

# "A Reactive Traffic Signal Control Algorithm" which Reduces Wasted Green Time at Intersections

交差点の無駄青時間を削減する「反応型の交通信号制御アルゴリズム」

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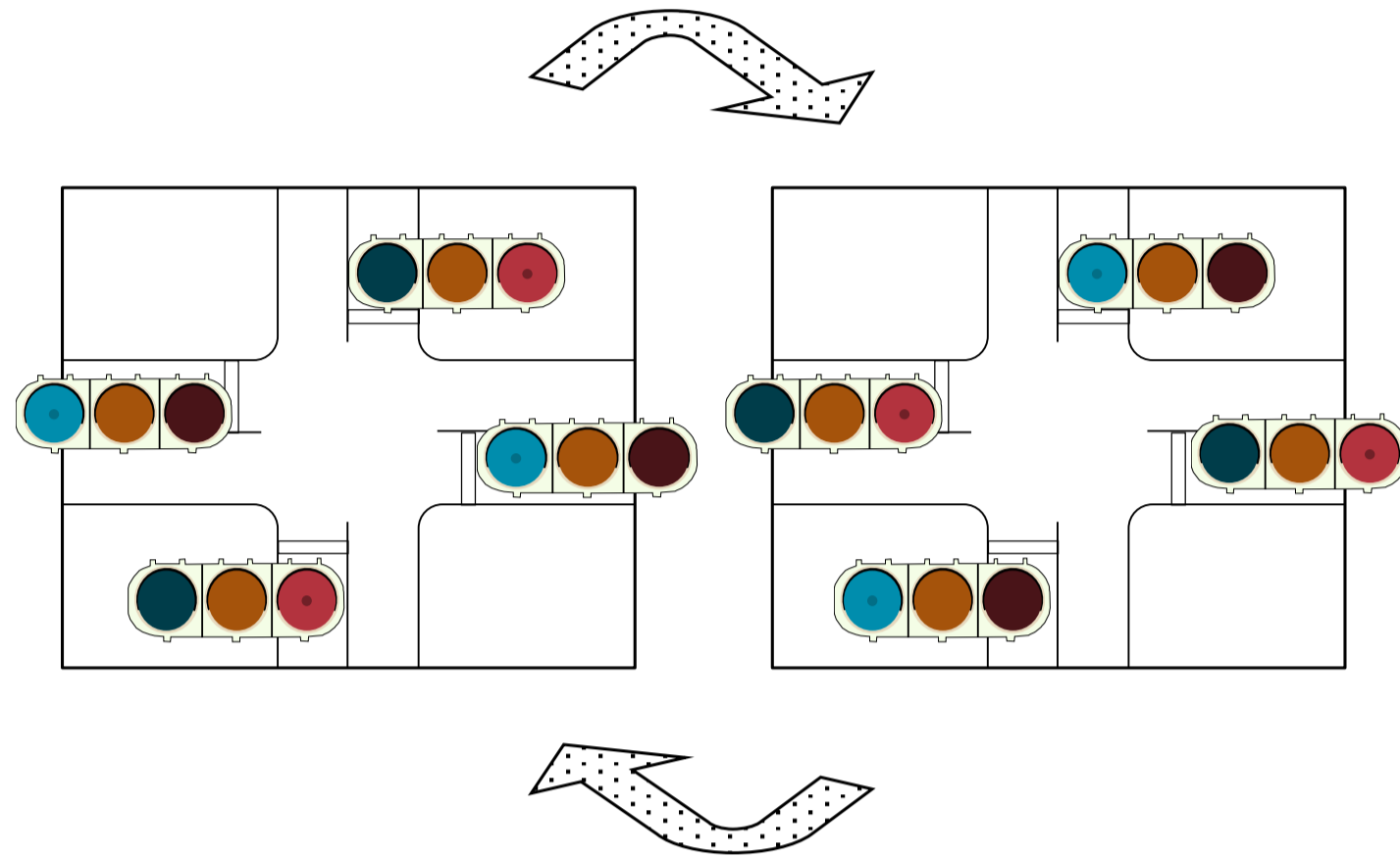
<http://www.transport.iis.u-tokyo.ac.jp/>

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## 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.

