Reactive Multimedia Contents in Smart Home Environments*

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Abstract. We present vrFlora which shows adaptive responses suitable for user's context. It perceives the context through ubiTrack detecting the user's profile, location, orientation, etc, and ubiFlowerpot sensing the user's manipulation with a physical flowerpot. In addition, it analyzes the context according to its own characteristics, and then displays adaptive multimedia contents by applying the analysis. In order to make users experience the proposed vrFlora in home, we installed the vrFlora in ubiHome, as a test-bed for smart home environments. Accordingly, the proposed system demonstrates potentialities of reactive media contents, which autonomously show adaptive esponses according to the user's context, in smart home environments.

Introduction

With ubiquitous computing paradigm, computing has been pervasive into our daily life. Moreover, many researchers have studied on context-aware applications which offer services suitable for a user's situation [1]. Especially, the AdaptiveHouse [2], EasyLiving [3] and AwareHome [4] show how context can be used in home environments. However, they simply offer proper services according to context. That is, they do not consider reactions of application which differently analyze the context according to its characteristics and reflect the analysis to offering functions.

In order to overcome the limitations, the proposed system shows adaptive reactions according to its characteristics. It autonomously analyzes user's context, such as the user's profile, location, manipulation, etc. Then, it shows multimedia contents suitable for the situation by reflecting the analyzed results. Therefore, the proposed vrFlora makes life-like impression on the user through autonomous changes according to user's context.

System Overview

In order to allow users to naturally interact with the proposed system, as shown in Fig.1, we installed three components, i.e., ubiTrack, ubiFlowerpot and vrFlora, in

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ubiHome, a test-bed of home appliances for ubiquitous computing environments [5]. ubiTrack perceives user's context related to who the user is and where he/she is located. ubiFlowerpot provides the user with intuitive interfaces for interacting with vrFlora. The vrFlora displays multimedia contents through a specific display device called MRWindow, like an ordinary window in home.

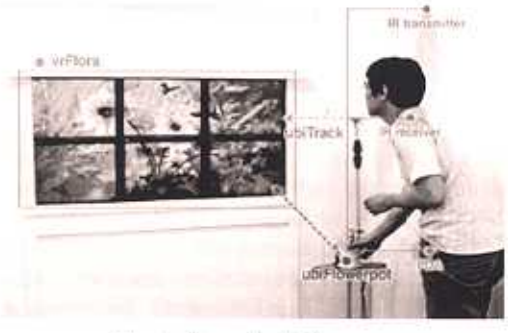
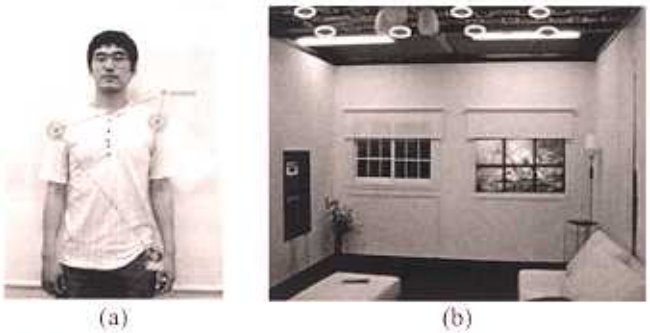


Fig. 1. Set up in ubiHome

ubiTrack generates preliminary context containing a user's profile, location and orientation in the ubiHome[6][7]. As shown in Fig. 2(a), a user puts two IR receivers on his/her shoulders. Then, it detects the user's location and orientation by exploiting IDs transmitted from IR transmitters which are installed on the ceiling, as shown in Fig. 2(b). In addition, it also extracts the user's profile, such as gender, age, status, etc, from the user's own PDA.



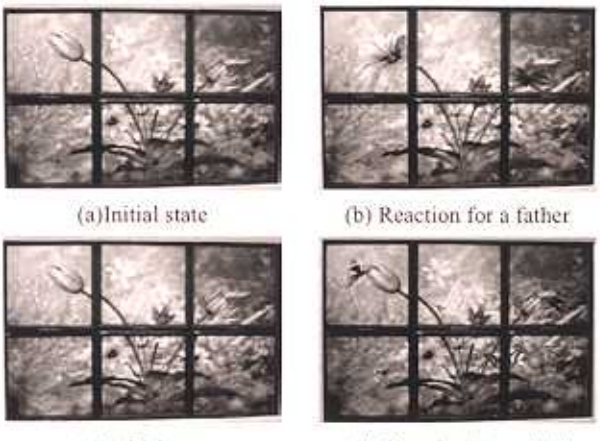
(a) (b)

Fig. 2. ubiTrack (a) IR Receiver and PDA (b) IR transmitters installed on the ceiling

ubiFlowerpot makes a user interact with vrFlora through real plants in daily life. As shown in Fig. 3, it detects the user's touch by exploiting sensors attached to leaves of the plants. Then it transmits sensed signal to the host through a RF transmitter. Finally, the host generates preliminary context containing a user's manipulation and the degree.

Fig. 3.ubiFlowerpot

vrFlora is aware of user's situation, and then presents personalized reactions suitable for the user's preference. It is based on vr-UCAM2.0 (A Unified Context-aware Application Model for Virtual Environments) [8]. It perceives user's context, e.g., the user's profile, location, orientation, manipulation, etc, by exploiting preliminary contexts generated form ubiTrack and ubiFlowerpot. It adaptively analyzes the context according to its own characteristics, and then shows different contents according to the analysis.



(a)Initial state (b) Reaction for a father

(c) Initial state (d) Reaction for a child

Fig. 4. Personalized reactions

Fig. 4 describes examples of the reactions. We assume a family of three in ubiHome, i.e., father, mother and a child. If any user gets near to MRWindow, the vrFlora supposes the user is interested in vrFlora. Then, it makes displayed contents enlarge. If a father touches leaves of ubiFlowerpot, as shown in Fig. 4(b), the vrFlora grows and comes into blossom by interpreting the father's manipulation as nourishment. On the other hand, if a child manipulates ubiFlowerpot, as shown in Fig. 4 (d), it displays adaptive contents, which exhibits butterflies fluttering from flowers to flowers, by applying propensities such as playing with friends. Therefore, the

vrFlora provides a user with life-like impressions by adaptively interpreting the users' situation and reacting according to its own characteristics.

Summary and Future works

We present vrFlora which shows adaptive reactions according to user's context in smart home environments. It autonomously responds by exploiting the users' profile, location, orientation and manipulation and so on. It also offers personalized interactions by showing customized responses suitable for a user's context. Furthermore, it makes life-like impression on the user through autonomous changes. For the future works, we plan to make vrFlora show various adaptive reactions by reflecting more environmental context of home environments e.g., temperature, humidity and so on. Moreover, we will perform usability test to evaluate the usefulness of the proposed vrFlora.

Acknowledgements

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