United States Patent Application Publication	20250258550
Kind Code	A1
Publication Date	August 14, 2025
Inventor(s)	Kai; Keisuke

KEYBOARD DEVICE, CONTROL METHOD, AND NON-TRANSITORY RECORDING MEDIUM

Abstract

A keyboard device includes a key switch corresponding to a character, a plurality of touchpads, a memory to store mapping information, a communication interface to communicate with an information processing apparatus, and circuitry. In the mapping information, a code to be output to the information processing apparatus is set for each combination of operations on the plurality of touchpads. When a combination of operations on the plurality of touchpads is received, the circuitry identifies a code corresponding to the combination of operations on the plurality of touchpads based on the mapping information and outputs the identified code to the information processing apparatus via the communication interface.

Inventors:	**Kai; Keisuke (Kahoku-shi, JP)**
Applicant:	**PFU LIMITED** (Kahoku-shi, JP)
Family ID:	**1000008560350**
Appl. No.:	**19/192184**
Filed:	**April 28, 2025**

Foreign Application Priority Data

JP	2023-097938	Jun. 14, 2023

Related U.S. Application Data

parent US continuation 18740202 20240611 parent-grant-document US 12326982 child US 19192184

Publication Classification

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This is a continuation application of U.S. patent application Ser. No. 18/740,202, filed Jun. 11, 2024, which claims priority and benefit to pursuant to 35 U.S.C. § 119(a) to Japanese Patent Application No. 2023-097938, filed on Jun. 14, 2023, in the Japan Patent Office, the entire disclosure of which is hereby incorporated by reference herein.

BACKGROUND
[0002] Embodiments of the present disclosure relate to a keyboard device, a control method, and a non-transitory recording medium.
[0003] Currently, various types of keyboard devices have been developed. In such a keyboard device, enhancing user convenience is desired.
[0004] A portable image display device provided with multiple touch sensors along the outer periphery of a display screen is disclosed.
SUMMARY
[0005] According to an embodiment, a keyboard device includes a key switch corresponding to a character, a plurality of touchpads, a memory to store mapping information, a communication interface to communicate with an information processing apparatus, and circuitry. In the mapping information, a code to be output to the information processing apparatus is set for each combination of operations on the plurality of touchpads. When a combination of operations on the plurality of touchpads is received, the circuitry identifies a code corresponding to the combination of the operations on the plurality of touchpads based on the mapping information and outputs the identified code to the information processing apparatus via the communication interface.
[0006] According to an embodiment, a control method includes storing mapping information in which a code to be output to an information processing apparatus is set for each combination of operations on a plurality of touchpads in a memory, and when a combination of operations on the plurality of touchpads is received, identifying a code corresponding to the combination of the operations on the plurality of touchpads based on the mapping information and outputting the identified code to the information processing apparatus via a communication interface.
[0007] According to an embodiment, a non-transitory recording medium storing a plurality of instructions which, when executed by one or more processors, causes the processors to perform a method. The method includes storing mapping information in which a code to be output to an information processing apparatus is set for each combination of operations on a plurality of touchpads in a memory, and when a combination of operations on the plurality of touchpads is received, identifying a code corresponding to the combination of the operations on the plurality of touchpads based on the mapping information and outputting the identified code to the information processing apparatus via a communication interface.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0008] A more complete appreciation of embodiments of the present disclosure and many of the

attendant advantages and features thereof can be readily obtained and understood from the following detailed description with reference to the accompanying drawings, wherein:

[0009] FIG. **1** is a perspective view of an input device according to an embodiment;

[0010] FIG. **2** is a top view of the input device;

[0011] FIG. **3** is a schematic block diagram illustrating a configuration of an input device according to an embodiment;

[0012] FIG. **4** is a schematic diagram illustrating an example of a data structure of a mapping table included in mapping information according to an embodiment;

[0013] FIG. **5** is a schematic diagram illustrating an example of a data structure of an operation table according to an embodiment;

[0014] FIG. **6** is a schematic block diagram illustrating a configuration of a storage device and a processing circuit according to an embodiment;

[0015] FIG. **7** is a flowchart illustrating an example of a control process according to an embodiment;

[0016] FIG. **8** is a flowchart illustrating an example of a control process according to an embodiment;

[0017] FIG. **9** is a flowchart illustrating an example of a control process according to an embodiment; and

[0018] FIG. **10** is a schematic block diagram illustrating a configuration of another processing circuit according to an embodiment.

[0019] The accompanying drawings are intended to depict embodiments of the present disclosure and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted. Also, identical or similar reference numerals designate identical or similar components throughout the several views.

