Interface Designed in Consideration of "Tangible User Experience": Proposal for a Device to Prevent Accidental Tapping on Advertisements

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Abstract

With the spread of smartphones, the device interfaces have changed significantly. As the Internet of Things (IoT) became a reality, where different types of devices are connected to the Internet, and just about anything can now be done with phone applications, many things are losing physical presence. Along with this, sensory experience in device operation has disappeared. In addition, as people use smartphones as a reading tool more often, for reading news apps or visiting user-generated content sites (UGC sites) on the web, people are now experiencing some problems - accidental tappings on advertisements and difficulty in reading due to narrow line spacing. In this research, we pay particular attention to these phenomena and propose a device for preventing advertisement mistaps, which comes with an interface to provide realistic user experience.

Keywords: IT, Smartphone Application, Readability, Smartphone Case, Human Interface, Internet of Things Introduction.

1   Introduction

In recent years, device interfaces have been changing significantly. Smartphones with touch screens have become commonplace now. Users can operate the device by directly touching the target area on the screen. With its intuitive operation, anyone can use smartphones. Accuracy of voice recognition and image recognition has also been improving, and new services using such input interfaces are now available in various products including smartphone. Smartphones have been increasingly used in recent years to support the elderly and people with physical disabilities. For example, there is a chat app that transcribes speech to text using voice recognition technology for users with hearing impairments (References [3][4]). Another app speaks to visually impaired users to tell what is in front of them, using image recognition technology (Reference [5]). With the help of these technologies, the demand for smartphones is expected to grow further.

However, many users think that it is difficult to use a smartphone, which should be convenient to them. While watch and calendar apps are lower-priced and convenient, it is also true that a

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certain number of people dare to choose to use paper planners and analog watches. This seems to be because people tend to find 'real and tangible' things easier to use than apps without physical presence, and they can enjoy a better life with them. Also, along with the spread of smartphone, it has become common to read on the mobile screen. However, this has some disadvantages including 'mistaps', or accidental tapping on advertisements.

In this study, we propose a mistap prevention device that has an interface meant to provide realistic experience.

2   Purpose and Aim

The purpose of this study is to analyze the "realistic experience" that has been disappearing in recent years, and then examine the disadvantages of using smartphones. On top of it, we propose a device to prevent accidental ad taps, which provides the "realistic experience".

3   Loss of "Realistic Experience"

3.1   Current Device Interface and "Realistic Experience"

With a smart society being realized, device interfaces are increasingly lacking in "realistic experience". In this paper, "realistic experience" includes both 'tactile sensation' and 'feeling' evoked by actually operating the devices.   The current situation suggests to us that the absence of "realistic experience" has the following three reasons:

A) Digitization,

B) Devices providing any functions, and

C) Users performing very few operations

A) The loss of realistic experience due to digitization happened to books and watches, for example. Electronic books are excellent in portability and can carry many books in one device, but the physical weight of the books and the feel of turning pages are missing. With fitness management function and vibration for notifications, a smartwatch, has realized what a conventional watch cannot. While it can display an analog face as well, it fails to deliver the faint ticking sound of the hands of an analog watch or the actual feeling of winding the watch to set the time.

B) applies to smartphone applications. Applications now cater almost all the daily needs of the society, and any interactions with the applications are being done by operating the flat touch screen. Smartphone has become indispensable to our daily lives. With the spread of cashless payment, people do not need to carry anything else if they had smartphones that cover their daily needs. However, the unique tactile sensation evoked by each activity is now gone.

C) means the loss of realistic experience, which is accelerated by the advancement of input interface in recent years. For example, smart speakers use voice recognition technology. They are highly convenient in respect of that they can be operated while users are working. However, users do not physically operate the device as they give smart speakers voice commands. Therefore, it can be said that users hardly feel that they are actually operating the device, and the reliability of the device can be poor.

While these trends as described in A, B, and C lead to loss of realistic experience, they enable quick device operations. Therefore, there is a high demand for these technologies in modern society, and more progress is expected in this regard.

