sMouse : A Development of the Analog Operability of Computer Mouse

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Abstract—Computer mouse have become necessary devices to use computers. There are many people who use external mice as the interfaces even today when it is common to carry laptop computers. It means that "Analog operability", to move a Mouse with hands, is suitable for a human being. However, today, a small laptop has various functions. In addition, the data is stored in the cloud service. From those reasons, to carry an external device is not suitable to today's lifestyle. Thereupon, we propose an application to turn smartphones as external mice. The goal is not the concept of IoT (Internet of Things), which suggests that various things should be connected to the Internet and be digitalized, but the concept that implement the analog tool or operability into the digital device or environment. Digital tools or environments have serious problems that those are stolen or copied easily. If the appearance or the operability is fundamentally unique, the similarity is quite obvious, and possibilities of being copied are low. Our aim is not only space saving of the mobile office, but also the attempt based on the idea of "design, which cannot be copied".

Keywords— *Computer Mouse, Track Pad, Human Interface, GUI, Interface Design, Interaction Design, Remote Mouse, Internet of Things, Smartphone Application*

I. INTRODUCTION

Since the computer mouse was implemented by Douglas Engelbart in 1968, it has become an indispensable device to operate a computer. Presently, there are a wide variety of mouse designs. Various types have been appearing depending on the purposes and the environments.

Normally, laptop computers have a track pad instead of a mouse. For that reason, there are not many scenes that necessarily need a mouse. However, there are many people who use external mice as interfaces even today when it is common to carry a laptop computer.

In recent years, performance of track pads, which are provided in laptop computers, has been improved rapidly. In other words, that fact that many people use external mice when

they use lap top computers means that the mouse is an optimized device for the use of the computers.

In other words, the analog operability is suitable for a human; when you move the device, which shapes a mouse with your hands, the cursor in the display is moved, to operate the computer actually.

However, today, the small laptops have various functions. In addition, every data is stored in the cloud service. Those technologies have generalized the mobile office environment. The number of the people who avoid carrying external devices is increasing. Although mice have great needs, to carry the external devices does not suit to modern lifestyles.

Thereupon, in this paper, we propose an app to turn the smartphone as an external mouse. The app provides the equivalent operability with the mouse without carrying the external device.
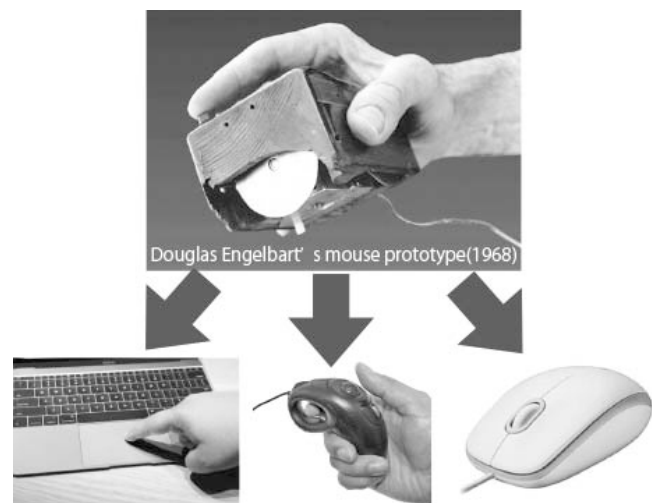

Fig 1. From Douglas Engelbart's mouse to various models

II. Purpose and Aim

Today, to enrich the mobile office environment without carrying many devices is expected in many scenes. Our proposal can respond to those expectations by the implement to substitute a smartphone app for the external device. We called this app "sMouse"

However, the purpose and the aim of this paper are not just to propose a useful app, which can save time and effort to carry a mouse. It is an attempt to reconsider an analog tool or operability, and to implement them to the latest mobile environment: smartphones that is carried with nearly 100% mobile probability.

The mouse, which is the subject of this research, is no exception. For example, there is a mouse, which has a sensor to monitor heart rate and record the data in a smartphone.

