Analysis of Pedestrian Accidents Based on In-vehicle Real Accident Videos

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ABSTRACT

For last several years, the number of pedestrian fatalities due to traffic accident is over 2,000 in Korea. The portion of pedestrian fatalities in total traffic fatalities reached about 40%. In this reason, it is important to introduce effective and aggressive policies which can reduce pedestrian traffic accidents. To do this, it is necessary to understand of actual situation and characteristics of pedestrian accidents. In this study, it is assessed that potential of in-vehicle real accident videos which can be used to analysis of pedestrian accidents. In-vehicle real accident videos used in this study contain real situation about collision.

In this study, we used the in-vehicle real accident videos recorded by car black-box in taxis. In-vehicle blackboxes (dashboard cameras) which recorded accident situation were installed in taxis in Incheon city. Therefore, analyzed accident videos are about car-pedestrian traffic accidents between taxis and pedestrians. Total 252 car-pedestrian accidents or car-bicycle accidents videos in 2010 were used. All videos contain the situation of accidents about between taxis and pedestrian or bicycle. 25 accidents videos are about children, 202 videos are about adults, and 25 videos are about elderly people.

In-vehicle real accident videos have a potential to explain several characteristics of accident such as violations of driver or pedestrian, car speed, causes of poor visibility of a car driver, and so on. Furthermore, the eye direction of pedestrians could be checked using accident videos. As a result of analysis, the ratio of pedestrians who looked taxi before collision is only 29%. It has decreased with higher car speed, bad weather conditions, car violation speed limit. Average duration between sudden appearance of pedestrian and collision is only 2.6 seconds. We thought that this duration is not enough time to dodge collision when considering drivers PIEV time. Duration has been decreased when taxi have darkness, high car speed, poor visibility.

Car-pedestrian accidents are very dangerous because collided pedestrian could be serious injury or fatality. However, it is not easy to understand the exact situation when car-pedestrian collision was occurred. In this study, in-vehicle real accident videos which recorded situation of collision are used. Accident videos have important information about collision time of accident. Through this study, we can find that In-vehicle real accident videos have potential to analyze of pedestrian accidents. Using accident videos, many characteristics of traffic accident can be explained. Nevertheless, it should be pointed that accident videos are not enough to analysis various cases of accident. Since in-vehicle dashboard cameras installed in vehicles are increasing, more accident videos will be archived in the future.

INTRODUCTION

Background

The severity of road traffic safety concerns has been escalating in recent years in South Korea. While the number of fatalities from traffic accidents has steadily decreased globally, in South Korea, some 5,000 people still die on the road and 340,000 people are injured in traffic
accidents yearly. The total cost of road traffic accidents in the country amounted to 17.7 trillion won in 2010, about 1.51 percent of its gross domestic product and significantly higher than that of Japan (1.33 percent) and the United Kingdom (1.02 percent). Among road traffic accidents, car-pedestrian accidents are especially acute, accounting for 39 percent of the total number of deaths from traffic accidents in the country as of 2011. The elderly accounted for nearly 43 percent of the total number of deaths from car-pedestrian accidents in 2011. Ensuring road traffic safety is one of the top priorities of the government in its fulfillment of its obligation to protect the lives and property of its citizens. Both the central and municipal governments are taking various policy initiatives to promote public awareness of traffic safety. Ensuring road traffic safety requires satisfying diverse prerequisites, chief of which are the collection and construction of accurate data to identify the cause and characteristics of traffic accidents for the promotion of road traffic safety.

The most recently collected traffic accident data are mostly on the posterior handling of accidents, which limits investigators’ capability to accurately understand the situation at the time of each accident. In this study, the characteristics of car-pedestrian accidents were investigated by examining video files recorded by in-vehicle black boxes (dashboard cameras) in an attempt to prevent car-pedestrian accidents. Video files recorded by in-vehicle dashboard cameras are valuable because they allow investigators to have a closer look at the series of events that lead up to an accident. As of 2011, an estimated 1.5 million vehicles in South Korea had an in-vehicle camera installed on their dashboard. Spurred by the potential to accurately identify the cause of each accident and the generous insurance discounts offered by insurers for insured cars with an in-vehicle dashboard camera, the number of vehicles with a dashboard camera installed is projected to significantly rise. This study was conducted to analyze the characteristics of car-pedestrian accidents by examining the recorded video files stored in in-vehicle dashboard cameras so as to identify the possibility of applying the findings to the prevention of car-pedestrian accidents.