DETAILED DESCRIPTION

[0020] In the descriptions of embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that have a similar function, operate in a similar manner, and achieve a similar result.

[0021] Referring now to the drawings, embodiments of the present disclosure are described below. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0022] A keyboard device, a control method, and a control program according to embodiments of the present disclosure are described below with reference to the drawings. The technical scope of the present disclosure is not limited to the embodiments described below and covers equivalents of elements described below. Thus, numerous additional modifications and variations are possible in light of the above teachings.

[0023] FIG. **1** is a perspective view of an input device **100** according to an embodiment.

[0024] FIG. **2** is a top view of the input device **100**.

[0025] In FIG. **1**, an arrow A**1** indicates the substantially vertical direction (the height direction of the input device **100**). In FIG. **1** and FIG. **2**, an arrow A**2** indicates the longitudinal direction (width direction) of the input device **100** that is perpendicular to the height direction, and an arrow A**3** indicates the transverse direction (depth direction) of the input device **100** that is perpendicular to both the height and width directions.

[0026] The input device **100** is an example of a keyboard device. The input device **100** receives an input operation performed by a user and outputs an operation signal corresponding to the input operation to an information processing apparatus (for example, a personal computer or a portable information terminal) electrically connected to the input device **100**.

[0027] The input device **100** includes a housing **101**, multiple key switches **102**, multiple buttons

103, a mouse pointer **104**, and multiple touchpads **110**. The multiple key switches **102**, the multiple buttons **103**, the mouse pointer **104**, and the multiple touchpads **110** are arranged on the housing **101**. The housing **101** does not include a display.

[0028] The multiple key switches **102** are arranged on the upper face of the housing **101**. The multiple key switches **102** are keys having physical key tops. The multiple key switches **102** correspond to, for example, symbols or alphanumeric characters and are used to input them. The multiple key switches **102** include special keys for performing special operations. Examples of the special keys include Function keys, a Ctrl key, a Shift key, an Alt key, a WINDOWS (registered trademark) key, and Command keys.

[0029] The multiple buttons **103** are arranged from the upper face to the front side of the housing **101**. The multiple buttons **103** can have functions similar to the functions of a left button, a right button, and a wheel button included in a standard three-button mouse. The multiple buttons **103** can have other functions used in a standard input device. In the following description, the multiple buttons **103** may collectively or individually be referred to as buttons **103** or button **103**.

[0030] The mouse pointer **104** is arranged on the upper face of the housing **101**. The mouse pointer **104** is disposed at a position relative to the position of the buttons **103**, taking into account being operated in conjunction with one or more of the buttons **103**. For example, the mouse pointer **104** is disposed at a position overlapping the buttons **103** in the width direction A**2**. Thus, the mouse pointer **104** is disposed at a position overlapping the buttons **103** in the depth direction A**3** when viewed from the width direction A**2**. The mouse pointer **104** is used to designate an input position or coordinates on a screen of the information processing apparatus to which the input device **100** is connected.

[0031] The touchpad **110** includes touchpads **110***a* to **110***d*. In the following description, each of the touchpads **110***a* to **110***d* may individually be referred to as touchpad **110** when there is no need to distinguish between the touchpads **110***a* to **110***d*. Further, the touchpads **110***a* to **110***d* may collectively be referred to as touchpad **110** or touchpads **110**. The touchpad **110***a* is arranged on the left portion of the front side of the housing **101**, and the touchpad **110***b* is arranged on the left side of the housing **101**. The pair of the touchpad **110***a* and the touchpad **110***b* is an example of a plurality of touchpads, and is an example of a pair of a first touchpad and a second touchpad, the second touchpad is different from the first touchpad. The touchpad **110***c* is arranged on the right portion of the front side of the housing **101**, and the touchpad **110***d* is arranged on the right side of the housing **101**. The pair of the touchpad **110***c* and the touchpad **110***d* is another example of a plurality of touchpads, and is another example of a pair of the first touchpad and the second touchpad.

[0032] The touchpad **110** is arranged along a side of the housing **101**. The touchpad **110** is a capacitive or pressure-sensitive touchpad. The touchpad **110** includes one or more sensors to detect a touch of a user. When the touchpad **110** includes multiple sensors, the sensors are arranged along a side of the housing **101**. Each sensor of the touchpad **100** outputs a detection signal that varies according to the detection status of the sensor. When the detection status of any sensor of the touchpad **110** changes, the touchpad **110** outputs an operation signal including the position and the detection signal of the sensor. The input device **100** detects a user operation (gesture) performed on the touchpad **110** based on the position of a sensor that has detected a touch of a user, the signal value of the detection signal, and the change in the position and the signal value over time. For example, when the signal value of the detection signal of any of the sensors is equal to or greater than a predetermined threshold value, the input device **100** detects a touch operation at the position of the sensor. When the signal value of the detection signal of a sensor that has detected the touch operation becomes equal to or less than the predetermined threshold value and when the signal value of the detection signal of another sensor adjacent to the sensor that has detected the touch operation becomes equal to or greater than the predetermined threshold value, the input device **100** detects a slide operation in a direction to the adjacent sensor from the sensor that has detected the

touch operation prior to the adjacent sensor.