Our aim is not the practice of an idea of IoT, with which various things are connected to the Internet and digitalized.. In contrast, our aim is the practice of the idea to add an analog tool or operability to the digital device or environment. In this paper, specifically, we aim to incorporate physical and analog operability of mouse, as an application into the digital device: a smartphone.
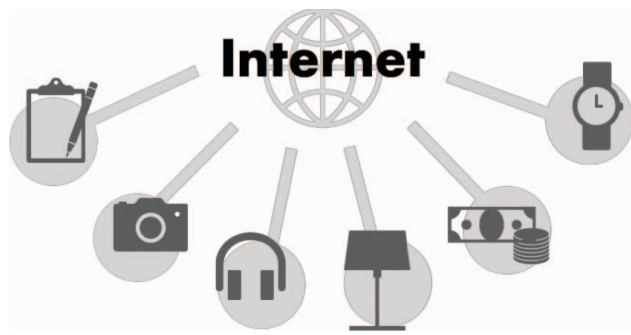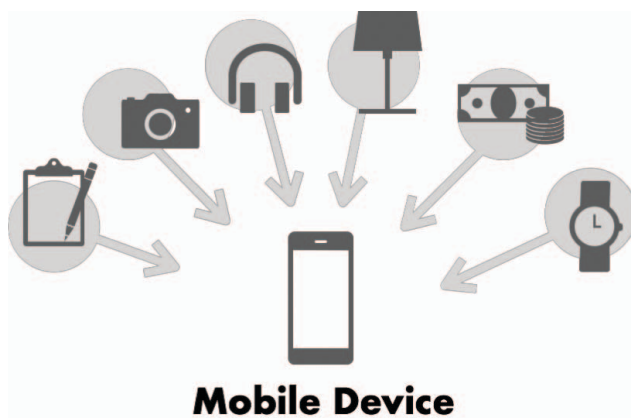

Fig 2. Image of defined in this paper

Fig 3. Image of incorporating analog tool into mobile device

III. Design to Prevent being from Copied

A. What is "easy to be copied"?

Digital tools or environments have serious problems that they are stolen and copied easily. If similarities are found out, it is often the case that someone says, "my idea is stolen".

However, "stealing" does not necessarily mean one definition. It is difficult to discern whether the similarity is illegal imitation or coincidental similarity. Of course, malicious stealing or obviously illegal copying is out of the question. In many cases, to pursue illegality is difficult. Unless the source code or the visual design was copied obviously, the similarities tend to be judged as just the result of inspiration or referencing.

In recent years, "pakuri (in this paper, it is defined as "taking" that cannot be said to be a crime in most of the context, but is the act which is not supposed to do by someone else in Japanese. It can sometimes mean a crime depending on the context)" problems including right or wrong discussion are occurring frequently regarding digital tools and environments.

That is because most of the similarities originates from internal program, and those similarities are difficult to notice intuitively. In the Internet society, various services of software are appearing. When one service gains popularity or starts spreading, many similar services and software appear. It is common that the service released later solves the problems of the preceding service, and acquires the reputation as a better service.

Of course, the services are protected by patents, but the similarities often develop to be a legal conflict including accusations. In many cases, recent new services or software on the Internet start from small ideas of individuals, and they rapidly develop to be a scale that cannot be managed at the individual level as you can see from the example of the origins of Facebook.

Because of this reason, they do not necessarily take procedures for patent applications in advance. In this way, it is difficult to keep away the new idea of mechanism or system from being copied.

B. What are "factors that is difficult to be copied"?

On the other hand, there are also things that are difficult to be copied. In this paper, we consider two possibilities as the factors that is difficult to be copied.

First, there is the visual design like a graphic design or formative design. Needless to say, the reason is simple. It is because everyone can see the obvious similarity in appearance intuitively.

Unlike internal systems or ideas, if superficial resemblance such as the visual or the operability is clear. It is hard to controvert or refuse the similarity because the similarity points are too obvious at a glance. Because there is the potential to be discovered as stealing easily, there are few people who actively seek to copy visual design.

