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사용성 로그 분석 기반의 사용자 인터페이스 설계 플랫폼

User Interface Design Platform based on Usage Log Analysis

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초 록

사용자 인터페이스는 어플리케이션 사용자에게 효율적인 서비스를 제공하는데 있어 중요한 요소이다. 특히 언제 어디서나 실행 가능한 모바일 어플리케이션들은 다른 도메인의 어플리케이션보다 사용성의 우선순위가 높다. 기존의 연구들은 어플리케이션의 사용성 향상을 위해서 프로토타입과 스토리보드 방식을 활용하여 해당 어플리케이션의 사용성에 대한 설문을 수행했다. 하지만 이러한 방식은 특정 어플리케이션의 사용성 관련 문제점을 지속적으로 식별하고 개선하는데 한계가 있다. 따라서 본 논문에서는 터치 제스처 데이터를 이용하여 사용성을 분석하는 기법을 제안하고 있다. 이는 어플리케이션이 배포된 후에도 지속적으로 사용자의 의도를 파악하여 어플리케이션의 UI/UX 문제점을 식별하고 개선시킬 수 있다.

ABSTRACT

The user interface is an important factor in providing efficient services to application users. In particular, mobile applications that can be executed anytime and anywhere have a higher priority of usability than applications in other domains.Previous studies have used prototype and storyboard methods to improve the usability of applications. However, this approach has limitations in continuously identifying and improving the usability problems of a particular application. Therefore, in this paper, we propose a usability analysis method using touch gesture data. It could identify and improve the UI/UX problem of the application continuously by grasping the intention of the user after the application is distributed.

키워드 : UI/UX, 터치 스크린 디바이스, 모바일 디바이스, 사용자 인터페이스 디자인, 로그 분석
UI/UX, Touch, Gestures, Touch Screen Device, Mobile Devices, User Interface Design, Usage Log Analysis

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1. Introduction

Recently, the importance of an user interface (UI) development for smart devices is emerged because many kinds of devices controlled by the finger. Then the users consume for their communication with smart devices due to the network technology is rapidly grow [4, 7]. However, the developers can't collect and look into the users' feedback sufficiently because the duration of the development is usually finite and the users' attendances for the testing phase are relatively low. Additionally, most of the application development processes are based on the top-down paradigm such as from the developers to the users. There are no opportunities for listening up the opinions from the customers who have utilized the applications in a real life by themselves [3, 11]. Alternatively, we suggest a new methodology, bottom-up paradigm, for a UI design of an application with the touch gesture technology. Generally, the statistical analysis for all touch activities on a touch device can help designers to create a user friendly UI.

On the other hand, the users' activity pattern must be considered according with the characteristic of an application because all touch gestures are not used in every application [1, 9]. For example, Telephony application doesn't have swipe gestures because the users only touch the number that they want to call. The platform presented in this paper has collected all touch gestures from the users' touch device and categorized them according with the predefined touch gestures. And, the statistical data for a certain of touch gesture such as scroll-up/down are given to the UI developers for giving a chance to confirm how much the users follow the guidelines based on their original idea.

Due to the disadvantage which is difficult to predict the user's behavior, then the UI on the touch screen often causes malfunction. We proposed the novel user interface platform for mobile devices. It could be analyzing the usability of touch activities for inducing the smart touch gestures.

Section 2 presents related works. In Section 3, we introduce a user interface design platform designed to deal with the usage log. Additionally, we describe the user scenarios using the user interface design platform in Section 4. Finally, in Section 5, the contents of this paper are summarized and future work is discussed.