3.2 Importance of Realistic Experience

The 'loss of real-life sensation' sounds smart and very convenient. However, not a few people seem to be opposed to or reluctant to support the idea. For example, schedule management app is now widely used. Most of them are offered for free and come with notification and sharing features, delivering what real calendars or planners could not.

Nevertheless, stores typically set up a calendar section at the end of each year, and people of different ages and genders are seen buying planners from them. These people choose to use physical planners though they know that it is more convenient to use the application.

This may be explained by multiple factors. Some of the reasons are as follows: users can easily remember the scheduled events by actually writing down them; paper planners provide a larger view of the writing space; and users can customize their planners without restrictions. These factors may be implemented in future applications, but the experience that they bring should be totally different from that of physical planners. It is reasonable to assume that using a physical object allows people to better feel the action and makes them feel familiar with the object.

In the field of education, especially in science classes, 'touching' action is considered important to understand the object (Reference [11]). In childcare, it has been pointed out that physical contacts with infants helps make communication with them easier (Reference [9]). Another report says that child's tactile sensation is closely linked to the development of human-to-human communication (Reference [10]). From the above, it can be said that sense of touch and the physical sensations are significant in enriching our lives.

3.3 Methods of Delivering "Realistic Experience"

This research proposes two methods of delivering "realistic experience" which is disappearing. One of the methods is intended for 'digitizing' such experience, and the other is for extending the device interface as an 'external device'. Efforts have been made to digitize sensations for a long time. In recent years, considerable research efforts have been made especially in the field of virtual reality (VR). In addition to 'visual' and 'auditory' sensations, researchers are working hard to create 'tactile' sensation with VR headset. A tool to reproduce tactile sensations and one to record and transmit the sensations have been reported (Reference [6]). This indicates that 'feelings' and 'tactile sensations' are considered to be important factors for humans to have a realistic experience.

However, devices or systems to easily implement such tools are yet to be completed. It will be a while before the tools are implemented as a smartphone or tablet application.

On the other hand, there are many cases in which operations can be expanded by attaching an external equipment to digital device. This practice has already become common.

For example, "HAKO VISION", a candy toy Bandai Co., Ltd. sells, is a package of sweets, which turns into a device to view mini-sized projection mapping shows (Reference [8]). By placing a smartphone on the device, users can easily enjoy projection mapping anywhere. In addition, Kato et al. (Reference [7]) have proposed using a product package as an external equipment, which makes it possible to use a smartphone as a mirror or as an output device to display nail art previews. Nintendo Co., Ltd. is working on new interfaces such as "Nintendo Labo," which uses both Nintendo Switch and cardboards to perform various operations, and "Ring Fit Adventure" with which users can exercise by using the interface together with a given equipment.

In either case, the operations of the device are expanded so that the additional usage is more intuitive than that of the device itself. Therefore, the interfaces feature operations for the users to enjoy performing.

In a world where realistic experiences are disappearing, our objective in this study is to solve the problem by using an external device rather than by solving digitally, thereby making the interface more user-friendly.

4   Issues and Current Situation Regarding the Use of a Smartphone

With the spread of smartphones, there are an increase in the number of opportunities to perform 'reading' on smartphone, such as news applications and UGC sites. However, many issues are left to be solved.

4.1   Advertisement

One issue is advertisement. Digital advertising expenditures accounted for 38.5% of total advertising expenditures in 2018. It exceeds 35.4% of TV advertisements. The Internet advertising market is expected to continue growing (Dentsu Aegis Network Ltd.). The form of advertising is unique to the Internet. There are 'pure advertisements' that that advertisers buy advertising space on websites that have many page views and video advertisements found on video hosting sites such as YouTube. In recent years, there is an advertising system upon which an advertiser can set the target user group for displaying an advertisement called DSP (Demand-Side Platform), which has become megatrend. Advertisers can also set the particular websites to display their advertisements and show the target the advertisement that may be of interest to them from their search history.