Research Scope

The current data on traffic accidents in South Korea were first examined. Victims of car-pedestrian accidents were singled out from the data set before they were divided again by age into children, grown-ups and the elderly. Next, the concept of the in-vehicle dashboard camera was examined along with its expected outcomes, installation method and current adoption rate. The characteristics of car-pedestrian accidents were analyzed by examining the video files stored in the sample dashboard cameras. The victims also included those of car-bicycle accidents, because bicyclers, like pedestrians, tend to ride along byways and side streets at much slower speeds than automobiles. With regard to the characteristics of car-pedestrian accidents, some general factors of car-pedestrian accidents were analyzed, including the time of the accident, the behavioral attributes of each pedestrian, and the violation of relevant laws, along with other specific elements available only in recorded video files like the time leading up to the accident and the direction of the pedestrian’s eyes.

The video files that were used in this study were sampled from those stored in the in-vehicle dashboard cameras installed in taxis operating in Incheon City. The city government ordered the installation of the device in the city taxis to identify the prime causes of accidents in the area. The video file samples were provided by the Incheon City Taxi Operators Mutual Benefits Association.

Literature Review

Han In-hwan et al. (2007) conducted a study on the development of a risk-detection algorithm by relying on the data recorded in in-vehicle dashboard camera cameras. Dangerous driving patterns were categorized and analyzed by collecting related data. Toward this end, the critical threshold was set. Kim Sook-hee et al. (2005) proposed a method of analyzing the traffic accident data and identifying only those factors that would raise the likelihood of an accident. In the study on the “Efficient
Operation of the Automatic Traffic Accident Recording System” commissioned by the Korea Transportation Safety Authority (2005), the effectiveness of the automatic traffic accident recording system was analyzed in a pilot test and ways to run the system more effectively were investigated.

Past studies on ways to reduce traffic accidents focused on the posterior development of improvement methods, or systems that alert the driver to oncoming dangers in real time. Such studies had limitations like their inability to consider the relationship between the driving status of the operating vehicle and that of other cars on the road at the same time, which spawned their limited ability to foretell and prevent accidents. Thus, this study is significant because it analyzes the causes of traffic accidents from actual car-pedestrian accidents recorded in in-vehicle dashboard cameras and suggests potential ways to prevent them.

CAR-PEDESTRIAN ACCIDENTS IN SOUTH KOREA

In 2011, there were 220,000 traffic accidents in South Korea, 16,363 of which involved children; 178,865, grown-ups; and the remaining 26,483, the elderly. Compared to 2005, the fatality rate in 2011 dipped by 3.2 percent, but the total number of accidents and of the injured either rose or remained the same. A closer look at the numbers shows that the percentage of accidents that involved the elderly over 65 is higher, whereas the percentage of accidents that involved children decreased by 3.7 percent and that of accidents that involved grown-ups increased slightly by 0.4 percent. The same pattern is seen in the total number of deaths from traffic accidents: the fatality rate of traffic accidents generally decreased by 3.2 percent but increased among the elderly. The number of casualties from traffic accidents again shows a similar trend. As a result, the percentage of the elderly who were killed in traffic accidents increased to 33 percent in 2011 and has kept rising. The elderly accounted for nearly one-third of the total number of deaths from traffic accidents, whereas their share in the total population was 11.2 percent as of 2011. Thus, there were 30.1 elderly car-pedestrian accident victims per hundred thousand people in 2011, about 23.4 times higher than the number of child victims and 3.3 times higher than that of grown-up victims.

