Proposal and Development of Markers-type Mouse System with Considering Practical and Entertainment

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Abstract - We proposed the new mouse interface that does not need operation restrictions of the existing mouse, and developed the prototype system. Our mouse system was developed using Augmented Reality Technology. This system attaches a mouse function to the marker attached to the object, makes a computer recognize it, and operates. All the things that attached the marker with a mouse function by this system can be used as a mouse interface. As a result, we realized the mouse interface system that does not have restrictions in mouse operation.

Keywords: Marker, Augmented Reality technology, Mouse interface, Mouse function

1 Introduction

Currently, the computer has spread to a home as a tool useful for anyone. In the background, there is development of the user interface for computer operation. Moreover, a mouse interface is famous also in a user interface. As a large factor, there is existence of the mouse interface developed by Douglas Engelbart in 1961.

After a mouse interface is invented, various mouse interfaces in consideration of convenience, a design, etc. have been developed. A mainstream mouse interface has three functions, “Left-click”, “Right-click” and “Cursor movement”. Currently, a mouse interface with these three functions is in use. Moreover, the mouse of an elliptical form called “two Button type” with a minimum function for controlling a computer is general. The design and structure of the "two Button type" are being fixed as a “form” of today's mouse interface.

However, the environment and the purpose of a computer are also diversified in recent years. Therefore, as for the interface for computer operation, diversification is demanded. Still now, various mouse interfaces are proposed and developed.

In this paper, we propose the new mouse system with a different concept by using the Augmented Reality Technology, and develop a prototype system.

In the prototype system developed by this study, the "marker" to which the function of the mouse was attached is used. By using this marker, even if there is no existing mouse, the function of a mouse is realizable. Moreover, if it is a thing that can attach a marker, it is utilizable as a mouse. As a result, a user's favorite thing can also be utilized as a mouse.

2 Purpose of Study

A mouse in recent years is divided into two classifications. First, it is a mouse operated using rotation of a trackball. Second, it is a mouse that makes the bottom of a mouse possess LED, is made to reflect LED in a plane floor etc., and is operated.

Although the mouse that LED possesses on the bottom in recent years is in use, the operation method is mentioned as the reason. When cursor operation is considered, with the mouse of a trackball, a ball is rotated in person. Therefore, precise operation cannot be performed if the hand of cut and moderate rotation is not taken into consideration. When it is the mouse that LED possesses on the bottom to it, the same motion as a direction to move on a flat place is performed. By that, there is an advantage that can perform cursor movement easily satisfactorily. However, when a flat place does not exist, there is a danger that operation is impossible. Moreover, while the use environment of a computer is diversified, the form of the interface used for the operation is also asked for diversity. But, a sufficient proposal or development is not necessarily made.

So, we aim at the interface that does not need restriction of the existing mouse interface. In order to realize this aim, we used the marker of Augmented Reality Technology. We propose the new mouse interface that uses the marker of extended actual feeling technology and makes computer operation possible. In addition, based on the proposed interface, and we develop a prototype system.
3 Background of Study

The mainstream of the present computer operation is a mouse interface. However, the present mouse interface requires a flat place. Moreover, in the track pad type of a notebook computer, operation area is narrow, and it is not fit for efficient operation. Furthermore, use becomes difficult when there is no place for placing a trackball type mouse interface. Currently, there are restrictions that a flat place is required for the mouse interface proposed and offered. Therefore, although restrictions of a mouse interface are not needed, the new mouse interface with a basic function can predict diversification. Then, we thought that there was big interest in a new mouse interface.

4 Summary of System

In this system, not using the existing mouse interface, the new mouse interface that conquers the fault of a mouse interface is realized. As the method, we propose the system that sticks a "marker" on a familiar thing and as which it operates it as a mouse interface. From this, it becomes possible to use mouse function even if there is no existing mouse interface. Moreover, the new mouse interface that does not need the flat place that is a fault of the existing mouse interface is realized.

The outline of this system is described below. In this system, the function of a mouse interface is given to a marker, and even if there is no existing mouse interface, the function of a mouse interface is realized. Augmented Reality Technology is used for giving the function of a mouse interface to a marker. Augmented Reality Technology recognizes the marker with the Web camera attached to a computer. Therefore, if it is a computer with a camera function, it can use also by a general computer. Augmented Reality Technology can display three-dimensional graphics, if a marker can be recognized with a camera. The marker of Augmented Reality Technology has two processing. It is “when recognize” and “when cannot recognize”. This system the function of a mouse interface is realized using this processing.