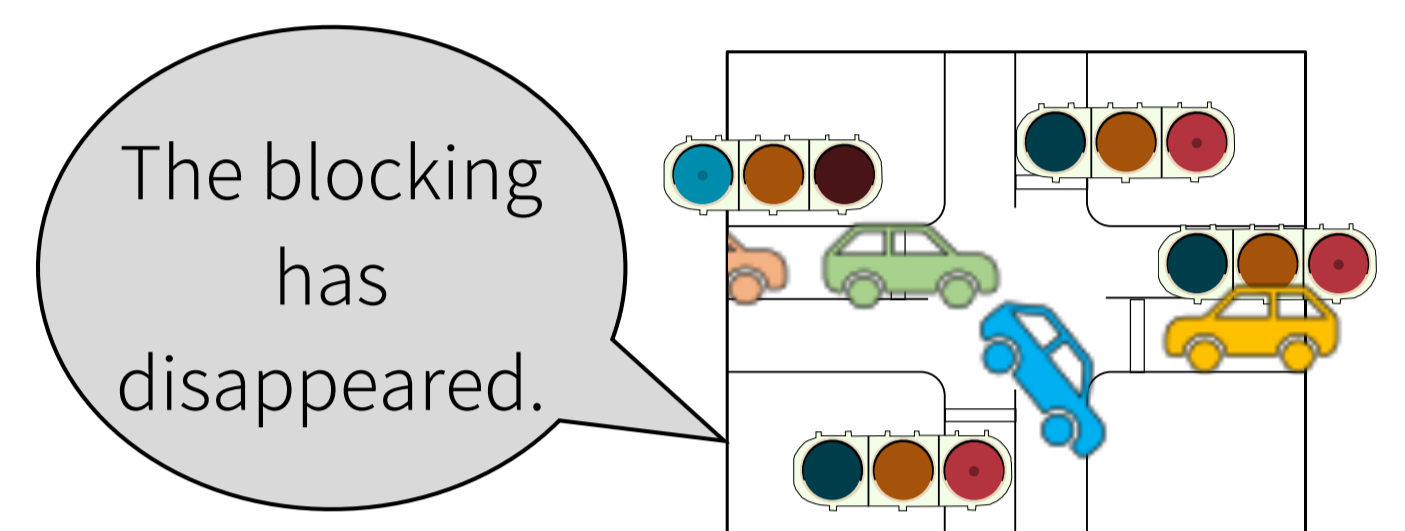


"Patterned signal control algorithm" is widely used.



However, it sometimes leads to "wasted green time."

- Turn the signal for in coming cars to red



If traffic signals are controlled reactively, "wasted green time" will be reduced.

### 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

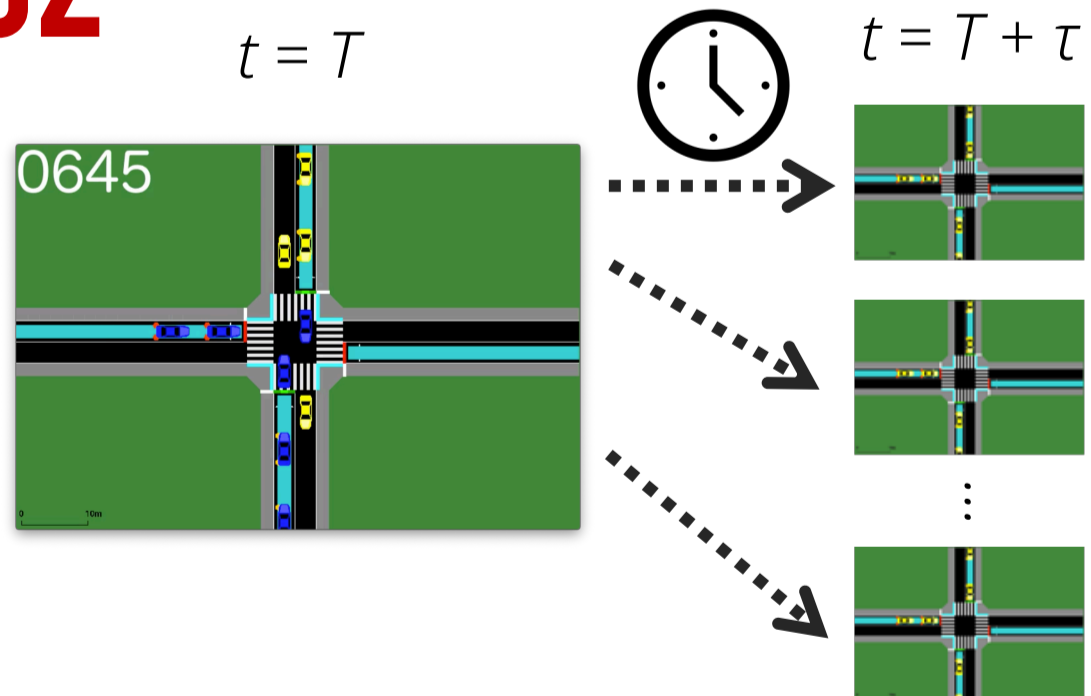
The possible G/R combination which results in the lowest total delay is selected by monitoring traffic condition frequently. Thus the signals are always kept to be suitable for the present situation.