### Table 1. Yearly traffic accidents in South Korea

<table>
<thead>
<tr>
<th>Criteria</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>Annual Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total no. of traffic acci-dents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>20,495</td>
<td>19,223</td>
<td>18,416</td>
<td>17,874</td>
<td>18,092</td>
<td>17,174</td>
<td>16,363</td>
<td>-3.7</td>
</tr>
<tr>
<td>Grown-ups</td>
<td>174,610</td>
<td>174,965</td>
<td>172,112</td>
<td>174,936</td>
<td>187,915</td>
<td>183,894</td>
<td>178,865</td>
<td>0.4</td>
</tr>
<tr>
<td>Elderly</td>
<td>19,066</td>
<td>19,557</td>
<td>21,134</td>
<td>23,012</td>
<td>25,983</td>
<td>25,810</td>
<td>26,483</td>
<td>5.6</td>
</tr>
<tr>
<td>Total</td>
<td>214,171</td>
<td>213,745</td>
<td>211,662</td>
<td>215,822</td>
<td>231,990</td>
<td>226,878</td>
<td>221,711</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>No. of deaths from traffic acci-dents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>284</td>
<td>276</td>
<td>202</td>
<td>161</td>
<td>154</td>
<td>160</td>
<td>101</td>
<td>-15.8</td>
</tr>
<tr>
<td>Grown-ups</td>
<td>4,386</td>
<td>4,317</td>
<td>4,177</td>
<td>3,970</td>
<td>3,857</td>
<td>3,592</td>
<td>3,404</td>
<td>-4.1</td>
</tr>
<tr>
<td>Elderly</td>
<td>1,700</td>
<td>1,731</td>
<td>1,786</td>
<td>1,735</td>
<td>1,826</td>
<td>1,752</td>
<td>1,724</td>
<td>0.2</td>
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<tr>
<td>Total</td>
<td>6,370</td>
<td>6,324</td>
<td>6,165</td>
<td>5,866</td>
<td>5,837</td>
<td>5,504</td>
<td>5,229</td>
<td>-3.2</td>
</tr>
<tr>
<td><strong>No. of the injured in traffic acci-dents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>25,314</td>
<td>23,880</td>
<td>22,806</td>
<td>22,364</td>
<td>22,257</td>
<td>21,066</td>
<td>20,086</td>
<td>-3.8</td>
</tr>
<tr>
<td>Grown-ups</td>
<td>297,087</td>
<td>296,131</td>
<td>291,087</td>
<td>292,430</td>
<td>312,209</td>
<td>303,998</td>
<td>293,306</td>
<td>-0.2</td>
</tr>
<tr>
<td>Elderly</td>
<td>19,832</td>
<td>20,218</td>
<td>22,013</td>
<td>24,168</td>
<td>27,409</td>
<td>27,394</td>
<td>27,999</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td>342,233</td>
<td>340,229</td>
<td>335,906</td>
<td>338,962</td>
<td>361,875</td>
<td>352,458</td>
<td>341,391</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note: Children are under 14 and the elderly are over 65.
The number of deaths from car-pedestrian accidents has consistently decreased in recent years but still hovers at 2,000 each year. The share of the deaths from car-pedestrian accidents in the total deaths from traffic accidents was about 38 percent, which is another evidence that traffic safety for pedestrians is critical in improving the overall traffic safety standards. Among the total number of pedestrians killed in traffic accidents, elderly victims exceeded 40 percent, which underscores the importance of devising ways to improve traffic safety that are tailor-made for each age group.

**Table 2. Yearly number of deaths from car-pedestrian accidents**

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>Annual Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>194</td>
<td>199</td>
<td>128</td>
<td>90</td>
<td>96</td>
<td>91</td>
<td>56</td>
<td>-18.7</td>
</tr>
<tr>
<td>Grown-ups</td>
<td>1,358</td>
<td>1,279</td>
<td>1,190</td>
<td>1,140</td>
<td>1,088</td>
<td>1,025</td>
<td>1,105</td>
<td>-3.4</td>
</tr>
<tr>
<td>Elderly</td>
<td>991</td>
<td>961</td>
<td>985</td>
<td>903</td>
<td>952</td>
<td>966</td>
<td>883</td>
<td>-1.9</td>
</tr>
<tr>
<td>Average</td>
<td>2,543</td>
<td>2,439</td>
<td>2,303</td>
<td>2,133</td>
<td>2,136</td>
<td>2,082</td>
<td>2,044</td>
<td>-3.6</td>
</tr>
</tbody>
</table>

**Table 3. Yearly number of the injured in car-pedestrian accidents**

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>Annual Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>10,697</td>
<td>9,914</td>
<td>9,318</td>
<td>8,798</td>
<td>8,616</td>
<td>8,174</td>
<td>7,713</td>
<td>-5.3</td>
</tr>
<tr>
<td>Grown-ups</td>
<td>30,808</td>
<td>30,594</td>
<td>30,506</td>
<td>32,709</td>
<td>34,933</td>
<td>34,801</td>
<td>35,443</td>
<td>2.4</td>
</tr>
<tr>
<td>Elderly</td>
<td>6,321</td>
<td>6,169</td>
<td>6,541</td>
<td>7,181</td>
<td>7,832</td>
<td>7,924</td>
<td>8,131</td>
<td>4.3</td>
</tr>
<tr>
<td>Average</td>
<td>47,826</td>
<td>46,677</td>
<td>46,365</td>
<td>48,688</td>
<td>51,381</td>
<td>50,899</td>
<td>51,287</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**MARKET PENETRATION AND CHARACTERISTICS OF THE IN-VEHICLE DASHBOARD CAMERA**