From the advertiser side, it means that they can efficiently attract consumers. From the user side, there is an effect to increase the number of opportunities of viewing content that interests him or her. It is clear that this mechanism has contributed to the growing demand for digital advertising.

However, regarding a smartphone application, this advertising method may hinder its usability. There are many websites and applications that contain advertisements as a source of income. They are free for browsing or the use but they have advertisements everywhere on the screen.

The website or the smartphone application that has an advertisement, is monetized by the number of times that the advertiser's site has been displayed by users' taps. Because it is difficult to determine whether the advertisement has been tapped or viewed with 'true interest'. Therefore,

there are many cases in which an advertisement is deliberately placed at a position to induce a user's mistapping easily. On the contrary to smartphones' further sophistication, it significantly reduces the usability of websites or applications.

As a solution for this problem at present, there are applications that block advertisements from being displayed. They identify the "tags of advertisements" embedded in web sites and hides them. While this only works with certain browsers, it can be very effective to advertisements that suddenly come to the foreground, or to advertisements that use loud colors for appealing. However, the advertisement display by targeted marketing, which is an advantage of the digital advertising, is beneficial for both advertisers and users. Therefore, the act of hiding all advertisements is not always best solution.

4.2 Low Visibility of Text Lines

Another issue is the recognition difficulty or where the user is reading. websites can be displayed anytime and anywhere with smartphones. Smartphones' small screen display websites content, which is originally designed to be displayed on desktop PCs' screens. For this reason, it is often the case that line spacing becomes too narrow to read. Nowadays, when creating a website, it is common to facilitate settings to change the layout for optimization for each device. However, changing the layout does not mean the reduced sentence volume. there are many cases that the width is reduced and it results in the screen filled with characters. It is difficult for producers to create web pages that are easy for everyone to see. Even if the user changes the size of the characters, there is a problem that the line break is made in a strange place, and the layout including a photograph or an image is broken. Changing the layout is not a fundamental solution.

Figure 1: Examples of adverse effects when using a smartphone

5   Advertisement Mistap Prevention Device

We designed and proposed an external interface for smartphones to avoid mistapping of ads and eliminate reading difficulty. The term "external" here means "the aim is realized as a physical device, not with an application".