Second, there are gimmicks or systems that users can experience with their senses. For example, we often see the

useful goods, like a suitcase that has a new lock-up system, or stationery that is easy to use. Regarding this factor,, like a visual design, the uniqueness is clear because the user can actually experience it with physical senses. If something with that factor is copied, it can be found out soon. From this reason, there are also few people who seek to copy things with the gimmicks or systems that users can experience with their senses.

Therefore, we suppose that the uniqueness of visual designs or interfaces and the gimmicks that users can experience with physical senses, increase the possibility to prevent themselves from being copied. Thus, the authors' experiment is the opposite of the IoT concept, which suggests various things connect to the Internet and be digitalized.

Our goal is not only space saving of mobile office, but also one of the attempts based on the concept: "the design that prevents being from copied".

IV. THE OUTLINE OF EXISTING MOUSE APP

In this section, we verify the existing mouse apps as the precedent or similar systems.

All mouse apps released currently are remote mouse app. mouse operation is far from the actual operation to move a physical mouse with hands. They suppose that the users give presentations, and the specific purpose is to operate a slideshow from a distance.

There are not apps to turn a smartphone into an external mouse with analog design and operability in our knowledge.

A. The outline of existing remote mouse app

To use the existing remote mouse apps, the user needs to install app for a smartphone and the dedicated software for a laptop computer. When the smartphone and the laptop computer are using the same Wi-Fi, the user can use the smartphone as a mouse.

The cursor in the computer display is controlled in conjunction with the touch on the touch screen of the smartphone. The operability is not a mouse, rather a remote track pad. In addition, if the user purchases the paid version, the apps can expand the range of functions to operate a power point or a music player.

However, any of the existing apps have no relationship with analog operability or convenience that a physical mouse has.

B. The characteristics of the existing remote mouse apps

1) Remote Mouse (Production company: Remote Mouse Development Team)
The most remarkable point in this app is the function called "Swing mode." It is the function that when the user moves smartphone from side to side and up and down, the cursor in the display also moves in conjunction with the user's moving. The function seems to assume the use like pointing the cursor at the computer display. It is not a function of our goal, because it is not designed to be used on the desk. However, if "up and down" is replaced with "back and forth", it is close to the app or our proposal.

However, the app's operability is extremely unfriendly to the users. Actually, to operate the mouse pointer with the track pad is better than to use "Swing mode."

2) Mobile Mouse Remote (Production company: RPA Technology)
The remarkable character of this app is that it is possible to set a password when connecting to Wi-Fi. The user doesn't need to worry that other people might be using his or her computer. Connection speed is also fast as compared to other applications. If the app requires connecting to Wi-Fi, consideration point like this is needed. Although, the limited operability to move the cursor is good, the operability of inputting characters is bad. To tap on the point where the user targets need some techniques. Also, it is hard to specify multiple characters. It is the app specialized for the presentations.

3) Remote: Mouse/Keyboard/Trackpad Free for PC/Mac (Production company: Benzle Inc.)
The one of the characteristics is the visual change function. The background on the touch pad of the mouse app can be changed to any of the images provided by the app. It is a unique function to the smartphone app, which cannot be provided with a physical remote mouse. However, the track pad part that the user can use like a mouse is very small because the character input pad is appeared in the bottom of the screen when the user taps on the part. Even if the user changes the background, it is hidden more than half. From this reason, this function cannot fully demonstrate its effect. From these three existing and similar apps, we got some hints for our app. There are also other remote Mouse apps, however none of them are practical as mice. It cannot be said that their operability is good, and it is more practical to use a track pad.

V. THE DESIGN OF SMOUSE

A. The outline of "sMouse"

In this section, we describe the sMouse in detail.

The operability and the design of our app, which turns a smartphone as an external mouse, are the same as ones of a physical mouse. That means, *"Something that can be controlled by holding with hands"*.