[0033] The touchpad **110** can have a gesture function for outputting a signal corresponding to an operation such as a slide (swipe), a flick, a tap, a double tap, a press, or a long press. The touchpad **110** is used to perform various actions such as vertical scrolling, horizontal scrolling, zooming in, zooming out, and rotation of an object on a screen displayed on the display of the information processing apparatus to which the input device **100** is connected.

[0034] The pair of the touchpads **110***a* and **110***b* or the pair of the touchpads **110***c* and **110***d* may be omitted. Alternatively, one of the touchpads **110***a*, **110***b*, **110***c*, and **110***d* may be omitted.

[0035] FIG. **3** is a schematic block diagram illustrating a configuration of the input device **100** according to an embodiment. The input device **100** further includes an operation signal receiving circuit **120**, a communication device **130**, a storage device **140**, a processing circuit (processing circuitry) **150**, etc. in addition to the above-described components.

[0036] The operation signal receiving circuit **120** receives operation signals corresponding to input operations performed by the user from the multiple key switches **102**, the multiple buttons **103**, the mouse pointer **104**, and the touchpad **110** and transmits the operation signals to the processing circuit **150**.

[0037] The communication device **130** is an example of a communication interface that functions as a communication unit for communicating with the information processing apparatus. The communication device **130** includes an antenna that transmits and receives wireless signals, and a wireless communication interface circuit that transmits and receives signals to and from the information processing apparatus through a wireless communication line according to a predetermined communication protocol. The predetermined communication protocol is, for example, a wireless communication protocol using BLUETOOTH (registered trademark) or the Institute of Electrical and Electronics Engineers (IEEE) 802.15. The input device **100** may include an interface circuit compatible with a serial bus such as a universal serial bus (USB) instead of the communication device **130**, and may be connected to the information processing apparatus with wire to transmit and receive signals.

[0038] The storage device **140** is an example of a memory. The storage device **140** includes, for example, a memory device such as a random access memory (RAM) and a read-only memory (ROM). The storage device **140** stores, for example, computer programs, databases, and tables used for various processes performed by the input device **100**. The computer programs may be installed in the storage device **140** from a computer-readable portable recording medium using, for example, a known setup program. The portable recording medium is, for example, a compact disc read-only memory (CD-ROM) or a digital versatile disc read-only memory (DVD-ROM). The computer programs may be distributed from a server and installed in the storage device **140**. The storage device **140** further stores mapping information and an operation table as data. Details of the mapping information and the operation table are described later.

[0039] The processing circuit **150** operates according to a program pre-stored in the storage device **140**. The processing circuit **150** is, for example, a central processing unit (CPU). Alternatively, a digital signal processor (DSP), a large-scale integration (LSI), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), etc. may be used as the processing circuit **150** instead of a CPU. The processing circuit **150** is connected to the operation signal receiving circuit **120**, the communication device **130**, the storage device **140**, etc., and controls them. The processing circuit **150** acquires operation signals from the multiple key switches **102**, the multiple buttons **103**, the mouse pointer **104**, and the touchpads **110** via the operation signal receiving circuit **120**. The processing circuit **150** converts the acquired operation signals into electrical signals, which will be output from the communication device **130** and processed by the information processing apparatus, and transmits the electrical signals to the information processing apparatus via the communication device **130**.

[0040] FIG. **4** is a schematic diagram illustrating a data structure of a mapping table in mapping

information according to an embodiment.

[0041] As illustrated in FIG. **4**, in the mapping table, output information is assigned for each of the operations on the multiple key switches **102**, the multiple buttons **103**, and the touchpad **110**.

[0042] The operation on the key switch **102** is pressing the key switch **102**, and the operation on the button **103** is pressing the button **103**. The operation on the touchpad **110** includes, operations corresponding to a slide (swipe), a flick, a tap, a double tap, a press, a long press, etc. The details of operations on the touchpad **110** are defined in an operation table.

