Invited Talk: Emerging Role of Digital Assistant in Augmented Reality Driven Human-City Interaction

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***Abstract*—This keynote presentation will discuss the unique research issues and challenges in the intersection between augmented reality and smart cities. Designing interaction approaches for Mobile Augmented Reality (MAR) in city-wide urban scenarios are receiving rising attention. In our envisioned framework of Human-City Interaction, we foresee that MAR with complementary digital assistant will become critical enablers for immersive interaction in our smart cities. The proposed framework is on the basis of numerous works on MAR interaction design. We will discuss several illustrative examples to elaborate on the framework and accordingly highlight the importance of the digital assistant. The presentation will be concluded with future directions for Human-City Interaction.**

I. TALK DETAILS

Nowadays, the popularity of smart devices drives our city evolving towards an organic and agile city-system. The smart devices have accompanied the citizens in the city, acting as the primary channels for the citizens to interact with the virtual entities through the broadly available ubiquitous displays and digital assistants. We conjectured that Mobile Augmented Reality (MAR) allows the citizens in the smart city to achieve two-way communications with the organic and agile city-system. Therefore, Augmented reality (AR) headsets become one of the critical enablers for the interaction between the citizens and city-systems. The citizen with such headsets can receive multitudinous digital overlays in the forms of windows, icons, or more complex 3D objects on the top of the physical urban environment.

Under the mutual consideration of AR and smart city, we consider **Human-City Interaction** as an extended research domain of the Human-Computer Interaction. It focuses on the design space, usability, user-centric issues of specific computing devices, wearable computers in particular, designated for city-wide systems in a smart city. With the enablers of Human-City Interaction as mentioned above, the citizens can easily reach various AR applications at their arm length, for instance, transportation and driving information, government digital services, omnipresent entertainment, ordering goods outside shopping windows, as well as looking for WiFi hotspots in the immersive views driven by AR.

This ***keynote*** emphasizes the ideas of **Human-City Interaction** from the angles of shifting interaction paradigm in the smart urban environment. We sketch out the complementary roles of *miniature-size interfaces* (e.g., ring-form interfaces) and *digital assistants*. By considering the dynamic contexts of the city-systems, the shrinking size interfaces can work together effectively with digital assistants for highly mobile yet user-centric interaction solutions. We will illustrate our recent studies on context-aware interfaces and miniature-size interaction approaches, and accordingly, propose the challenges of designing the complementary roles of the technologies. It is necessary to explore the mutual space of interaction design for both *miniature interfaces* and digital assistants, under the premise that a context-aware framework is able to support the convenient interaction at the city-wide level.

II. SPEAKER'S BIOGRAPHY

Dr. Lik-Hang LEE is currently a postdoctoral researcher at The University of Oulu, Finland. Dr. LEE received his BEng. degree in Logistics Engineering and Supply Chain Management and MPhil. (Industrial Engineering) from The University of Hong Kong, Hong Kong SAR. He then worked in a Multinational corporation for two years. Afterward, he pursued his Ph.D. degree in Computer Science and Engineering at The Hong Kong University of Science and Technology, Hong Kong SAR, under the guidance of Professor Pan HUI (Nokia Chair). His research interests lie primarily in the areas of wearable computing, augmented reality, and human-centric computing. His works are published at the well-known venues of ubiquitous computing, including ACM ISWC, IEEE PerCom, and IMWUT/UbiComp. Additionally, he has served as the program committee member and reviewer for conferences like ACM Mobile Human-Computer Interaction, IEEE International Conference on Computer Communications and Networks, European Conference on Artificial Intelligence, International Joint Conferences on Artificial Intelligence.

Apart from his research career, he is an active member of the Hong Kong start-up community. He is a founder of an EdTech start-up named AVATech Innovation Limited, and since late 2017 his company has earned more than 18 awards, e.g., Hong Kong Awards for Industry 2018 (Creativity and Innovation), Hong Kong ICT Awards 2018, Award for Impactful Technology 2019 (Co-issued by Citi-Foundation and United Nation DP), etc. He is recently appointed by the Hong Kong Cyberport as Cyberport Mentor (2019 - 2022).