1. Background & Objective

We propose a reactive traffic signal control algorithm to reduce “wasted green time”, and then we carry out several evaluation experiments in order to clarify its characteristics as a traffic signal control method.

What is “wasted green time”? Wasted green happens when signals are green, but there are no cars to pass the intersection. Due to it, some cars are needlessly forced to stop and wait at the intersection, and this deteriorates smoothness of traffic. Thus, wasted green time should be reduced.

2. Proposed Algorithm

The possible G/R combination which results in the lowest total delay is selected by monitoring traffic condition frequently. Thus the signals are always kept to be suitable for the present situation.

01 Listing possible combinations

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<th>A</th>
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Possible G/R combinations, which lead no conflict, are listed by using “movement matrix.”

02 Estimating total delay

The present vehicles’ condition around the intersection are detected. Then, the total delay in which each combination will result is estimated by using simulator.

03 Selecting the appropriate combination

The possible G/R combination whose estimated total delay is the lowest is chosen.

Why is the “estimation” necessary? At the isolated signalized intersection, “total delay” is usually used as the objective function. Since the delay occurs as a result of the control, estimation of it is required in order to obtain it beforehand. Therefore, the future is predicted in the algorithm.

3. Calculation Example & Results

We applied the algorithm to an intersection. The length of the wasted green time is reduced.

Accumulated length of wasted green time

- Reduction of 38.2 %

Switching history

- Existing Algorithm
- Proposed Algorithm

Detailed information about calculation condition

- Existing Algorithm
  | Fixed phase method by Webster (Green Time; A-C: 19 sec., B-D: 13 sec.)

- Proposed Algorithm
  | Whole # of combinations: $2^4 = 16$ Possible # of combinations: 7 of 16
  | Selection frequency: 5 sec. Prediction duration: 15 sec.

4. Conclusion & Future Work

- The proposed algorithm works reactively because the length of wasted green time is reduced.
- The mechanism of the results will be examined through several experiments such as sensitivity analysis.
- The extensibility will be checked by applying the algorithm to the signalized intersections in network.