On the screen of the app, which is installed on the smartphone, a right and left click buttons and a scroll wheel is set by default like a mouse.

How to use is also same as a mouse. The user can control the cursor on the computer by moving the smartphone back and forth and around like a physical mouse. The app does not have any other function to operate power point or music player. It has a mouse function only. This is because mice we usually use do not have such functions.

Bluetooth is used for the connection to the computer. There are two reasons.
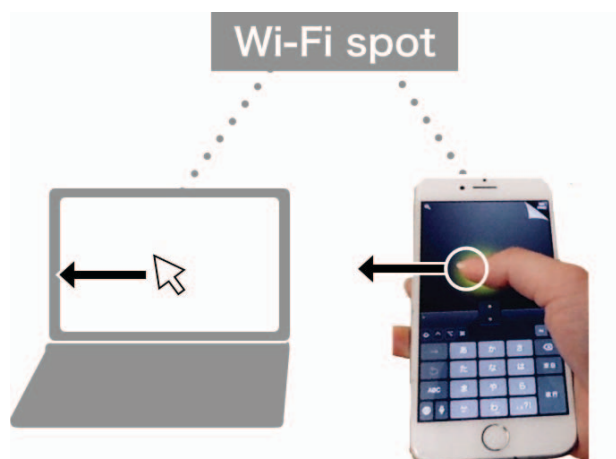
One is to prevent operations by other people who use the same app, as the situation is seen with the existing apps. The other is to enable the operation for the computer in

environments without Wi-Fi. Today, it has become common to carry computers.

However, it is not always the case that where one is going has Wi-Fi environment. Some cafés are supplying services for Wi-Fi environments. However, most of the case, the services requires charges.
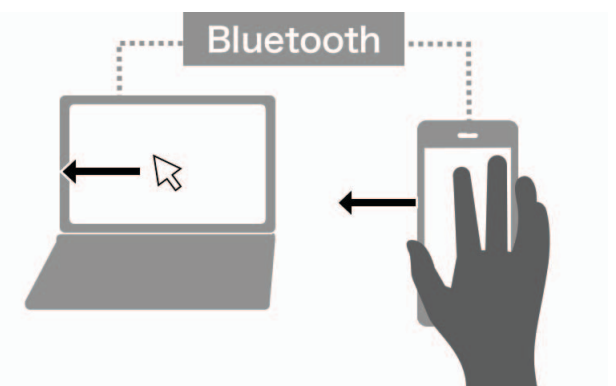
The app that we propose is different from the existing apps, which aim to provide remote control for the presentations. It presupposes that the distance between the computer and the mouse is close. Therefore, Bluetooth connection is better than Wi-Fi connection because of low price and functionality that works in any environment.

Fig 4 and *Fig 5* show the characteristics and the difference between the existing apps and the sMouse.

Fig 4. The use imate of existing remote mouse app

Fig 5. The use imate of our app; sMouse

Regarding the prototype app, we presuppose the use on iPhone, which is smartphone by Apple.

Its position information is got by the accelerometer, which is equipped on iPhones. Thus, the smartphones are turned to mice. The execution image of sMouse will be explained specifically below.

The prototype, which was proposed in this paper, was designed in the motif of a mouse device. If the user taps on the clicking part like a normal mouse, the user can perform click operation on the computer connected by Bluetooth. For replicating the feeling of clicking, if the manner mode is deactivated, the sound of "Clicking" is set up.

