Analysis of Mobility Entropy for Representation of Human Movement in Digital

MinHo Han *, Keun-Woo Lim**,Young-Bae Ko*

* Dept. AI Convergence Network, Ajou University, Suwon, South Korea

** Telecom Paris, Institut Polytechnique de Paris, Palaiseau, France

vosej2414@ajou.ac.kr , keunwoo.lim@telecom-paris.fr, youngko@ajou.ac.kr

***Abstract*—This work analyzes the effect of mobility entropy in real-time representation of human positioning in digital twin applications. Real-time representation of positioning data is challenging due to the energy constraints of IoT devices, inducing a tradeoff between representation accuracy in digital twin applications and energy efficiency in real-world IoT devices. We consider the utilization of mobility entropy, which reflects the dynamics of a movement, to leverage the tradeoff for more efficient management of both IoT and digital twins. Our preliminary analysis shows that our proposed calculation of mobility entropy can accurately capture mobility characteristics and suggests that this value can be used future methods of enhancing and optimizing accuracy and energy efficiency**

***Keyword*— Digital twins, Mobility Entropy, Ultra wide-band**

Han Minho was born in Suwon, South Korea, in 1994. He received the B.S. degree in industrial engineering from Ajou University, South Korea, in 2019, and the M.S. degree in computer engineering and security from the same university in 2022. He is currently pursuing the Ph.D. degree in the Department of AI Convergence Network at Ajou University, specializing in computer security. His research focuses on the practical applications of UWB in Digital Twin environments. His current research includes the study of mobility entropy for energy-efficient realism in digital twin environments.

Keun-Woo Lim is currently an associate professor in Telecom Paris, IPP, France. He received his B.A. in English Literature, B.S., M.S., and Ph.D. in the School of Information and Computer Engineering at Ajou University, Korea, in 2007, 2009, and 2014 respectively. His-research interests are in the area of service-specific wireless networking and communications, and integrations of data and security in wireless applications.

Young-Bae Ko received his Ph.D. degree in computer science from Texas A\&M University, College Station, TX, USA in August 2000. He then joined IBM Thomas J. Watson Research Center, Yorktown Heights, NY, as a Research Staff Member. Dr. Ko is currently a full professor with the Department of Software and Computer Engineering, Ajou University, Korea, leading the Intelligence of Connected \& Convergence Systems (iCONS) laboratory funded by the Brain Korea 21 (BK21) National Project. The main areas of his research interest are the convergence of XR and localization, AI-empowered wireless communications(6 G), and Multi-UAV networks.