**Market Penetration of the In-vehicle Dashboard camera**

The in-vehicle dashboard camera is a device that, installed on the dashboard or rear-view mirror of a vehicle, automatically records such varied driving data as videos before and after a traffic accident, the accident site, the vehicle speed and velocity, and the driver’s voice (optional). Its key features include video recording of an accident (10-14 seconds before the accident and 6-10 seconds after the accident), continuous video recording (12-24 hours), and video recording when the vehicle is parked. Its working concept is as follows.
Figure 3. System concept of the in-vehicle dashboard camera - 1

Figure 4. System concept of the in-vehicle dashboard camera – 2
There are different models available in the market. An example of the traffic accident analysis screen captured in the in-vehicle dashboard camera follows.

In 2008, about 5,300 taxis in Incheon City had an in-vehicle dashboard camera. In 2009, about 34,000 taxis in Gyonggi-do followed suit. The device has since been adopted fast in other provinces: in Seoul City (by 22,700 taxis run by taxi companies and 23,300 privately-owned taxis) and Jeollanam-do (3,200 taxis run by taxi companies and 3,900 privately-owned taxis) in 2010, and in Busan City (11,000 taxis run by taxi companies and 14,000 privately-owned taxis), the Jeju Special Self-governing Province (1,500 taxis run by taxi companies and 1,000 privately owned taxis) and Jeollanam-do (9,500 taxis) in 2011. Thus, roughly 1.5 million vehicles are thought to be running in South Korea with the device installed on their dashboard. They account for approximately 7 percent of all the vehicles registered in the country. In 2011 alone, 250,000 vehicles were estimated to have had the device installed, followed by 500,000 additional vehicles in 2012 – about twice the number of total installations in 2010.

**Effect of In-vehicle Dashboard Cameras**

Installing in-vehicle dashboard cameras on corporate taxis is expected lower the direct and indirect costs. Reduction in direct cost includes reduction in repair cost due to reduction in crash frequency, reduction in insurance fees due to reduction in crash frequency, and increase of operating mileage per liter due to safe/cautious driving. Indirect cost includes reduction in accident negotiation and management costs, improving the social valuation of corporate image as a safety-oriented institution, and avoiding disadvantaging the driver in the course of crash investigation.

In an effort to estimate the crash reduction effects, key crash statistics have been investigated on a taxi company in Busan Metropolitan City (Daedo Taxi Company) by comparing the figures before and after installation of in-vehicle dashboard cameras on 178 taxis. Person damage rate after installation was reduced from 44.88% to 25.51%. Property damage rate was reduced from 53.37% to 33.74%. These are the average figures for one year before and after installation and the reduction in damage compensation during these two periods was 500,000,000KRW (438,000USD). Similar comparisons were made on 3 other taxi companies (companies with approximately 80 taxi vehicles) and the rate of crash reduction showed similar average figures in all criteria of personal and property damages.

**RESULT OF ANALYSIS OF THE CAR-PEDESTRIAN ACCIDENTS VIDEOS**

**Methods and Data Sources**

In this study, we used the in-vehicle real accident videos recorded by car black-box in taxis. In-vehicle dashboard cameras which recorded accident situation were installed in
taxis in Incheon city. Therefore, analyzed accident videos are about car-pedestrian traffic accidents between taxis and pedestrians. Total 252 car-pedestrian accidents or car-bicycle accidents videos in 2010 were used. All videos contain the situation of accidents about between taxis and pedestrian or bicycle. 25 accidents videos are about children, 202 videos are about adults, and 25 videos are about elderly people.

Analysis of the General Characteristics of Car-Pedestrian Accidents

With regard to the time of the accidents of the surveyed vehicles, accidents that involved children and the elderly happened more frequently in the day, whereas those that involved grown-ups happened more frequently at night. The hourly distribution of those accidents is as follows: the accidents that involved child and elderly pedestrians happened more frequently in the afternoon, whereas those that involved grown-ups happened more frequently from midnight to 3 a.m. These figures suggest that more grown-ups tend to go out at night than children and the elderly.

