A. Background
Large numbers of traffic accidents are reported every day worldwide. In particular, intersection traffic accidents accounted for approximately 40% of all crashes in 2008 in the U.S. [1], which is a nonnegligible proportion.

B. Objective
This study intends to build a database on drivers' perception response time (PRT) under dangerous circumstances at intersections.

A. Purpose and Hypotheses
The purpose of this study is to assess drivers’ PRT and prevent potential accidents in the simulated dangerous situation by analyzing the acquired data. The following hypotheses were proposed and tested.

- Hypothesis 1: There exist differences in drivers’ mean PRT/vehicle data according to demographic characteristics (age/gender).
- Hypothesis 2: There exist differences in mean PRT/vehicle data depending on accident occurrence.

B. Independent Variables and Dependent Variables
The independent variables were demographic characteristics and accident occurrence. Age and gender were selected as the participants’ demographic characteristics. (Table 1) (Mean ± SD = 3.41 ± 0.99 years. The subjects were classified into different age groups, namely, 20s, 30s, 40s, 50s, and 60s. The subjects were divided into male and female drivers by gender. (Table 1)

The dependent variables were acquired when drivers avoided dangerous situations.
1) Perception time (PT): The time between the appearance of a danger and the time point of the driver’s last eye fixation toward the dangerous event [1-3].
2) Accelerator Release Time (ART): The time between the occurrence of the dangerous event and the initiation of releasing the accelerator pedal [4-6].
3) Brake Reaction Time (BRT): The time between the occurrence of the dangerous event and the initiation of braking [4, 7].
4) Steering reaction time (SRT): The time between the appearance of a threat and the initiation of steering input. (Condition: a steering angle > 10°, and the angular speed of steering wheel rotation > 15°/s) [8].
5) Steering-wheel Angle (SA): The difference between the angle rotated from the moment at which the danger occurs and the maximum rotation angle over a 2.5 s time window [2, 9] (°).
6) Steering-wheel Speed (SS): The difference between the steering speed from the moment at which the danger occurs and the maximum steering speed rotated over a 2.5 s time window (°/s). [2, 9].
7) Accident occurrence: Whether the participants were involved in an accident [10].

C. Experimental Design
1) Scenario: When the drivers pass through the intersection with speeds of 60km/h and 80 km, an oncoming vehicle approaches the interaction through the right crossing against the red light with a TTC of 2.5 s. (Figure 1). (IRB Approval Numbers. 1
2) Equipment: A driving simulator and eye trackers owned by Kookmin University's Humans Vehicle Automation Laboratory were used in the experiment. (Figure 1)

Figure 1. Scenario (left) and driving simulator for data acquisition (right)

RESULTS
A. Descriptive Statistics
The results of descriptive statistics by age and gender are in Table 2. Avoidance-related data results are as follows. In the experiment, there were 60 accident cases and 239 no-accident cases.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT (s)</td>
<td>0.56 ± 0.36</td>
<td>0.19</td>
<td>2.0</td>
</tr>
<tr>
<td>ART (s)</td>
<td>0.67 ± 0.43</td>
<td>0.12</td>
<td>2.3</td>
</tr>
<tr>
<td>BRT (s)</td>
<td>0.90 ± 0.57</td>
<td>0.30</td>
<td>3.0</td>
</tr>
<tr>
<td>SRT (s)</td>
<td>1.11 ± 0.63</td>
<td>0.30</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Table 1. Number of participants by demographic characteristics

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20s</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>30s</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>40s</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>50s</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>60s</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2. Descriptive statistics by independent variables (Data: Mean ± SD)

METHOD
OBJECTIVE

REFERENCES

CONCLUSION

REFERENCES