Pedestrian’s Signal Mechanism through Smart Traffic System centered on the vehicle

2016. 1. 19.
SE Lab, Hongik University
Hyeon Jun Lee
Advisor : R. Youngchul Kim
# Table of Contents

1. Research Motivation

2. Related Work

3. IV. Pedestrian’s Signal Mechanism through Smart Traffic System centered on the vehicle

3. III. Simulation

5. V. Conclusion & Future Works
1. Research Motivation

There is a handicapped who have difficulties with the normal traffic system. Those people are slower than normal people, there is an issue that they have a hard time crossing the crosswalk safely with the normal pedestrian signal. Causing traffic jams required to customize the walking signal mechanism for the handicapped persons.
1. Research Motivation

Traffic accident of crossing street: 1,970 times accidents during walking, increasing trend

Disabled persons 2013, Statistics

Elderly persons 2016, aged society 2026, super-aged society

Case by Singapore, Korea

<table>
<thead>
<tr>
<th>Assortment</th>
<th>Elderly accidents (over 65 year old)</th>
<th>Total accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occurrences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cases</td>
<td>Share</td>
</tr>
<tr>
<td>11</td>
<td>3,733</td>
<td>9.2%</td>
</tr>
<tr>
<td>12</td>
<td>4,197</td>
<td>103%</td>
</tr>
<tr>
<td>13</td>
<td>4,492</td>
<td>11.4%</td>
</tr>
</tbody>
</table>

Unit: One thousand people

<Estimated future population>

<Traffic accidents in Seoul>
(Source: Road Traffic Authority)
2. Related Work

People can Change the walking signal through the "walk signal button “
- Its not for extension of the walking time.
- Its for the objective of a signal change

"voice signal button" for the People with blindness
- User difficulty can find the position of the button for the operation of the voice signal

Elderly people of protected areas, children of protected areas
- There’s Relaxation of walking speed :
  1.0m /s > 0.8m/s
- This problem can be solved by expanding the time of the traffic light
- the efficiency of traffic signal lights will decrease

2. Related Work

There is a major next-generation transportation system ITS (Intelligent Transportation Systems). ITS representative service is as follows:

- **ATMS (Advanced Traffic Management System)** is the automation of tasks such as road traffic management and optimal signal system, and the recognition of both enforcement systems and traffic accidents.
- **APTS (Advanced Public Transportation System)** manages the public transport system based on the information received from the transit operating system.
- **CVO (Commercial Vehicle Operation)** recognizes the status of each vehicle and then manages the electronic customs systems and the loaded vehicle managing system.

**Layer 1**: The lower layer collects the physical layer of traffic information.

**Layer 2**: The middle layer is the framework that controls the traffic flow operation.

**Layer 3**: The upper layer is the application layer. This layer enables the road traffic to flow dynamically, based on intercommunication between the intersections.

---

**Intersection Simulation System Model**

3. Pedestrian’s Signal Mechanism through Smart Traffic System centered on the vehicle

Step 1: The handicapped install a private application on their smart device.

Step 2: The Bluetooth recognition devices installed in the traffic signal detects the Bluetooth signal from the pedestrian’s smart device.

Step 3: The traffic signal controller provides a signal to the smart pedestrian signals.

- At this time, the walking time is set to $T + \frac{L}{V}$. $T$ is a pedestrian crossing entry time, $L$ is the distance of crosswalk, $V$ is the velocity of the pedestrian. $V$ is set based on the average walking speed of each trafficking weak. Then the walking speed is reflected in the time signal.
3. Pedestrian’s Signal Mechanism through Smart Traffic System centered on the vehicle

- This picture is a virtual simulation to visualize the structure. The physical layer in this collects the data from the traffic weak and transmits the data to the upper layer. The framework layer provides additional walking time for the trafficking weak. Application layer manages and grouping intersections.
III. Simulation

Intersection grouped in a virtual simulation
### III. Simulation

#### Compare traffic by waiting time

<table>
<thead>
<tr>
<th>Division</th>
<th>Population (thousand)</th>
<th>Contrast Ratio(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Population</td>
</tr>
<tr>
<td>Elderly</td>
<td>638</td>
<td>12.7</td>
</tr>
<tr>
<td>Children</td>
<td>719</td>
<td>14.3</td>
</tr>
<tr>
<td>Disabled</td>
<td>249</td>
<td>4.9</td>
</tr>
<tr>
<td>Total</td>
<td>1606</td>
<td>31.9</td>
</tr>
</tbody>
</table>

**Population data of handicapped persons**

- Estimated future population. 0~14 year old. Statistics Korea. 2014
- Declared handicapped person. Ministry of Health & Welfare. 2014 (included over 65 year old people)
V. Conclusion & Future Works

- Smart pedestrian signals **must be consider the effects of the traffic flow** due to the adjustment of the walking time of pedestrians.

- ITS can improve the vehicle traveling speed, minimize the degree of delay, and also, reduce air pollution. However, **ITS does not provide enough time for handicapped to cross the crosswalk safely**.

- We seek to improve the connection **between the intersection simulation based on the ITS for the smart pedestrian signals**

- Considering traffic flows and added walking time due to the handicapped, **the smart pedestrian is expected to be applied at the best time of the signal**.

- In this paper, only limited information due to ITS information. **In future studies**, we want to verify the actual implementation of the various possibilities for advanced smart pedestrian traffic signal system model.
Thank you

E-mail
Lucky.hyunjun@gmail.com