5.1 Design Object

In recent years, almost all the smartphone users use dedicated cases for their smartphones. The cases are essential not only for design but also for device enclosure. In this study, we use a smartphone case to apply the proposed device, which improves the usability of a smartphone. Using a transparent plate adapted to the width of the smartphone screen, the device was designed so that it can be placed anywhere on the smartphone screen. By using this plate, two functions can be added to the smartphone. It is possible to apply on any terminal by using a belt for the back surface. (Figure 2)
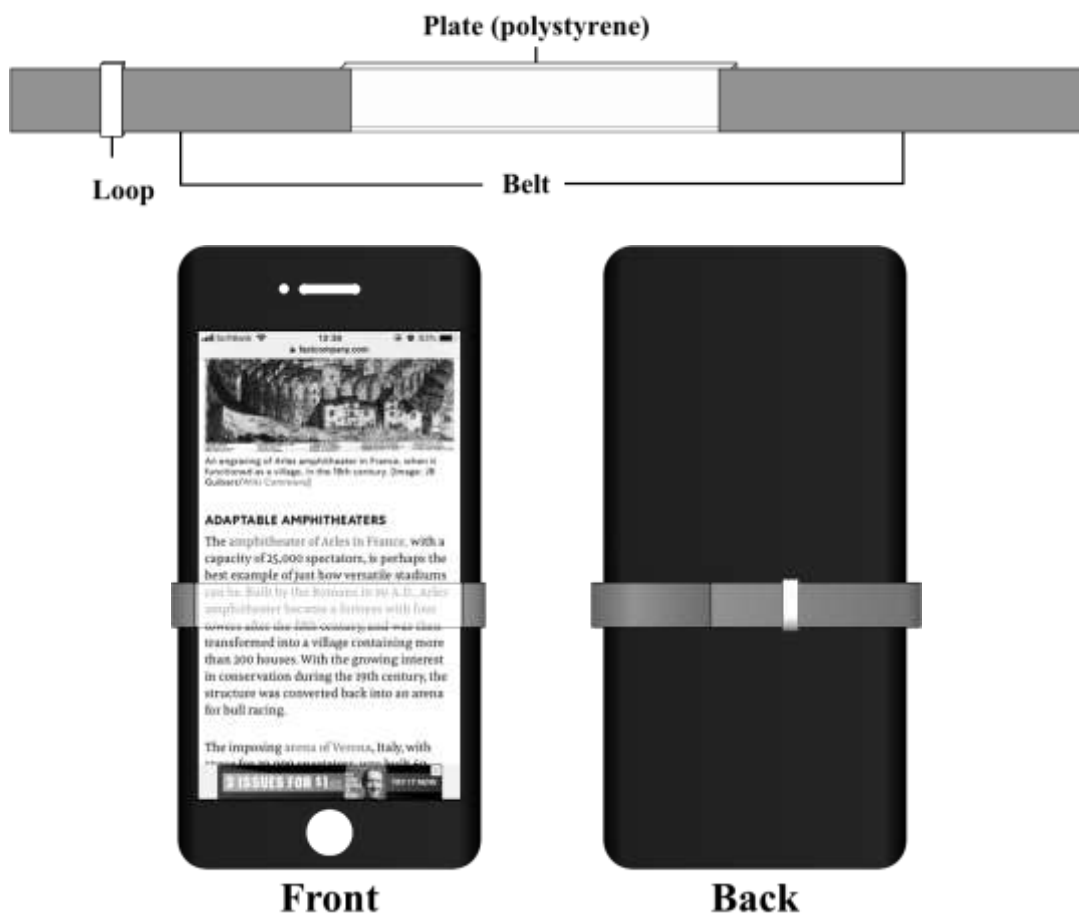

Figure 2: Image of the device and its application

We explain two functions that are enabled by using this device.

5.1.1   Function to Prevent Mistaps on Advertisements

One of the obstacles of a smartphone use is 'mistap', which means the accidental taps on advertisements. If the plate is placed on an advertisement displayed on the screen, it will prevent a user's mistapping even if the user's finger touches the advertisement unintentionally. Also, by making the plate translucent, if the displayed advertisement is interesting to the user, he or she can again shift the plate and tap on the advertisement to check details.
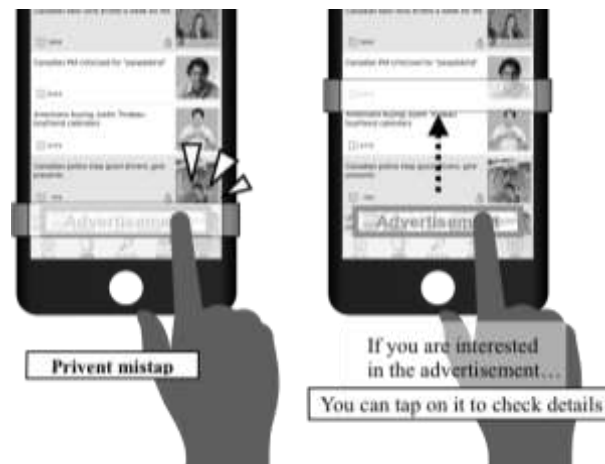