### 01 Listing possible combinations

confliction	A	B	C	D
A: Green		x	o	x
B: Green	x		x	o
C: Green	o	x		x
D: Green	x	o	x	

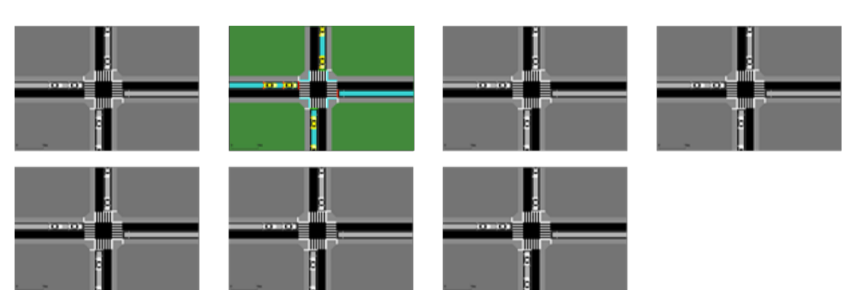
Possible G/R combinations, which lead no conflict, are listed by using "movement matrix."

### 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



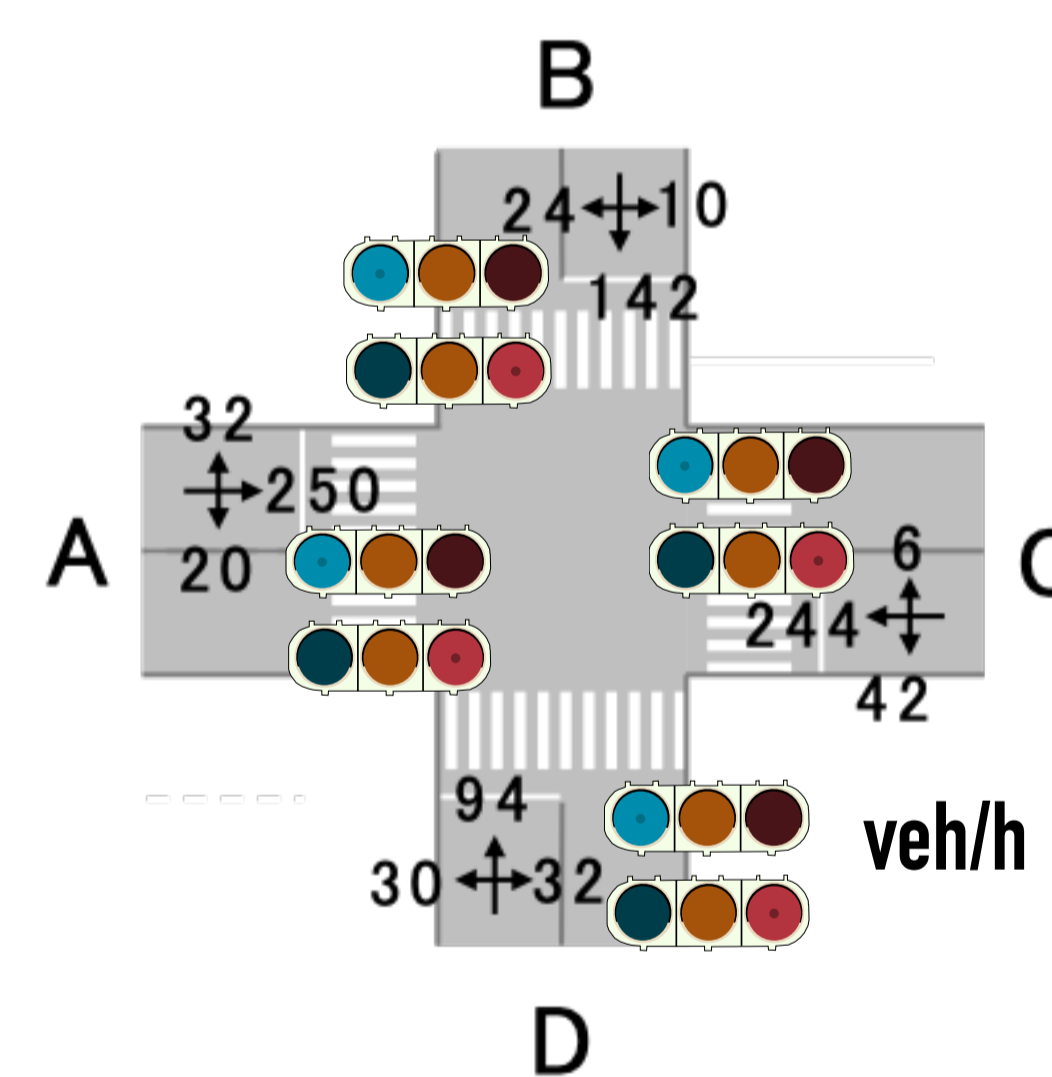
The possible G/R combination whose estimated total delay is the lowest is chosen.