[0043] The output information is information to be output to the information processing apparatus when an operation is performed. The output information is a code corresponding to an operation on the key switch **102**, the button **103**, the touchpad **110**, or a combination of these. In other words, when an operation is performed, a code corresponding to the operation is output as output information. The code is a numerical sequence predetermined between the input device **100** and the information processing apparatus. The code functions as a command for causing the information processing apparatus to execute a corresponding action. The action includes vertical scrolling, horizontal scrolling, zooming in, zooming out, rotation of an object on a screen displayed on the display of the information processing apparatus.

[0044] The operation on the mouse pointer **104** is applying a force to the mouse pointer **104** in a predetermined direction. The output information of an operation performed on the mouse pointer **104** is movement information corresponding to the operation (a direction in which the force is applied and the strength of the force). The movement information indicates, the direction, the amount of pointer movement, etc. The movement information is information for moving an object such as a cursor displayed on the display of the information processing apparatus. The movement information functions as a command for causing the information processing apparatus to execute a corresponding action.

[0045] In the mapping table of the mapping information, a combination of multiple operations is also assigned with output information. The combination of operations includes a combination of operations on a plurality of touchpads, and a combination of operations on the plurality of touchpads and an operation on a special key of the multiple key switches **102**.

[0046] In the following description of embodiments, a combination of operations on a plurality of touchpads to which an output information is assigned in the mapping information, that is, a combination of operations on both the touchpad **110***a* and the touchpad **110***b* or both touchpad **110***c* and the touchpad **110***d*, may be referred to as a combined operation. Further, a combination of operations on a plurality of touchpads and an operation on a special key to which output information is assigned in the mapping information, that is, a combination of the operation on the special key and the operations on both the touchpad **110***a* and the touchpad **110***b* or both the touchpad **110***c* and touchpad **110***d*, may also be referred to as a combined operation. The combined operations include a pinch operation and a rotation operation achieved by slide operations on the plurality of touchpads. The combined operation may be a combination of any operations including a slide operation, a flick operation, a tap operation, a double tap operation, a press operation, a long press operation, etc. on the plurality of touchpads.

[0047] By contrast, an operation on a single touchpad, that is, an operation on the touchpad **110***a*, **110***b*, **110***c*, or **110***d* alone, to which output information is assigned in the mapping information, may be referred to as a single operation. Further, a combination of an operation on a single touchpad and an operation on a special key, that is, a combination of an operation on one of the touchpad **110***a*, the touchpad **110***b*, the touchpad **110***c*, and the touchpad **110***d* and an operation on a special key to which output information is assigned in the mapping information may also be referred to as a single operation. The single operation is, for example, a slide (swipe) operation. The single operation may be any operation such as a flick operation, a tap operation, a double tap operation, a press operation, and a long press operation.

[0048] In the following description of embodiments, an operation on each of the multiple key

switches **102** may be referred to as a key operation, an operation on each of the multiple buttons **103** may be referred to as a button operation, and an operation on the mouse pointer **104** may be referred to as a pointer operation.

[0049] The combination of the touchpad **110***a* arranged on the left portion of the front side of the housing **101** and the touchpad **110***b* arranged on the left side of the housing **101** is an example of a combination of a plurality of touchpad. Further, the combination of the touchpad **110***d* arranged on the right portion of the front side of the housing **101** and the touchpad **110***b* arranged on the right side of the housing **101** is also an example of a combination of a plurality of touchpads. In other words, in the present embodiment, the plurality of touchpads indicates either the pair of touchpads arranged adjacent to the left front corner of the housing with the left front corner in between the pair of touchpads or the pair of touchpads arranged adjacent to the right front corner of the housing with the right front corner in between the pair of touchpads. Because a code is set for each of combined operation on each pair of touchpads, a user can easily perform a predetermined action to the information processing apparatus with his or her left hand or right hand alone. As a result, the input device **100** can enhance user convenience.

[0050] Further, because a code is assigned to a combined operation of a combination of operations on a plurality of touchpads and an operation on a special key, the user can easily perform various actions to the information processing apparatus by operating only the input device **100** without using other devices. As a result, the input device **100** can enhance user convenience.

[0051] As described above, the operations, each of which is assigned with the output information in the mapping information, may include an operation corresponding to a combination of an operation on a single touchpad of the touchpads **110** and an operation on a special key of the multiple key switches **102**. Further, the operations, each of which is assigned with the output information in the mapping information, do not include an operation on a special key alone. As a result, the input device **100** can have a special key with a conversion function so that when the special key is operated in combination with another operation, output information different from the output information assigned to said another operation is output.

[0052] The storage device **140** may store mapping information including a plurality of mapping tables each of which corresponds to one of a plurality of information processing apparatuses of different types, with different operating systems (OSs), etc. In this case, output information assigned to the same operation varies depending on the mapping table. Details of a changing operation for changing the mapping tables (components to be operated and operations to be performed on the components) are stored in the storage device **140**.