Analysis of the Moment of Car-Pedestrian Accidents

With regard to season, car-pedestrian accidents that involved children happened more frequently in summer and those that involved the elderly happened more frequently in autumn. Those that involved grown-ups happened almost uniformly across different seasons.

In terms of the pedestrian’s behavior at the time of an accident, about half of the grown-up victims were walking, about 88 percent of the child victims were running, and 44 percent of the elderly victims were riding a bicycle. There were even accidents that involved victims who were standing still. With regard to the types of violations of traffic laws and regulations by pedestrians, jaywalking accounted for more than 40 percent, but nearly half of the victims were simply walking normally, which suggests that accidents are happening even if the pedestrians involved did not violate traffic laws. Thus, some pre-emptive policy moves must be made to prevent those accidents.

With regard to the total hospitalization period of each victim, about 10 percent of them did not require prolonged hospitalization, whereas more than half of them had to be hospitalized from one to four weeks. However, the elderly victims were frequently required to be hospitalized for more than nine weeks, during which they often underwent emergency treatment or eventually died.

Figure 6. Hourly distribution of car-pedestrian accidents

Figure 7. Distribution of the post-accident hospitalization periods by age
of the directions of the victims’ eyes showed that they were looking somewhere else than at the rushing vehicle -- which means that many pedestrian victims simply did not see the vehicle involved in an accident in the first place, or were unable to foretell or prevent the accident. In the case of the elderly victims, 76 percent of those surveyed did not see the rushing vehicle. Their percentage is about three times higher than that of the elderly who saw the rushing vehicle. This is because the elderly victims tended to show various types of deterioration in their physical strength. They have been known to experience about 30-percent deterioration in their aural capability, unlike the grown-ups (Han Sang-bok et al., 2005). The main causes of a poor field of vision are obstruction by other vehicles, nighttime walking and poor weather conditions.

Figure 8. Various causes of a poor field of vision and visual obstruction

Figure 9. Directions of the pedestrian victims’ eyes by age at the moment of an accident

It was also proven that blind spots are the main causes of accidents. The key causes of the poor field of vision of drivers include nighttime driving, blind spots, and visual obstruction by vehicles parked along byways. As a poor field of vision can endanger both drivers and pedestrians, immediate actions are needed to address it.
It was proven that the field of vision deteriorated notably when the pedestrian looked somewhere else other than at the vehicle that was rushing toward him or her. The fatal accidents (seven in all) happened only when the victim looked somewhere else other than at the rushing vehicle. In the case of the elderly victims, they were injured more seriously when they failed to spot the rushing vehicle.

The vehicles’ cruising mode in the accidents showed that most of the accidents happened when the vehicle was driving straight along the motorway, and that 80 percent of such accidents involved children and 68 percent, the elderly. With regard to the violation of traffic laws by drivers, the number of accidents caused by the driver’s negligence (XX percent) was higher than those of the accidents caused by traffic signal violations (XX percent) and speeding (XX percent). Among them, 73 percent of those that involved children, 39 percent of those that involved grown-ups, and 44 percent of those that involved the elderly still happened despite the driver’s non-violation of traffic laws. The videos recorded in the dashboard camera confirmed that accidents are still happening even without violations of traffic laws.

With regard to the correlation between a vehicle’s instantaneous velocity and the direction of the pedestrian’s eyes, the faster the instantaneous velocity of the vehicle was, the higher the probability of the pedestrian looking somewhere else other than at the oncoming vehicle was. In the case of the elderly pedestrians with aural and visual capabilities that were inferior to those of the grown-ups, only 13 percent of them were able to recognize the oncoming vehicle cruising at a speed higher than 60 kph, whereas the rest (87 percent) did not see the oncoming vehicle at all. With regard to the direction of the pedestrian’s eyes depending on the weather condition, the pedestrians tended to look somewhere else other than at the oncoming vehicle on rainy (76 percent) and snowy (100 percent) days than on fine-weather days (69 percent). Moreover, the pedestrians failed to spot the oncoming vehicle more frequently when the driver violated traffic laws than otherwise, which provides powerful evidence of the danger of traffic violations.
In addition, the time from the moment when the pedestrian appeared in the recorded video all the way to the moment of the accident was measured. The time from the appearance of the pedestrian to the accident was defined by the time from the video frame right before the appearance of the pedestrian to the video frame in which it is clear that the accident indeed happened. The single video frame that was used in this study lasted 0.2 second. However, the elapsed time was measured only in about 81 video files in which it was possible to clearly confirm the appearance of the pedestrian and the occurrence of the accident. The surveyed video files were categorized according to the age of the filmed victims, as follows: one file with a child victim; 73 with grown-ups; and seven with elderly victims.

