

A Simulation Environment for Pervasive Networking and Computing (PI: Prof. Cao Jiannong; 2011/12)

Development and deployment of systems and applications for pervasive networking and computing (PNC) is challenging due to the need of creating various application specific smart environments. In many cases, it is very difficult and even impractical to experiment with and test the proposed mechanisms due to the overhead of managing a large number of smart devices. To cope with the above problems, it is highly desirable to build a test-bed or simulation system which will allow them to re-create the smart devices and environments in their table-top computers with unprecedented ease-of-use in designing, testing and managing the respective entities. However, existing test-beds and simulators for experimenting with PNC systems are limited in scale and consider only existing devices not including everyday physical world entities (e.g., smart table, etc.) which are fast evolving and to be embedded into our surrounding environments. Moreover, they are mostly designed for simulating applications but do not consider PNC related protocols and algorithms. In this project we shall develop a generic framework and software environment for simulating different types of PNC applications, protocols and algorithms. Along with the traditional computing devices, sensors and actuators, we will propose to model everyday physical objects as smart entities called ubiquitous interacting objects (UIOs), and develop the simulation system based on the abstraction of UIO and their interactions. We will first provide a language to describe the characteristics, functions and services of those entities. We then model static and dynamic characteristics of PNC environments using the defined UIO model. With the design considerations of ease of use, flexibility and extendibility, the system will allow

developers to use default environment settings provided by the simulator library or to define new devices and functionalities for their own settings based on the application requirements. Also, we will provide a visualization tool for users to graphically manipulate the application scenarios and display scenarios as well as actions induced by tested applications, protocols and algorithms. Pervasive computing is the next wave of computing paradigms. The results of this project will facilitate the development of high-performance pervasive computing systems and applications, such as smart spaces, social networks, pervasive healthcare, intelligent transportation systems, and smart cities. As the Hong Kong SAR government has been greatly promoting the development of innovative technologies, the contribution of this project is highly relevant to Hong Kong scientific and industrial community and society.