The simulated experience road crossing using AR

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Abstract

In Japan, fatal traffic accidents have accounted for the majority of overall traffic fatalities by the pedestrians,In addition, About 73 % is pedestrian fatalities by while pedestrians are crossing road. Therefore, Many of pedestrian traffic fatalities have occurred in the crosswalk crossing. One of the major reasons why pedestrians are involved in traffic accidents is that they does not confirm safety. So, we developed an crosswalk simulator for education that pedestrians are crossed a road using the Augmented Reality (AR). Because the simulator can present a virtual vehicle to the real road, it is possible to produce a pseudo traffic-environment, This simulator can experience a safe road crossing at low cost. The subject can learn the dangerous crossing by the experience.

Categories and Subject Descriptors (according to ACM CCS): K.3.1 [Computer Graphics]: Computer Uses in Education—Collaborative learning

1. Introduction

According to investigation statistics for Japan's traffic accident mortality rate data, pedestrians account for 36.5 % of total traffic fatalities [AUT15]. In addition, about 73 % of these accidents happened when pedestrians were crossing road. Therefore, Many of pedestrian traffic fatalities have occurred in the crosswalk crossing. One of the major reasons why pedestrians are involved in traffic accidents is that they do not confirm safety [RA10]. Therefore, it is important that the pedestrian themselves learn the importance of safety checks in order to reduce the traffic accidents pedestrians.

We developed an crosswalk simulator for education that pedestrians are crossed a road using the augmented reality. Because the simulator can present a virtual vehicle to the real road, it is possible to produce a pseudo traffic- environment. This simulator can experience road crossing without any dangerous. The subject can learn how to confirm the safety when crossing a road.

2. The simulated experience road crossing using AR

The subject wear the head mounted display (HMD) equipped with a stereo camera on their head during the experience. This simulator uses AR technology. In addition the simulator uses a marker to determine the present position of the virtual vehicle. The system detects the marker from the camera image. On the basis of the detected marker is displayed on a virtual vehicle in a real space in a superimposed and a virtual traffic environment. This virtual traffic environment is located in the two lane road. The subject tries to cross a road as not to collide with the virtual vehicle. HMD displays that you had a collision with the vehicle when if you has collided with virtual vehicle during the cross road.

2.1. The conditions of approaching vehicle speed used in the simulator

Figure 1 shows the conditions of approaching vehicle speed used in the simulator [MSY12]. It is known that most of the pedestrian caught in a vehicle accident that is coming from the left side. It is set faster speed of the coming vehicle from the left side than the coming vehicle from right side, in order to call subject attention to the vehicle coming from the left side. Therefore the speed of the vehicle running in the roadway on the rear side as viewed from the subject who is set to 60km/h, the speed of the vehicles on the front lane is 40km/h. Three interval of the vehicle were used as follows: (1) Vehicle-to-vehicle distance that can be crossing road safely on foot (Safety). (2) Vehicle-to-vehicle distance that barely missed having a crash on foot (Danger). (3) Vehicle-to-vehicle distance that will crash on foot (Brink). Walking speed of the pedestrian was assumed to be 1.1 m/s.
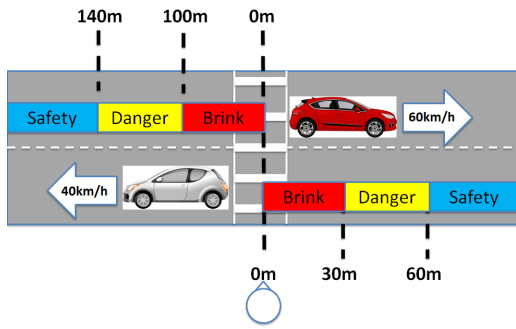
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Figure 1: *Conditions of approaching vehicle speed used in the examination*

2.2. Experience details

Figure 2 shows experience details. The subject begins experience from a position of about 5meters away from the marker. The subject walks towards the marker while confirming the safety through look left and right. Simulation is finished when the subject is hit by a virtual car that has been displayed by the AR. Also simulation is ended if you arrive to the marker.
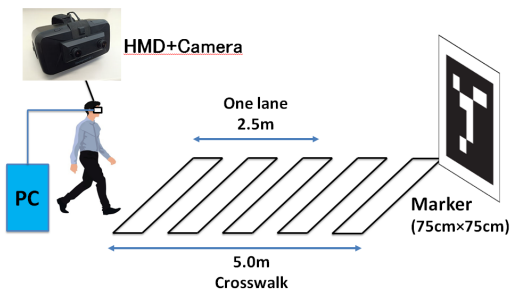

Figure 2: *Experience details*

3. Results

When the HMD screen turns red, this means that the subject collided with the virtual car. In addition, if the HMD screen turns yellow, it means that the crossing has been successful. Also as a CSV file the detailed results are stored in a local directory (Table 1). Therefore, it is possible to check the places where you collided with car, number of checks left side and right side and so on.

Table 1: *Result table*

1st Trial		2nd Trial	
Elapsed time[s]	Look Position	Elapsed time[s]	Look Position
0.129	center	1.9666	center
0.355	right	2.2065	left
3.3422	center	4.9801	center
3.5824	left	5.22	right
4.3291	center	10.3405	center
4.5688	right	10.6202	left
«omission»			
17.3692	left	23.5144	left
19.1959	center	24.541	center
19.4229	right	24.741	right
21.6501	center	25.1678	center
21.8494	left	25.381	left
23.5562	center	26.355	center
26.7829	Achieve	28.652	Collision Car1:frontF

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