The calculated elapsed time from the appearance of the pedestrian in the video frame to the moment of the accident averaged 2.6 seconds. Considering that it was the time it took for the driver to recognize the pedestrian and start decelerating the vehicle, the accident happened within a very short time span. The elapsed time from the appearance of the pedestrian to the accident was further reduced when another vehicle obstructed the driver’s field of vision: by 2.13 seconds at night, which is much shorter than in the day (3.66 seconds). The faster the vehicle rushed on, the shorter the elapsed time was for the driver. Most of the accidents that involved the elderly pedestrians were caused by the driver’s poor field of vision, which underscores the importance of ensuring a clear field of vision for drivers.

Moreover, the elapsed time from the appearance of the pedestrian to the accident decreased notably in cases of jaywalking and signal violation by the pedestrian compared to the cases when the pedestrian walked normally straight. In the case of the elderly pedestrians, the accident happened within 4 seconds after the appearance of the victim in the video frame.

**STUDY IMPLICATIONS**

The video files stored in the in-vehicle dashboard camera installed on vehicle
dashboards record the changing conditions in front of the vehicle while it is running. With the recent increase in the number of vehicles with a dashboard camera installed, it has become possible to understand what had been previously impossible to figure out with respect to accidents. In the case of traffic accidents, it is critical to comprehend the situation right at the moment of the accident. The arrival of the in-vehicle dashboard camera is significant in this respect because the device allows investigators to accurately comprehend specific details related to the accident – which means that it is now possible to pinpoint the driver who triggered the accident, while accurate understanding of the cause of an accident opens up new possibilities for the prevention of traffic accidents. The video records of traffic accidents that were used in this study gave detailed accounts of accidents like the location and eye direction of the pedestrian, the causes of the obstruction of the driver’s field of vision, and the time that elapsed from the appearance of the pedestrian to the moment of the accident. Additional information on whether the driver exceeded the speed limit or obeyed traffic laws allows investigators to nail down the cause of an accident, which makes it possible to come up with measures to prevent accidents according to their causes. Furthermore, the dashboard camera data that were used in this study enabled discernment of the differences among the accidents that involved children and those that involved adults and the elderly, which again provided a useful platform for the establishment of policies to ensure road traffic safety for different age groups.

To reduce the number of car-pedestrian traffic accidents, the following policy initiatives are required. Currently, transportation facilities are being built and managed around automobiles. The automobile-centric transportation environment can cause inconveniences and anxieties among pedestrians. The simple act of restraining speeding is the fastest way to prevent traffic accidents, because it gives pedestrians time to recognize an oncoming vehicle and drivers to recognize pedestrians. Toward this end, methods of calming traffic flow and gently nudging automobile drivers to slow down, as well as installing roadside speed cameras, are needed.

It is also important to eliminate blind spots in places where car-pedestrian accidents happen frequently. There are many causes of drivers’ poor field of vision. Such causes must be identified from the perspective of drivers and fixed immediately. Moreover, motorway visibility must be improved to prevent pedestrian jaywalking while the causes of poor driver visibility must be eliminated. The implementation of such policy initiatives should be accompanied by related education and publicity activities to boost their effectiveness. To ensure traffic safety, pedestrians and drivers should simultaneously be made more aware of it. Policymakers must provide legal and regulatory support to promote the emergence of an environment conducive to traffic safety and public awareness of it.

**CONCLUSION**

Car-pedestrian accidents are very dangerous because collided pedestrian could be serious injury or fatality. However, it is not easy to understand the exact situation when car-pedestrian collision was occurred. In this study, in-vehicle real accident videos which recorded situation of collision are used. Accident videos have important information about collision time of accident.

Through this study, we can find that In-vehicle real accident videos have potential to analyze of pedestrian accidents. Using accident videos, many characteristics of traffic accident can be explained. Since in-vehicle dashboard cameras installed in vehicles are increasing, more accident videos will be archived in the future. Nevertheless, it should be pointed that accident videos are not enough to analysis various cases of accident.

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