In addition, when the functions of a common mouse interface is considered, there are three functions, “Left-click”, “Right-click” and “Cursor movement”. The functions realized by this system are these three functions.

4.1 Marker Attached Mouse Functions

This system realizes a mouse function with the marker of Augmented Reality Technology. It is operated by processing “when recognize” and “when cannot recognize”. In addition, when considering the minimum function of a mouse, there are six functions “Left-click”, “Right-click”, “Movement on cursor”, “Movement under cursor”, “Movement left cursor” and “Movement right cursor”. Therefore, the six markers for them are needed.
5.2 Mouse Cursor Movement Operation

Four markers of the lower berth of Figure 1 were used for cursor movement.

A case of cursor movement operation, “When cannot recognize” has nothing happen. And, “When cannot recognize” cursor movement is performed. The operation procedure of the cursor movement is shown below.

1. The cursor movement marker cannot be recognized from the camera. (Cursor move stop)
2. The cursor movement marker can be recognized. (Cursor move start)
3. The cursor movement marker cannot be recognized from the camera again. (Cursor move stop)

At this time, if a marker can be recognized, it can attach anywhere. For example, it is a PET bottle, a writing case, and a purse etc. If a marker can attach, anything can realize the function of a mouse. Figure 3 shows one example of “Extempore mouse interface” used to experiment. These were able to use a minimum function of the mouse.

![Figure 3](image1.png)

(a) (b) (c) (d)

Figure 3. Example of “Extempore mouse interface” (a)empty can, (b)Plastic bottle, (c)book, (d)mobile phone

6 Example of System Operation Procedures

In this system, by attaching the marker in which the function of the mouse is incorporated, anything can be used as a mouse. As the example of operation of this prototype system, “Unnecessary box” was used. Of course, even if this is not “Unnecessary box”, if a marker can be attached, it can use anything.

The example of operation is described below. As an example, operation of starting “Internet Explorer” on a desktop is performed. Usually, in order to start a browser, it carries out at the following three steps.

1. A cursor is moved to on an icon.
2. Double-click the left click of mouse.
3. The browser start.

Therefore, this system also needs to perform same operation. A cursor movement marker is attached on an “Unnecessary box” and a mouse click marker is arranged. In this stage, “Unnecessary box” serves as an interface with a mouse function.

First, the “Unnecessary box” that stuck the marker so that it might be visible from a camera is arranged. Next, a cursor movement marker is made to recognize and a cursor is moved. The actually used box is shown in Figure 4, and a system startup state is shown in Figure 5. In addition, the three-dimensional graphics currently displayed on Figure 5 is graphics of a fundamental quadrangle. These graphics are made intelligible in an experiment. Of course, the graphics in consideration of entertainment, etc. can be changed freely.

![Figure 4](image2.png)

Figure 4. Example which attached the marker of the mouse function on the “Unnecessary box”

![Figure 5](image3.png)

Figure 5. Example of starting of the whole system
Next, if movement of a cursor is completed, it prevents from recognizing a mouse click marker with a finger etc. Then, the click Operated and “Internet Explorer” starts.

8 Problem Point

8.1 Problem of Cursor Movement operation

This In this system, in realizing the function of mouse interface by a marker, six minimum functions were mounted “Left Click”, “Right Click”, “Up Move”, “Down Move”, “Left Move”, and “Right Move”. As a result, the cursor movement has been fixed vertically and horizontally. That is the problem that nonlinear movement cannot be performed has occurred.

8.2 Problem of Click operation

In The problem that should improve also about click operation remained. The marker designed the system that performs click operation, “cannot be recognized”. As a result, if recognition of a marker becomes impossible in some accidents, an error may occur. In addition, when the state where a marker cannot be recognized continues, there is a problem that malfunction of click operation generates. We would like to consider it as a future examination subject.

9 Relevant study and Similar Study

In this study, there is ARDesktop as related study. ARDesktop is the three-dimensional graphics library that applied ARtoolkit and was manufactured. If the graphics of a marker are touched in the graphics currently displayed, operation corresponding to it will be performed. Moreover, it is possible to operate it so that using two or more markers may hold graphics.

There is a mouse interface of OZUPAD as similar study. Incorporated Company Blue Mouse Technology developed OZUPAD. OZUPAD is a multifunction mouse interface that can operate not only as the function of a mouse interface bus as a joystick and the presentation function also has. Moreover, it is wireless, and it can be operate even if there is no flat place like this study.

In this study, the proposal and the prototype were performed based on the concept of “realizing the function of a mouse interface using a marker not using the existing mouse interface.” However such a mouse system exists in neither the existing study nor similar study, so it is thought that novelty is high.
10 References