[0053] FIG. **5** is a schematic diagram illustrating an example of a data structure of the operation table according to an embodiment.

[0054] As illustrated in FIG. **5**, the operation table defines the details of operations performable on the touchpad **110**. In the operation table, for each operation can be performed on the touchpad **110**, operation direction on the touchpad **110**, duration of contact with the touchpad **110**, frequency of contact with the touchpad **110**, area of contact with the touchpad **110**, the number of contact areas on the touchpad **110**, etc. are stored in association with each other. In other words, the operations on the touchpad **110** are distinguished based on one of the operation direction on the touchpad **110**, the duration of contact with the touchpad **110**, the frequency of contact with the touchpad **110**, the area of contact with the touchpad **110**, and the number of contact areas on the touchpad **110**. The operations on the touchpad **110** may be distinguished based on at least one of the operation direction, the duration of contact, the frequency of contact, the area of contact, and the number of contact areas, rather than based on all of them.

[0055] The input device **100** can support a large number of types of operations on the touchpad **110** by defining the operations using various parameters.

[0056] FIG. **6** is a schematic block diagram illustrating a configuration of the storage device **140** and the processing circuit **150** according to an embodiment.

[0057] As illustrated in FIG. **6**, the storage device **140** stores a control program **141** etc. The programs are functional modules implemented by software operating on processors. The processing circuit **150** reads a program from the storage device **140** and operates according to the read program to function as a control unit **151**.

[0058] FIGS. **7**, **8**, and **9** are flowcharts illustrating examples of control processes executed by the input device **100**. The control process is executed mainly by the processing circuit **150** in cooperation with one or more of the components in the input device **100** according to the program pre-stored in the storage device **140**.

[0059] First, the control unit **151** waits until an operation signal is acquired (step S**101**). When any one of components (the key switch **102**, the button **103**, the mouse pointer **104**, and the touchpad **110**) receives an operation, the component outputs an operation signal corresponding to the operation to the operation signal receiving circuit **120**. When receiving the operation signal from the component, the operation signal receiving circuit **120** converts the received operation signal into a predetermined format and outputs the converted operation signal to the processing circuit **150**. The operation signal includes information indicating the component to which the operation has been performed and the type of the operation on the component.

[0060] When receiving multiple operation signals from multiple components within a sufficiently short period of time, the operation signal receiving circuit **120** may combine the received multiple operation signals into one and output to the processing circuit **150**. Further, when the control unit **151** receives multiple operation signals from the operation signal receiving circuit **120** within a sufficiently short period of time, the control unit **151** may process the received multiple operation signals collectively.

[0061] Subsequently, the control unit **151** determines whether the operation indicated by the acquired operation signal is a changing operation (Step S**102**).

[0062] When the operation indicated by the operation signal is a changing operation, the control unit **151** identifies a mapping table that corresponds to the changing operation from the storage device **140** and changes the mapping table currently used to the identified mapping table (Step S**103**). Then, the process returns to Step S**101**. As described above, the control unit **151** changes the mapping table in response to a user request. As a result, the input device **100** can change the mapping table according to the type or the OS of the information processing apparatus connected to the input device **100** and can support various information processing apparatuses accordingly.

[0063] When the operation indicated by the operation signal is not a changing operation in Step S**102**, the control unit **151** determines whether the operation indicated by the operation signal is a single operation on a single touchpad (Step S**104**). The control unit **151** refers to the mapping table and the operation table stored in the storage device **140**, and determines whether the operation indicated by the operation signal is a single operation to which output information is assigned in the mapping table.

[0064] When the operation signal indicates a single operation, the control unit **151** determines whether the current operation status of the input device **100** is a combined operation status (Step S**105**). The combined operation status indicates that the input device **100** is outputting a code assigned to a combined operation. The operation status is set to the combined operation status from when a combined operation is performed until an end condition of the combined operation is satisfied. When the operation status is a combined operation status, the control unit **151** determines that the previous combined operation is ongoing, and discards the operation signal without outputting a code assigned to the single operation indicated by the operation signal (Step S**106**). Then, the control unit **151** returns the process to Step S**101**.

