Paper 01

Smart traffic lights switching and traffic density calculation using video processing

Problem:
Automation of traffic signal depending on camera input.

Solution:
1) Use of cumulative density to determine which will turn green first.
2) Use this cumulative density to determine green light time with a minimum (10 sec) and maximum (60 sec) value.

Performance Metric:
1) Density of vehicle on the roads.
2) How many cars have passed junctions.
3) On different times (idle, normal, peak).

Paper 02

Multi-modal traffic signal control with priority, signal actuation and coordination

Problem:
Priority assigned vehicle request to infrastructure.

Solution:
1) Mathematical model to optimize things considering real time vehicle actuation and soft signal coordination.
2) Proposes a flow chart

Performance Metric:
1) Average delay of different kind of vehicles.

Paper 03

An Experimental Review of Reinforcement Learning Algorithms for Adaptive Traffic Signal Control

Problem:
Experimental review of RL in ATSC (automated traffic signal control).

Discussion:
1) Review paper. Measures performance
2) Addresses issue that in RL based methods all agents are independently greedy. Central control is impossible due to various number of possible actions and states.
3) States - Queue length, Delay, Flow rate
4) Reward – Average trip waiting time, junction waiting time, trip time, junction flow rate, juction stop count.
5) Reward/performance metric should be easily calculated by simulator.

Performance Metric:
Can be same as states or rewards.

RL Method:
- Agent receives scaler reward based on previous actions.
- Q values represent expected reward stored in a matrix.
- Markov decision process : from any state s, selecting a action will result in s' with probability T(s,a,s') and give reward r=R(s,a,s'). Goal is to choose most appropriate action for each state.
- Model-based RL methods needs T to be known which is nearly impossible for staochastic processes like traffic system.
- Q-learning : model-free approach.

Paper 04

Multi-agent Reinforcement Learning for Traffic System

Problem:
Multi-agent controlling

Solution:
Status bit sharing

Performance Metric:
Previous ones

*Other approaches:
- Congestion information sharing
- Communicate with only the neighbors