Augmented Reality based on Driving Situation Awareness in Vehicle

Byoung-Jun Park, Changrak Yoon, Jeong-Woo Lee, Kyong-Ho Kim

IT Convergence Technology Research Laboratory, Electronics and Telecommunications Research Institute,
Daejeon, 305-700

bj_park@etri.re.kr, cryoon@etri.re.kr, jeow7@etri.re.kr, kkh@etri.re.kr

Abstract—**In this paper, we introduce a vehicle augmented reality (AR) system to present information of driving situation awareness in a vehicle. Today, manufacturers related with vehicles have been pointing to AR as a next-generation visualization technology for in-car driving displays. Such in-vehicle AR-based display systems are helpful in reducing driver distractions, thereby increasing driver safety, and provide intelligent interactions for enhancing driver convenience. The proposed system offers information of driving situation and warning to a driver through the augmented reality using head-up display. The system consists of several sub-modules such as sensor, vehicle/pedestrian recognition, vehicle state information, driving information, time to collision (TTC), threat assessment, warning strategy, and display modules. We have defined the threat level and the presentation of AR information based on TTC values and driver's preference throughout experiments. The proposed system have been installed to a test vehicle with a vehicle AR information system prototype and carried out in the real road environments. The proposed system demonstrates to offer intuitively danger information according to the presentation rules to a driver on real road.**

Keyword—**Augmented Reality, Time to Collision, Head-Up Display, Situation Awareness, Warning Strategy**

Byoung-Jun Park is a senior researcher in ETRI, Daejeon, Rep. of Korea. He received his BS, MS, and PhD in control and instrumentation engineering from Wonkwang University, Iksan, Rep. of Korea, in 1998, 2000, and 2003, respectively. From 2005 to 2006, he was a postdoctoral fellow in the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Alberta, Canada. Since 2008, he has been with ETRI. His current research topics include forward situation awareness service, human–computer interaction, head-up displays, and augmented reality applications in vehicles.

Chang-Rak Yoon is a principal researcher of the Human–Vehicle Interaction Research Center, Electronics and Telecommunications Research Institute, Daejeon, Rep. of Korea. He received his MS degrees in computer science from Kyungpook National University, Daegu, Rep. of Korea, in 1996. Since 1995, he has been with ETRI. His current research topics include intelligent vehicles, human–computer interaction, head-up displays, and augmented reality applications in vehicles.

Jeong-Woo Lee is a senior researcher of the Human–Vehicle Interaction Research Center, Electronics and Telecommunications Research Institute, Daejeon, Rep. of Korea. He received his BS and MS degrees in computer engineering from Sungkyunkwan University, Suwon, Rep. of Korea, in 1999 and 2001, respectively. Since 2001, he has been with ETRI. His current research topics include intelligent vehicles, V2V, V2I, head-up displays, and augmented reality applications in vehicles.

Kyong-Ho Kim is a principal researcher and director of the Human–Vehicle Interaction Research Center, Electronics and Telecommunications Research Institute, Daejeon, Rep. of Korea. He received his BS and MS degrees in electronic engineering from Kyungpook National University, Daegu, Rep. of Korea, in 1993 and 1995, respectively, and his PhD degree in computer science from the Korea Advanced Institute of Science and Technology, Daejeon, Rep. of Korea, in 2010. Since 1994, he has been with ETRI. His current research topics include intelligent vehicles, human–computer interaction, head-up displays, and augmented reality applications in vehicles.