[0065] On the other hand, when the operation status is not a combined operation status, the control unit **151** determines whether the operation status is a single operation status of another touchpad that is different from the touchpad that has received the operation and indicated by the operation signal (Step S**107**). For example, when the touchpad that has received the operation is the touchpad

110*a*, another touchpad is one of the touchpads **110***b*, **110***c*, and **110***d*. The single operation status is a status where the input device **100** is outputting a code assigned to a single operation. The single operation status of another touchpad is a status in which the input device **100** is outputting a code assigned to a single operation performed on said another touchpad. The single operation status is set to the operation status from when a single operation is performed until an end condition of the single operation is satisfied. When the operation status is a single operation status of another touchpad, the control unit **151** determines that the previous single operation is ongoing, and discards the operation signal without outputting a code assigned to the single operation indicated by the operation signal (Step S**106**). Then, the control unit **151** returns the process to Step S**101**.

[0066] On the other hand, when the operation status is not a single operation status of another touchpad, the control unit **151** determines whether the operation status is a key operation status (Step S**108**). The key operation status is a status where the input device **100** is outputting a code assigned to a key operation. The key operation status is set to the operation status from when a key operation is performed until an end condition of the key operation is satisfied. When the operation status is a key operation status, the control unit **151** determines that the previous key operation is ongoing, and discards the operation signal without outputting a code assigned to the single operation indicated by the operation signal (Step S**106**). Then, the control unit **151** returns the process to Step S**101**.

[0067] On the other hand, when the operation status is not a key operation status, the control unit **151** determines whether the operation status is a button operation status (Step S**109**). The button operation status is a status where the input device **100** is outputting a code assigned to a button operation. The button operation status is set to the operation status from when a button operation is performed until an end condition of the button operation is satisfied. When the operation status is a button operation status, the control unit **151** determines that the previous button operation is ongoing, and discards the operation signal without outputting a code assigned to the single operation indicated by the operation signal (Step S**106**). Then, the control unit **151** returns the process to Step S**101**.

[0068] On the other hand, when the operation status is not a button operation status, the control unit **151** determines whether the operation status is a pointer operation status (Step S**110**). The pointer operation status is a status where the input device **100** is outputting movement information assigned to a pointer operation. The pointer operation status is set to the operation status from the time when a pointer operation is performed until an end condition of the pointer operation is satisfied. When the operation status is a pointer operation status, the control unit **151** determines that the previous pointer operation is ongoing, and discards the operation signal without outputting a code assigned to the single operation indicated by the operation signal (Step S**106**). Then, the control unit **151** returns the process to Step S**101**.

[0069] On the other hand, when the operation status is not a pointer operation status, the control unit **151** sets the operation status to a single operation status of the touchpad that has received the operation indicated by the operation signal (Step S**111**).

[0070] Subsequently, the control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and identifies output information (code) assigned to the operation (single operation) indicated by the operation signal. The control unit **151** outputs the identified output information (code) to the information processing apparatus via the communication device **130** (Step S**112**), and returns the process to Step S**101**.

[0071] As described above, when a single operation is performed on one of the pair of touchpads, the control unit **151** outputs a code assigned to the single operation on the touchpad. Further, as described in Step S**105**, when a single operation is performed on one of the pair of touchpads while a combined operation is being performed, the control unit **151** does not output a code assigned to the single operation. In other words, when the control unit **151** is outputting a code assigned to a combined operation, the control unit **151** does not output a code assigned to the single operation

even when a user's finger is separated from one of the pair of touchpads. Accordingly, even when the user's finger is separated from the one of the touchpads by mistake while the user is performing a pinch operation, a rotation operation, etc., the control unit **151** does not cause the information processing apparatus to execute an action corresponding to a slide operation on the other touchpad of the pair of touchpads. Further, when outputting the code assigned to the combined operation on the pair of touchpads, the control unit **151** does not output a code assigned to an operation on another touchpad, even when the operation is performed on said another touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation on the plurality of touchpads and enhance user convenience.

[0072] Further, as described in Step S**107**, when a single operation is performed on one of a pair of touchpads while the control unit **151** is outputting a code assigned to a single operation on the other of the pair of touchpads, the control unit **151** does not output a code assigned to the single operation on the one of the pair of touchpads. Accordingly, even when the user touches one of a pair of touchpads by mistake while performing a slide operation etc. on the other of the pair of touchpads, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the single operation on the one of the touchpads. As a result, the input device **100** can prevent the occurrence of an erroneous operation on the plurality of touchpads and enhance user convenience.