Figure 3: Function to Prevent Mistaps on Advertisements

5.1.2   Reading Assistance Function

'Reading assistance function' is a function that supports a user to cope with reading difficulty; when a Web page is displayed on a smartphone, the line spacing is crowded. To solve this problem, the user can use the translucent slide plate. The user set the plate below the line that he or she wants to read, and after finishing that line, the user can slide down the plate to read the next line, and repeat the procedure. Then the user can read text without losing the focus on the line that he or she is reading.
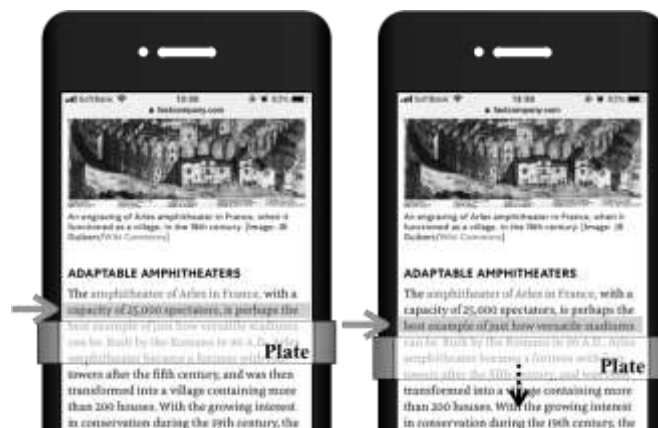

Figure 4: Reading Assistance Function

5.1.3 Evaluation experiment

We created a prototype device upon the proposal introduced in the previous section, and a simple questionnaire survey was carried out with 28 men and women in their 20s, who are digital natives. As a result, responses of a majority were positive about the functions. However, many people reported that they felt uncomfortable when they took a hold of the devices. There were also comments indicating that it was troublesome to apply the device to a smartphone and that the device looked easy to get lost.

6 Discussion

By using the proposed device, it is possible to prevent users' mistaps without absolutely hiding advertisements. The belt shape enables easy use for anyone because it is not tied to particular apps or terminals. It is necessary to reconsider the materials and to examine integrating the device with the smartphone case so that it would not get lost.

As for the problem to be solved with this device, it can be pointed out that the advertisement display needs to be designed not to give the user any stress during his or her normal use. This device can be easily removed. When the user does not need to block ads, he or she can remove and keep it. There are many types of smartphone accessories, from chargers to earphones, and because this belt-shaped device is the same size as those, the device size is not a major problem.

The essential point is how stressful the user is when using the device that covers the screen partially. Since the evaluation experiment targeted digital natives, it is necessary to conduct evaluation experiments for a wider range of age groups. However, from the perspective of preventing mistaps on advertising, it is clear that the stress of seeing the covered screen is less than the stress of selecting the appropriate function for each browser or application as tedious settings. With the conscious awareness of 'real feel', we suggested an external approach. This makes the device available to anyone, unlike complex applications. There are also advantages for content developers who publishes advertisements. If the advertisements are blocked completely, they would not be tapped at all and it means that the content developer is not paid commissions at the fair price. Avoiding this is significant, and users also have the advantage upon which they can get information from the advertisements that may interest them.

It is also important that the device can be applied on any digital content because of the form as an external device. A user can use the same device consistently without changing anything depending on browsers or applications. Furthermore, the external device that can be directly touched conveys 'tactile sensation' of using the device. We believe that this is a meaningful idea in the present age where the loss of 'real feel' is remarkable.

Thus, this paper focuses on 'tangible user experience', and the essential purpose of the research as a whole, is to set up an information system as a robust infrastructure that is easy to use for everyone.It should be noted that the approach to 'real feel' in this paper is proposed as one of the methods for the purpose.

7 Conclusion and Future Works

In this research, we demonstrated the current situation where 'realistic experience' has disappeared regarding digital interfaces in recent years and the problems, namely, the adverse effects on smartphones; low visibility of text lines and possibility of mistapping on advertisements. Based on this, we have proposed the device to prevent mistapping on advertisements that focuses on "physical sensation" This device was proposed as an external device, not as an application. Since the user can operate the device by directly touching, he or she can feel that they are actually using the device. In addition, the mistap prevention function is compatible with any devices and the proposed device can be used without being restricted by a specific browser or an application. A current major task is to keep the device not to impair the convenience of smartphones.

In the future, besides the function of mistapping prevention, it can be considered to use the device like a magnifying glass and change the color of the specified line. The combination use with a dedicated application is also possible. It is necessary to study the design to be integrated with the smartphone case and ease of the operation so that the device can be more user-friendly.

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