

Enhancing Signal-Based Positioning Systems with Augmented Reality in Controlled Environments

Jiwoo Han*, Jaejun Yoo*, Junhaeng Lee*, Yangkoo Lee*, Kyunghyun Park*, Seonghun Seo*,
Yonghyun Kim*, Daesub Yoon*

* *Mobility UX Research Section, Electronics and Telecommunication Research Institute, Daejeon, South Korea*
chau@etri.re.kr, jjryu@etri.re.kr, junhaeng007@etri.re.kr, yk_lee@etri.re.kr, hareton@etri.re.kr, ssh@etri.re.kr,
yhkeen@etri.re.kr, eyetracker@etri.re.kr

Abstract—This paper presents an Augmented Reality (AR)-enhanced approach to improving the accuracy and efficiency of signal-based indoor positioning systems, particularly in controlled environments such as laboratories, cleanrooms, and data centers. Traditional positioning systems face challenges related to manual fingerprint database creation, accuracy, and environmental variability. The proposed system automates the database creation process using AR for real-time distance measurement and visual reference capture, significantly reducing manual effort and errors. In the positioning phase, the system combines signal strength data with AR-based distance validation and visual reference comparisons to improve location accuracy. The integration of AR enhances the system's ability to provide more reliable positioning results in environments where conditions, such as lighting and surface textures, are stable. This paper outlines the architecture and key components of the system while future work will focus on empirical validation and optimization of the system for real-world applications.

Keyword— Augmented Reality, Fingerprint, Signal, Positioning System, Database



Jiwoo Han received B.S. degree (2009) in Computer Science from the University of Sciences, Ho Chi Minh, Vietnam and M.S. degree (2013) in Computer Science from the Korea Advanced Institute of Science and Technology (KAIST). He is currently a senior researcher of the Mobility UX Research Section at Electronics and Telecommunications Research Institute (ETRI). His research interests include big data management, architecture, and distributed systems.



Jaejun Yoo received MS and PhD degrees in School of Computing from Korea Advanced Institute of Science and Technology, Daejeon, Rep. of Korea. He is currently a principal researcher working at Electronics and Telecommunications Research Institute, Daejeon, Rep. of Korea. His current research interests include positioning, databases, information retrieval, geographic information systems, intelligent transportation systems, location based services, and machine learning.



Junhaeng Lee is currently a researcher of the Mobility UX Research Section at Electronics and Telecommunications Research Institute (ETRI), Daejeon, Rep. of Korea.



Yangkoo Lee currently a principal researcher of the Mobility UX Research Section at Electronics and Telecommunications Research Institute (ETRI), Daejeon, Rep. of Korea.



Kyunghyun Park currently a principal researcher of the Mobility UX Research Section at Electronics and Telecommunications Research Institute (ETRI), Daejeon, Rep. of Korea.



Seonghun Seo currently a senior researcher of the Mobility UX Research Section at Electronics and Telecommunications Research Institute (ETRI), Daejeon, Rep. of Korea.



Yonghyun Kim currently a senior researcher of the Mobility UX Research Section at Electronics and Telecommunications Research Institute (ETRI), Daejeon, Rep. of Korea.



Daesub Yoon received MS and PhD degrees in Computer Science and Software Engineering from Auburn University, Auburn, AL, USA. From 2001 to 2005, he was a Research Assistant in the Intelligent and Interactive System Laboratory at Auburn University. He joined the Electronics and Telecommunications Research Institute, Korea, in 2005. His research interests include assistive technology, eye tracking, attentive user interface, mental workload, and human factors in automated driving vehicles and smart factories.