[0073] Further, as described in Step S**108**, when a single operation is performed on one of the touchpads while a key operation is being performed on one of the key switches and the control unit **151** is outputting a code assigned to the key operation, the control unit **151** does not output a code assigned to the single operation. Accordingly, even when the user touches a touchpad by mistake while performing an operation on any one of the key switches, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to an operation on the touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0074] Further, as described above, the operations, each of which is assigned with the output information in the mapping information, include an operation corresponding to a combination of an operation on a single touchpad and an operation on a special key, and do not include an operation on a special key alone. Accordingly, when a single operation is performed on a single touchpad while a key operation is performed on a special key, the control unit **151** outputs a code corresponding to the combination of the key operation on the special key and the single operation on the single touchpad. In other words, in this case, the control unit **151** outputs a code corresponding to the combination of the key operation on the special key and the single operation on the single touchpad. In other words, the control unit **151** executes processing corresponding to the combination of the key operation on the special key and the single operation on the single touchpad. Accordingly, the input device **100** can increase the variation of codes to be output by using a special key.

[0075] Further, as described in Step S**109**, when a single operation is performed on one of the touchpads while a button operation is being performed on any one of the buttons, the control unit **151** does not output a code assigned to the single operation. Accordingly, even when the user touches a touchpad by mistake while performing an operation on any one of the buttons, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to an operation on the touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0076] As described in Step S**110**, when a single operation is performed on a single touchpad while a pointer operation is performed on the mouse pointer **104**, the control unit **151** does not output a code assigned to the single operation. Accordingly, even when the user touches a touchpad by mistake while performing an operation on the mouse pointer **104**, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to an operation on

the touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0077] When the operation signal does not indicate a single operation in Step S**104**, the control unit **151** determines whether the operation signal indicates the end of a single operation (Step S**113**). For example, when the operation status is a single operation status and the corresponding single operation being performed is a slide operation, a press operation, or a long press operation, the control unit **151** determines whether the operation signal indicates that the user's finger is separated from the operated touchpad. When the operation status is a single operation status and the operation signal indicates that the user's finger is separated from the operated touchpad, the control unit **151** determines that the operation signal indicates the end of the single operation.

[0078] When the operation signal indicates the end of the single operation, the control unit **151** releases the single operation status (Step S**114**), and returns the process to Step S**101**. In other words, while outputting a code assigned to a single operation performed on one of the touchpads, the control unit **151** determines that the single operation is ended when the user's finger is separated from the one of the touchpads. This allows the user performing an operation such as a slide operation, a press operation, or a long press operation to keep the current operation ongoing even when the user accidentally touches another component, as long as the user continues to touch the touchpad currently being operated. Further, this allows the user to determine whether the operation is ongoing according to whether the user continuously touches the touchpad currently being operated and correctly recognize the current operation status. As a result, the input device **100** can enhance user convenience.

[0079] When the single operation being performed is a flick operation, a tap operation, or a double tap operation, the control unit **151** may release the single operation status when a predetermined time has elapsed since the operation status is set to the single operation status in Step S**111**. In this case, the control unit **151** monitors the elapse of the predetermined time asynchronously with the control process.

[0080] When the operation signal does not indicate the operation corresponding to the end of the single operation in Step S**113**, the control unit **151** determines whether the operation signal indicates a combined operation on a plurality of touchpads (Step S**115**). The control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and determines whether the operation signal indicates a combined operation to which output information is assigned in the mapping information.

[0081] When the operation signal indicates a combined operation, the control unit **151** determines whether the operation status is a combined operation status of another plurality of touchpads different from the plurality of touchpads that has received the operation and indicated by the operation signal (Step S**116**). For example, when the plurality of touchpads that has received the operation is the pair of the touchpads **110**a and **110**b, the other plurality of touchpads is the pair of the touchpads **110**c and **110**d. The combined operation status of the other plurality of touchpads is a status where the input device **100** is outputting a code assigned to a combined operation on the other plurality of touchpads. When the operation status is a combined operation status of the other plurality of touchpads, the control unit **151** determines that the previous combined operation is ongoing, and discards the operation signal without outputting a code assigned to the combined operation indicated by the operation signal (Step S**117**). Then, the control unit **151** returns the process to Step S**101**.

[0082] On the other hand, when the operation status is not in a combined operation status of the other plurality of touchpads, the control unit **151** determines whether the operation status is a single operation status (Step S**118**). When the operation status is a single operation status, the control unit **151** determines that the previous single operation is ongoing, and discards the operation signal without outputting a code assigned to the combined operation indicated by the operation signal (Step S**117**). Then, the control unit **151** returns the process to Step S**101**.

[0083] On the other hand, when the operation status is not a single operation status, the control unit **151** determines whether the operation status is a key operation status (Step S**119**). When the operation status is a key operation status, the control unit **151** determines that the previous key operation is ongoing, and discards the operation signal without outputting a code assigned to the combined operation indicated by the operation signal (Step S**117**). Then, the control unit **151** returns the process to Step S**101**.