### 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.

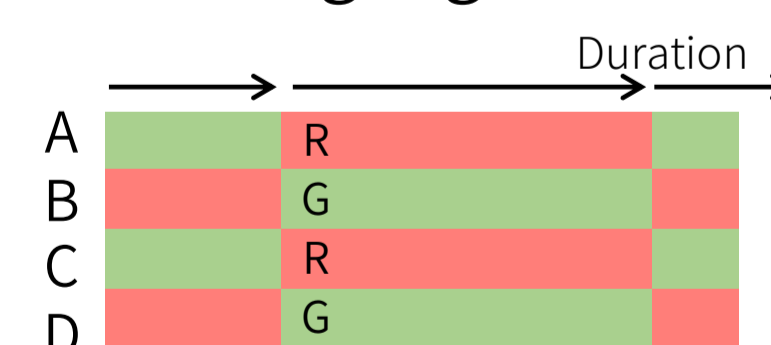
## 3. Calculation Example & Results

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

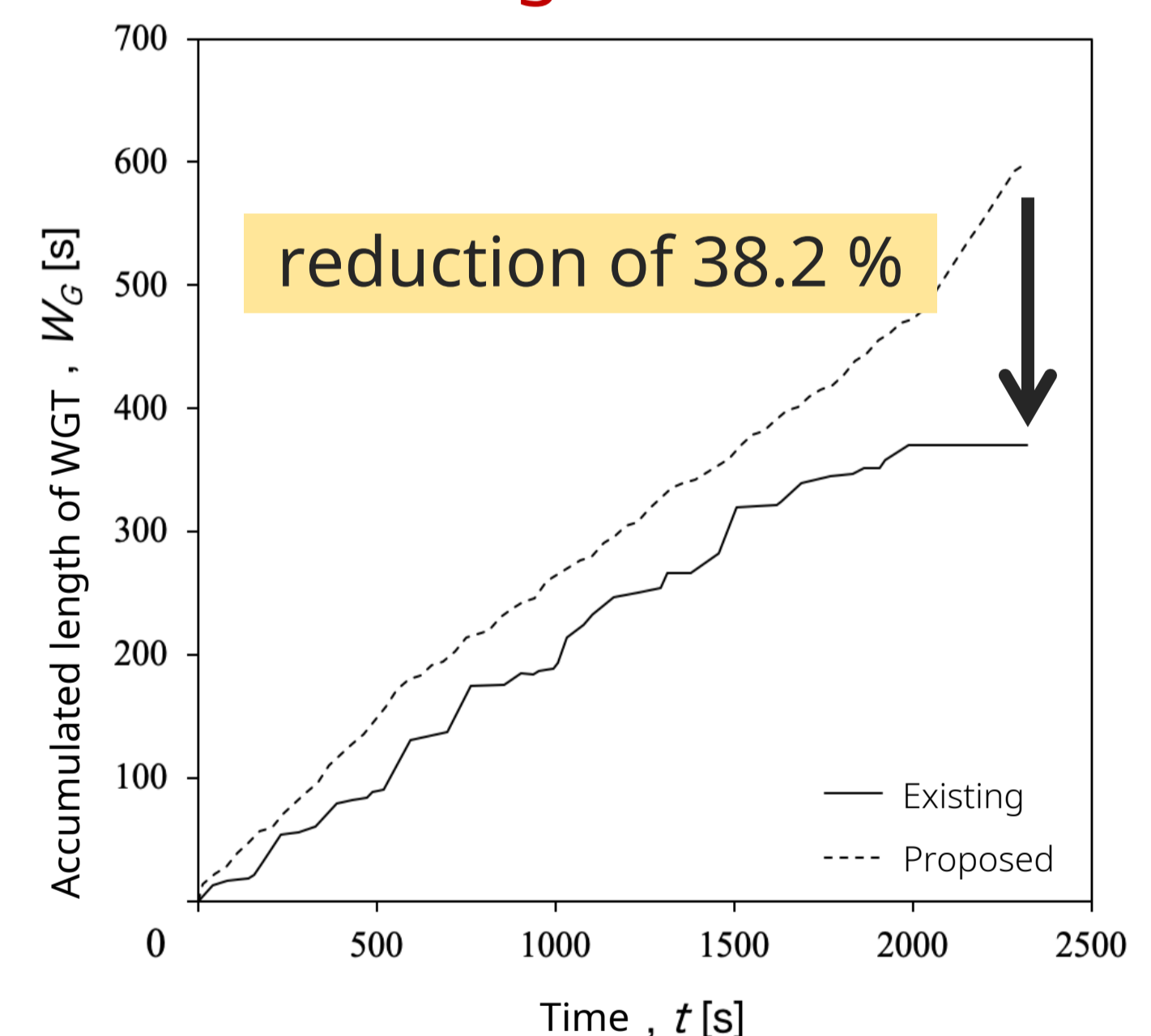


