An Effective Service Composition Scheme based on IoT

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Abstract—Ubiquitous computing is supposed to ensure that all the components in any specific environment are connected with each other. Based on this assumption and due to the remarkable enhancement of network technologies, the concept of ubiquitous computing can be implemented in more detailed form of IoT (Internet of Things). Under the given circumstances, we introduce an effective scheme to provide a personalized service based on the multi-modal service composition in IoT environment. Our proposed scheme is a model focused on service evolution with the changing combination of available IoT resources. It concentrates rather whether any given service can be evolved or not, as the possible number of available smart objects are increased. The multi-modal service composition of IoT is described in this paper.

Keywords—Personalized Service; Ubiquitous Computing; Internet of Things; Multi-Modal;

I. INTRODUCTION

The purpose of the Internet of Things (IoT) is to provide services with multi-modal objects that are connected each other in the physical environment. With the enhancements of networking technologies and mobile devices, numbers of objects can be designed to have the capability of providing any specific functions required to building services. For example, some of them can generate information by communicating each other or scanning surrounded environment. And also, others can provide visual or sound information by acquiring data from related sensors. Many researches regarding IoT are dealing with schemes of construction methodologies for IoT infrastructure. And the connectivity issues or interaction scheme is also major subject studied for the IoT. However, conventional researches stay at the level of initial service composition step. They do not concern the evolution of service under the condition that the availability of smart objects are varying. Because researches of evolutionary service of IoT are not dealt with widely, in this research we propose an effective service composition scheme based on multi-modal combination of smart objects.

The rest of this paper, we introduce the related work in Section 2. In Section 3, we describe out the multi-modal service composition scheme. Section 4 explains several evaluation results. Conclusion is provided in Section 5.

II. RELATED WORK

Many researches on IoT(Internet of Things) service provision are introduced these days. Basic concept of IoT service based on combination of the Internet and emerging technologies such as nearfield communications, real-time localization, and embedded sensors are presented in [1]. And also, the physical design of the IoT to support efficient communication among smart objects [2]. Then, the physical implementation model of IoT is described based on the cooperation of WSN and RFID. And also, cloud computing based smart city model is introduced to support the concept of IoT. However, these service models have limitations, namely it is not concerning the capability problem of the objects and detailed manner of providing services [3, 4, 5].

Another related issue is interoperability of smart objects. If we say an IoT service then the smart objects must be available all the time any certain service is being provided. In [6, 7], an efficient model for the management of data exchange among smart objects is shown. And their paper presents the management scheme based on cloud computing for the interoperability. However, these studies are not guaranteeing the service evolution as the availability of any given smart object is varying.

III. PROPOSED SCHEME

We design the effective service composition scheme based on the idea that the availability of smart object can be varied under any circumstances. And the availability of smart objects are another kind of context namely resource context, so we can design a scenario regarding the varying situation and the mechanism to utilize it. We call this mechanism an evolutionary service composition.

The coffee shop searching task can be a good example. When we run any application regarding coffee shop suggestion, the service is executed with the smart objects such as GPS, Map, and Compass, basically. But, sometimes it is not easy to utilize that service because there are too many candidates to visit. In this case, the service can be changed by applying the evolution mechanism. The smart objects used for this service can be changed. For example, the coffee scoring board smart
object can be added to filter the inadequate candidates. The example scenario is described in Fig. 1.

Fig. 1. Evolution Scenario of Coffee shop Suggestion Service.

As shown above, the evolutional service composition can be used to enhance the user experience of any given services.

More detailed example of evolutinal service composition model is shown in Fig. 2. In Fig. 2, the enhancing model of sample Car-navigation is shown. In this sample, we can realize that the services are enhanced by the extra smart object which has better ability of displaying something.

Fig. 2. Car Navigation Example of Evolved IoT Service.

IV. EVALUATION

We try to examine the quality of services during experimental time. We assume that the available number of smart objects, which can be used for the running service, are varying during the service execution in our suggested model. On the contrary, the available number of the conventional model is fixed. The quality values are calculated by adding the total number of available smart objects on every hour as simulation is being processed. The more available smart objects means that the better service quality because the quality of any given service can be enriched with the possibly better smart objects. Based on these assumptions, we simulate the proposed scheme and get the result as shown in Fig. 3 below.

Fig. 3. Number of Available Smart Objects.

V. CONCLUSION

The purpose of the Internet of Things (IoT) is to provide services with multi-modal objects that are connected each other in the physical environment. The conventional researches stay at the level of initial service composition step. They do not concern the evolution of service under the condition that the availability of smart objects are varying. Because researches of evolutionary service of IoT are not dealt with widely, in this research we propose an effective service composition scheme based on multi-modal combination of Smart Objects.

REFERENCES