Learning Smart Phone App Execution Patterns with BAM Network for Improving User Convenience

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Abstract. There are too many Apps available for smart phone users but not many of them are used frequently. The convenience of smart phone usage can and should be developed not just by the predefined functions but to maximize its UI usefulness from user’s point of view. In this paper, we propose an intelligent method using BAM network to minimize searching for the frequently asked Apps by recognizing and learning user’s signal to execute them. This is a form of activity-centered design to maximize user’s convenience in user interface of a smart phone.

Keywords: Smart phone, Apps, User Interface, BAM network, Activity-centered Design

1 Introduction

Human activity recognition task through mobile devices like smart phones using accelerometers is one of the recent trends of researches. Typically those researches interpret the problem as a supervised learning problem with sensors to classify human behaviors for monitoring general behavior [1] or a sports-specific behavior [2] for maximizing user convenience [3]. That line of researches, though, is to provide convenient functions for the smart phones production companies to allure users for sale thus pre-designed in nature and gathering practical data is an issue to solve.

In this paper, we approach this task as a personalized design issue of maximizing the convenience of smart phone on user’s side especially for relatively elderly people. Since so many convenient and useful Apps available in the mobile App market, people are used to download more than necessary number of Apps but some Apps are
seldom used. Although a user has multiple pages of Apps available, not many of them are frequently used thus the user interface needs to provide a function to minimize this “search for appropriate Apps from the interface” elapsed time [4]. Thus, we adopt a Bidirectional Associative Memory (BAM) [5] neural network approach to associate user activity patterns to frequently used Apps by user specification so that regardless of number of downloaded/available Apps a user has, a user can search and execute desired Apps with pre-learned user’s signals.

2 Learning Personalized Apps Execution Patterns with BAM

In general, the procedure to execute an App is as follows.

1. Click “Hold” button.
2. Push “Unlock” button as shown in Figure 1.
3. Search the target App icon through pages
4. Execute target App by touching/pressing it.

Figure 2 summarizes the overall procedures of learning user execution patterns that this paper is aimed for. From the general user behavior enumerated from 1 to 4, step 3 is the most time-consuming one and our effort is to minimize that elapsed time if the target App is one of those frequently used Apps. There are two conditions that this learning is necessary for users.
Condition 1: Learning App should be able to obtain the “Available App Table”. Condition 2: There is limited number of “Frequently Asked Apps” for a user.

Figure 3 demonstrates a typical user input for a “frequently-called” App on our learning App. Then the BAM learning starts. BAM is hetero-associative, recurrent network that given a pattern it can return another pattern which is potentially of a different size.

BAM network obtains output vector $Y(p)$ by applying the transposed weight matrix $W^T$ to the input vector $X(p)$. Then, $Y(p)$ is again applied to the weight matrix $W$ to produce new input vector $X(p+1)$ until there is no significant changes as shown in Figure 4.
From user's side, a user simply draws a picture/signal like the right-hand side of Figure 5 and touches the corresponding App as shown on the left side. BAM learning does not limit to have one-to-one correspondence thus more than one patterns are able to associated with a target App for user's sake. Then, after learning, a user simply draw a pictured signal on the smart phone as shown in Figure 6 and the corresponding App is executed immediately.

Fig. 6. App Execution Example.

3 Conclusion

In this paper, we propose a method of learning specific user’s behavior pattern signals to execute specific frequently-asked Apps on the smart phone. BAM network learning does the crucial job to make associations between user signals and targeted Apps. This special learning function maximizes user convenience on executing frequently asked Apps without hesitation and matches recent trend of recognizing user behavior through smart phones.

References