### Switching history

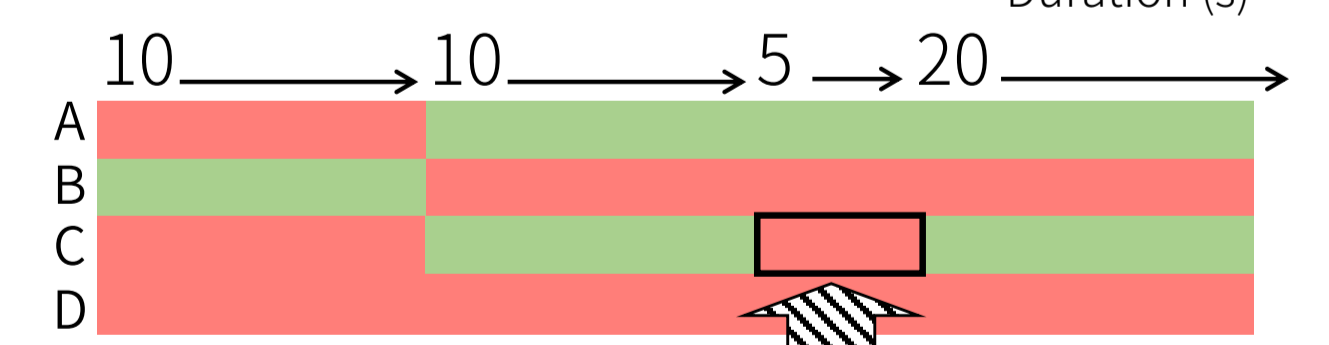
Existing Algorithm



### Accumulated length of wasted green time



Proposed Algorithm



★ On coming car stops for five seconds.

### 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.