

Performance of Tandem Sorting Strategy in Non-ideal conditions



現実的な交通条件下におけるタンデムソーティング戦略の性能解析

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What is the Tandem Sorting Strategy (TSS)?

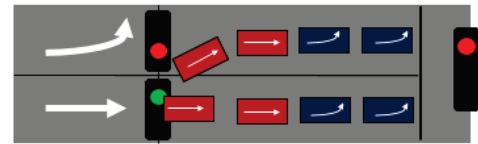
TSS concept was proposed by Xuan, et. al. (2011).

A: Vehicles are separated by turning movement before reaching the pre-signal.



B: Vehicles occupy (at most) all lanes in the storage area.

First, the left turners. Then, the through traffic.



Benefits of TSS

- Number of discharge lanes is **increased**.
- Has **larger capacity** than conventional system under oversaturated conditions.
- **More green time** can be given to left/right turners.

Signal Control Strategy

We proposed a signal control strategy that limits entry to the storage area when non-ideal conditions are detected.

FEATURES:

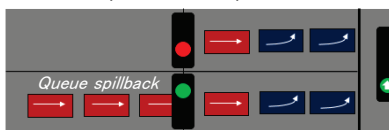
- prevents spillover
- prevents lane failure
- green time is allotted based on each phase's demand

TSS under un-ideal conditions

The capacity under TSS system is reduced when conditions are not ideal. We calculate the capacity reduction using shockwave theory.

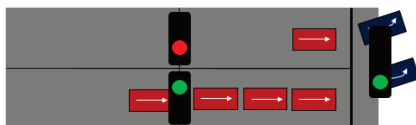
Non-ideal Condition 1: Inadequate Storage Length

A. Queue spills back to upstream lane.



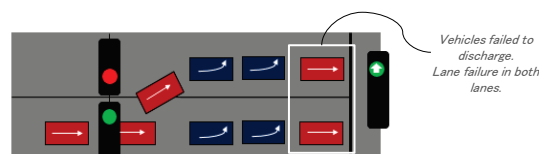
Non-ideal Condition 2: Early dissipation of queue

The queue is dissipated before all Through vehicles can enter the storage area. When the pre-signal and main signal are simultaneously green, entering vehicles immediately proceed to the main signal without sorting.



Non-ideal Condition 3: Late dissipation of queue

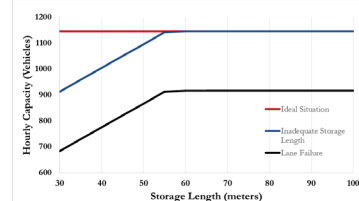
Queue is discharged slowly so some vehicles remain in the storage area and block the next cycle's vehicles. This is called lane failure. One cycle is wasted for every lane failure.



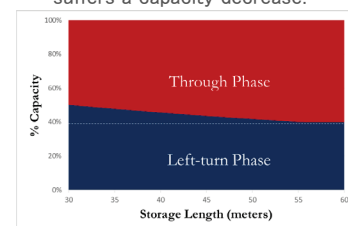
Performance of TSS

Assumptions: 40% Left turners
50% green split for left and through phase

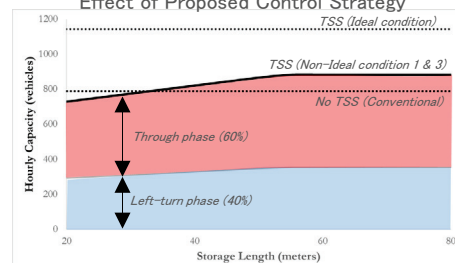
Capacity reduction under un-ideal conditions.



When the control strategy is not applied, only the Through phase suffers a capacity decrease.



Effect of Proposed Control Strategy



Even in non-ideal conditions, TSS generally has higher capacity than conventional configuration.

TSS is a promising way to increase capacity when the traffic flows are high.