2. Related Work

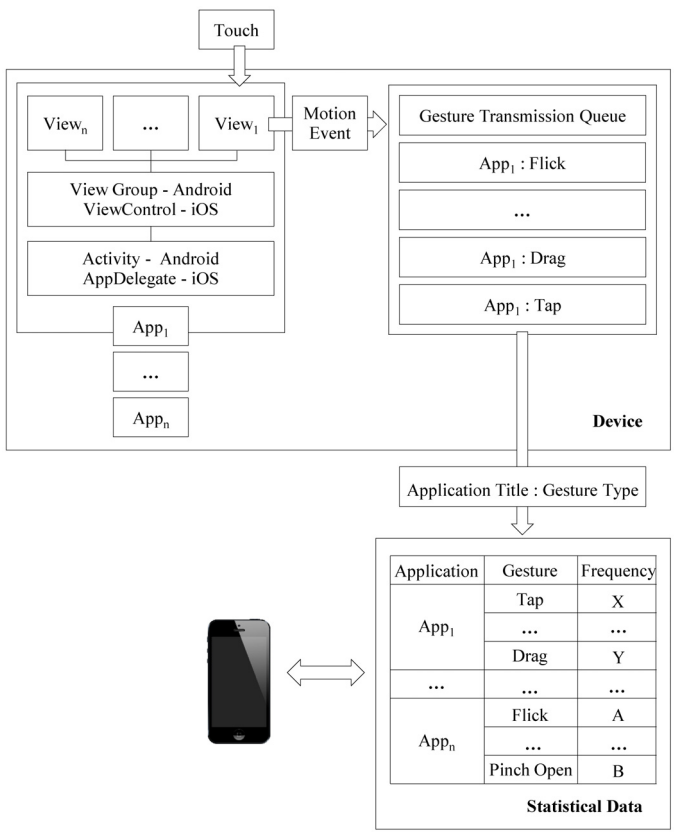
The touch gestures are simple idea that has been little explored. Hassan's "Chucking" technique [5] used a simultaneous touch and motion gesture to toss a file from a mobile device to a wall display. The user holds a finger on the file's icon, while indicating where to place the file via a motion gesture.

Rahman [2] also used touch and motion to measure wrist deflection angles. They suggested several examples of touch and motion gestures, and they revealed the larger design space of touch and motion by articulating its properties and charting a taxonomy of related techniques.

On the other hand, several efforts considered touch in combination with other modalities. Spilling [8] and Touch Projector [6] used direct input on the screen of a device, in combination with movement of the device itself, to augment physically situated interactions. Touch gesture also echoed other example of synergistic modalities, such as pen and touch [10].

3. User Interface Design Platform

Apple has defined many kinds of touch gestures for iOS based on the touch device model. Similarly, Google has made the ambiguous definition for android OS. As you



〈Figure 1〉 User Interface Design Platform Overview

know, most people already are accustomed with the rules made by Google and Apple because the guidelines from Google and Apple are very creative and sensational for them. The more applications for iOS and Android have been appeared, the less the uniqueness of each application is.

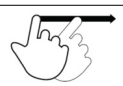
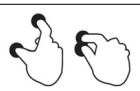
Additionally, many people have been embarrassed how to use new application they bought because the UI/UX of the application is more complicated than the previous version and doesn't make an analysis what they want seriously.

The proposed platform has to collect the frequency of touch gestures from a touch device of the people to determine how many touch gestures are used in a certain application. The reasons may be differences between the intention of the designer and the requirements of the users.

3.1 Gathering the User Data for Touch Gestures

In our platform, all touch gestures in each View controller are gathered by using a Motion Event function in their device. As you can see in (see <Figure 1>). A Motion Event method has categorized all touch gestures according with the predefined touch gesture in an application. After the categorization process, a Motion Event method has saved the categorized data in the Gesture Transmission Queue.

〈Table 1〉 Classification of the Touch Gesture

Gesture	Name	Standard Action
	Tap	Selects item or menu
	Drag	Moves item to new location
	Flick	Scroll or pan quickly
	Double Tap	Zoom in or zoom out
	Pinch	Controlled zoom out
	Spread	Controlled zoom in
	Press	Display context menu

3.2 Categorizing Touch Gestures

After collecting and classifying the data from the devices, our platform could perform the categorization process again because the statistical results doesn't have the characteristics of the application. And it could be bias for the expectation result of the usage ratio of the touch gestures. The reason is why every application does not use all touch gestures, but the selected specific gestures are adjusted to UI.

For the classification of all touch gestures, the general definition of the touch gesture in (see <Table 1>). They are used basically to make an analysis how many touch gestures are used in a certain of application.

3.3 Analyzing Usage Log Data

The statistical data for a certain of touch gesture such as scroll-up/down gives a chance to confirm how much the users follow the guidelines based on their original idea. The statistical analysis factors is the aspect of touch gesture that the gesture leverages, which can be any of (see <Table 2>).

First, an element of the screen where the activity occurred, 'Entire Screen' means all screens that can be touched on the device. The X and Y points represent the coordinates of the x and y coordinates of the touch point, and the drag path represents the moving path of the finger. The 'Select Object' is a specific icon, object, or area selected by the user. The Rectangle indicates the length and the length obtained through the two touch points. The Contact & Shape indicates the geometry of the touch.

