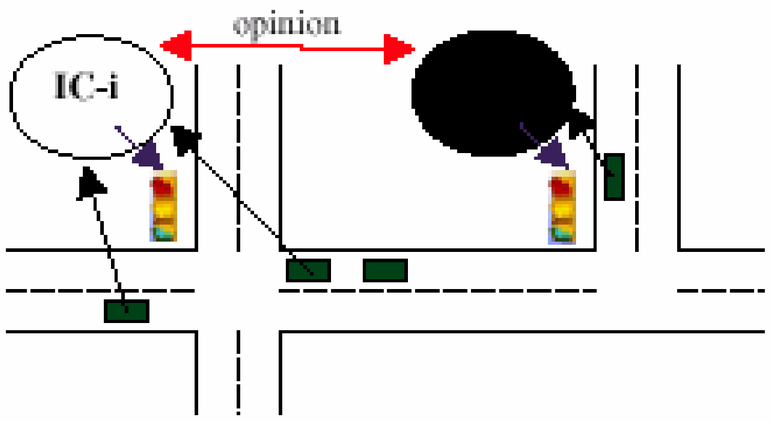

Figure 1. Controller architecture scheme

Road Model For Simulation: Penn Circle Area

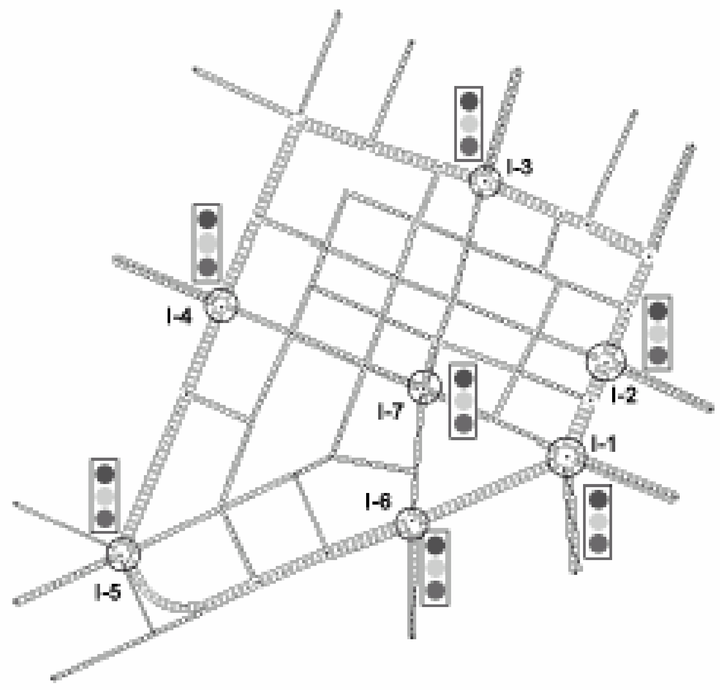

Figure 2. Road model of Penn Circle showing agent controller distribution

Comparing four models of traffic controllers

- Fix Time – Fixed time controllers optimized based on pre-observed data
- Fix-ff – Controllers based on pre-computed feed fractions on locally measured lane data
- Local – Local adaptive controller based on locally measured lane data.
- Online-ff – online computing of feed fractions based on “opinions” from neighboring intersections and locally measured data

Results: Average Trip Time across controllers

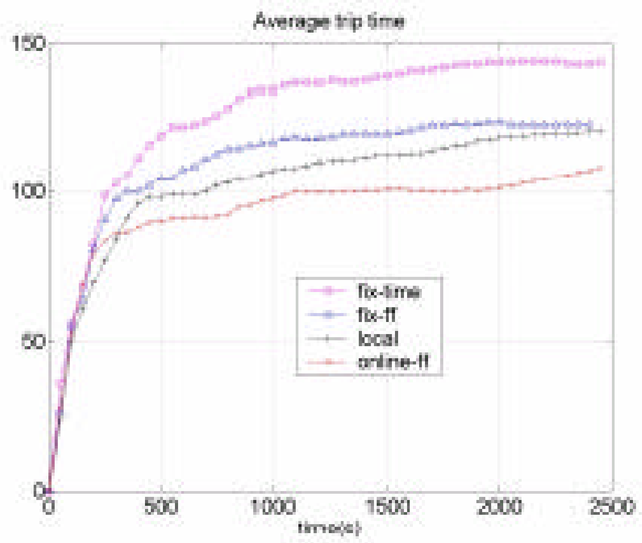

Figure 3. Average trip time for a typical run comparing different controllers

Results: Network Density

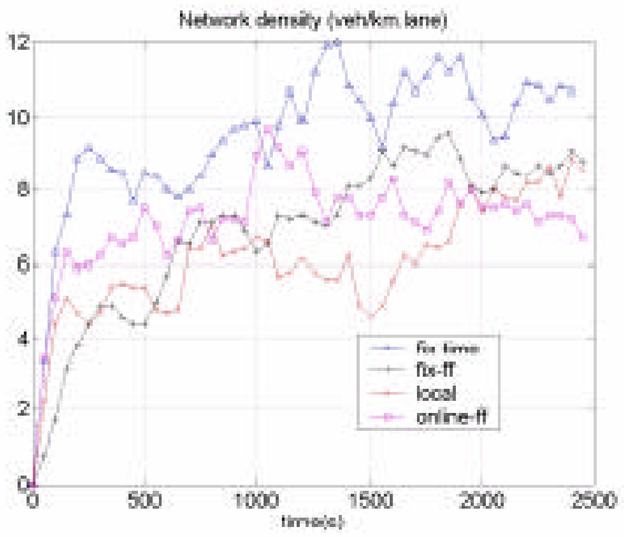

Figure 4. Network density for a typical simulation run.

Results: Percentage of Vehicles in the Network

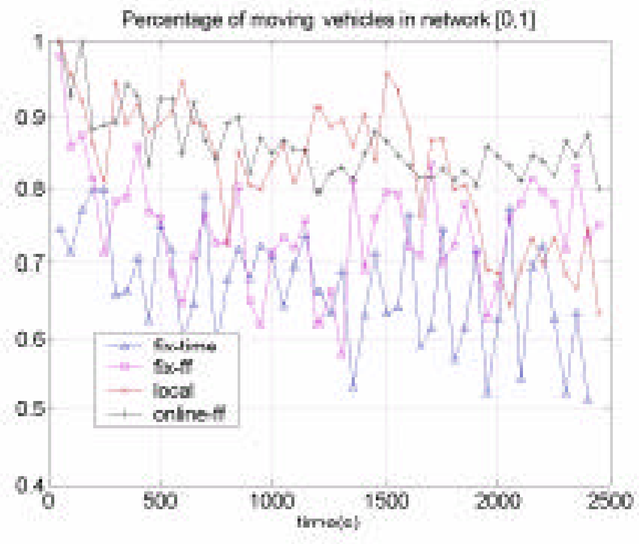

Figure 5. This plot shows that adaptive controllers improve average stopping time.

Summary and conclusions

- Locally adaptive controllers perform better than fixed time controllers by about 20%
- Traffic intersection agent communication of “opinions” to neighbors improves the performance even better.
- Global optimum for the network using Online-ff model has not been proven –needs additional tests.
- More expensive as it requires more sensors.
- Easy incorporation of new intersection agents.

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