Fig 6 shows the app image. By tapping on the start button, the screen switches to the next screen.
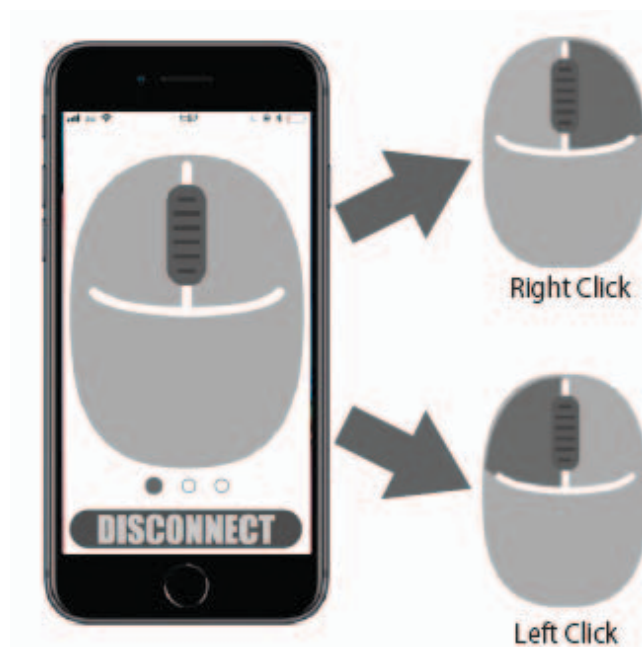

Fig 6. The Design of prototype sMouse

When the app is launched, and the user needs to tap on <CONNECT> button. Then, the smartphone will be connected to the computer that has recognized the smartphone in advance. In this mode, the user can use the smartphone as a mouse device. Fig. 10 shows the screen of the mouse mode.

If the user taps on a button of <DISCONNECT>, the connection is deactivated, and the screen will switch back to the previous screen.

Fig 7 shows the transition diagram of sMouse, Fig 8 shows execution of prototype app.
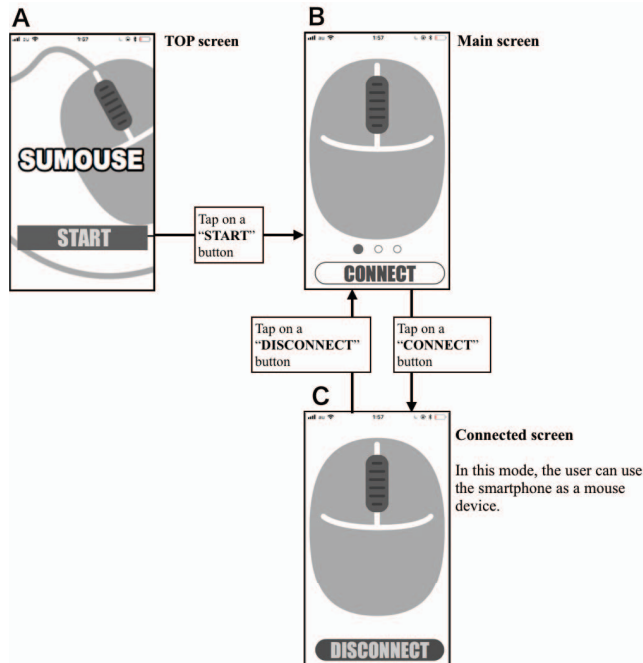
Fig 7. Transition diagram of sMouse

Design or operability of sMouse referred to the existing remote mouse apps in principal, and emphasized the "Analog" feeling for the use of a mouse. Of course, this design is a tentative idea. We need consideration of the usability and the benefit through the design comparison and the subject experiments as future issues.

Fig 8. Prototype of sMouse (1)

Fig 9. Prototype of sMouse (2)

VI. CONCLUSION

In this paper, we took references [2] one step further with including correction and revision contents, we proposed an app that turns a smartphone as an external mouse.

Although the track pad is in progress, there are many users who want the operability of mice, and many wireless mice are commercialized in the current situation. In addition, almost all the business parsons have a smartphones.

The app that combines the wireless mouse with the smartphone will save a space of the mobile office and great needs can be expected. For further improvement of operability, we would like to approximate the operability of the actual mouse by the subject experiment.

Also, we proposed the concept to incorporate the analog tool into the digital tool. In the production society, which is complicated and saturated, it is very modern to make lifestyles simpler. The unique visual design or the interface makes difficult to produce counterfeit products, and it can also prevent being from copied.

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