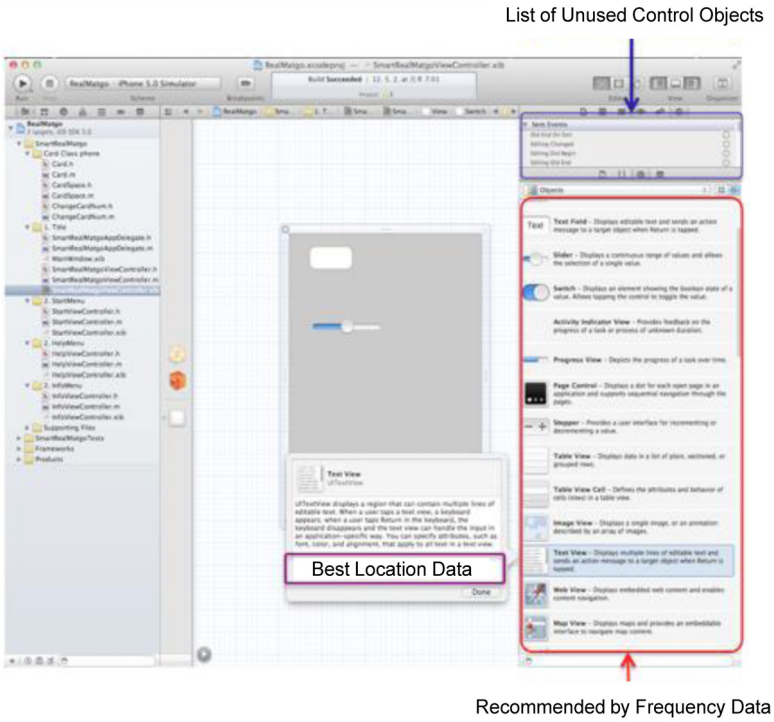
〈Table 2〉 Statistical Analysis Factor of Touch Gesture

Factor	Describe
Entire Screen	Touch anywhere on the screen
X, Y Point	Centroid of the touch point.
Drag Path	Path followed by the finger
Select Object	User touches a specific icon, object, or region of the screen to select it.
Rectangle	(Two touch points) Bounding box
Contact & Shape	Geometry of the touch

4. Scenarios

There are some cases occasionally that the same application has two kinds of UI design for a hardware specification. For example, the UI of the Flipboard that is a famous application for social network. This application works differently on smartphones and tablets. When the users want to change the subject on the Flipboard on a smart phone, the users often perform the functionality of a move up/down gesture, but the users can't find the gesture on tablets. And they have to swipe gesture for doing the similar operation.

The platform described in this paper sug-



〈Figure 2〉 Scenario of the Design Builder

gest a set of recommendation for the UI/UX designer to create a user interface friendlier by using the statistical analysis based on the frequency of the touch gesture (see <Figure 2>).

4.1 Selection of the Controls or the Widgets

Most designers tend to use software tools such as interface builder to make a UI easily without the developer's assistance. The statistical data made from our platform could recommend the designer to choose the best candidate control or widget. Because our platform can make an alternative list that is sorted by the usage ratio of the controls or widgets. This sorted recommended list is more helpful that a present list because the UI/UX designer can refer what kinds of control or widget are used usually in the other applications for a certain location.

4.2 Correctness of the Undefined Touch Gestures

Many users are confused to use a touch gesture to do a specific capability because there are many options to do the same operations in an application. Alternatively, some

users accustomed with a specific touch gesture sometimes have tried the same touch gesture that is not defined in a certain of application.

Our platform makes optional lists and followed advices for designers. They are including what kinds of control and widget are the erroneous objects in a specific location.

4.3 Location Designation of the Controls or Widgets

The designer has to make a decision which area is the best location for a certain control or widget selected. The platform suggests which area is good for a specific control or widget based on the considering both the location and the control or the widget as (see <Figure 2>). The recommendations are the result of analyzing the difference between the activity considered in the design and the activity generated by the actual users in the application. The recommended outcomes could improve the usability of the application by identifying the needs of users that are not considered in the design.

5. Conclusions

The user interface is an important factor in providing efficient services to application users. In particular, the user interface has higher usability priority than other domain applications because of characteristics of mobile applications that can be executed anytime and anywhere.

In this paper, we have presented the user interface design platform to make a certain of UI easily and conveniently. The proposed platform is based on the statistical results which is collected from the touch devices. It analyzed to determine how much control was used at which location within the application screen. The proposed platform could analyze content usage patterns in mobile devices. In the future, by recognizing and analyzing the touch gesture, it is possible to find a meaningful connection between touch data and apply it to a recommendation service linked with new contents.

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