[0084] On the other hand, when the operation status is not a key operation status, the control unit **151** determines whether the operation status is a button operation status (Step S**120**). When the operation status is a button operation status, the control unit **151** determines that the previous button operation is ongoing, and discards the operation signal without outputting a code assigned to the combined operation indicated by the operation signal (Step S**117**). Then, the control unit **151** returns the process to Step S**101**.

[0085] On the other hand, when the operation status is not a button operation status, the control unit **151** determines whether the operation status is a pointer operation status (Step S**121**). When the operation status is a pointer operation status, the control unit **151** determines that the previous pointer operation is ongoing, and discards the operation signal without outputting a code assigned to the combined operation indicated by the operation signal (Step S**117**). Then, the control unit **151** returns the process to Step S**101**.

[0086] On the other hand, when the operation status is not a pointer operation status, the control unit **151** sets the operation status to a combined operation status of the plurality of touchpads that has received the operation indicated by the operation signal (Step S**122**).

[0087] Subsequently, the control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and identifies output information (code) that is assigned to the operation (combined operation) indicated by the operation signal. The control unit **151** outputs the identified output information (code) to the information processing apparatus via the communication device **130** (Step S**123**), and the process returns to Step S**101**.

[0088] As described above, when operations on the plurality of touchpads are received, that is, a combined operation is received, the control unit **151** outputs a code assigned to the combined operation based on the mapping information. This allows the user to easily perform a fine operation such as vertical or horizontal scrolling, zooming in or out, or rotation using the input device **100**, and the input device **100** can enhance user convenience.

[0089] Further, as described above, the combined operation includes a combination of operations on a plurality of touchpads and an operation on a special key. Thus, when operations on a plurality of touchpads and an operation on a special key are received, that is, a combined operation is received, the control unit **151** outputs a code assigned to the combined operation that corresponds to the combination of the operations on the plurality of touchpads and the operation on the special key based on the mapping information. Accordingly, the input device **100** can increase the variation of codes to be output by using a special key.

[0090] Further, the control unit **151** outputs a code corresponding to the operation directions on the plurality of touchpads. Alternatively, the control unit **151** outputs a code corresponding to the durations of contact, the frequencies of contact, the areas of contacts, or the numbers of contact areas on the plurality of touchpads. Accordingly, the input device **100** can increase the variation of operations on the touchpad.

[0091] When a combined operation is performed on the touchpad **110***a* and the touchpad **110***b* or the touchpad **110***c* and the touchpad **110***d*, the control unit **151** outputs a code assigned to the combined operation. As described in Step S**118**, when a combined operation is performed on a pair of touchpads while a single operation is being performed on one of the pair of touchpads, the control unit **151** does not output a code assigned to the combined operation. In other words, when a single operation is performed on one of a pair of touchpads while the control unit **151** is outputting a code assigned to the previously received single operation on the other of the pair of touchpads,

the control unit **151** does not output a code assigned to a combined operation. Accordingly, even when the user touches one of the pair of touchpads by mistake while performing a slide operation etc. on the other of the pair of touchpads, the control unit **151** does not cause the information processing apparatus to execute an action, such as a pinch operation, a rotation operation, etc. corresponding to the operation on the pair of touchpads. As a result, the input device **100** can prevent the occurrence of an erroneous operation on the plurality of touchpads and enhance user convenience.

[0092] Further, as described in Step S**119**, when a combined operation is performed on a pair of touchpads while a key operation is being performed on any one of the key switches other than the special keys, the control unit **151** does not output a code assigned to the combined operation. Accordingly, even when the user touches a touchpad by mistake while performing an operation on any one of the key switches other than the special keys, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to an operation on the touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0093] Further, as described above, the operations, each of which is assigned with the output information in the mapping information, include an operation corresponding to a combination of operations on a pair of touchpads and an operation on a special key, and does not include an operation on a special key alone. Accordingly, when a combined operation is performed on a pair of touchpads while a key operation is performed on a special key, the control unit **151** outputs a code corresponding to the combination of the key operation on the special key and the combined operation on the pair of touchpads. In other words, in this case, the control unit **151** outputs a code corresponding to the combination of the key operation on the special key and the combined operation on the pair of touchpads. In other words, the control unit **151** executes processing corresponding to the combination of the key operation on the special key and the combined operation on the pair of touchpads. Accordingly, the input device **100** can increase the variation of codes to be output by using a special key.

[0094] Further, as described in Step S**120**, when a combined operation is performed on a pair of touchpads while a button operation is being performed on any one of the buttons, the control unit **151** does not output a code assigned to the combined operation. Accordingly, even when the user touches a touchpad by mistake while performing an operation on any one of the buttons, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to an operation on the touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0095] As described in Step S**121**, when a combined operation is performed on a pair of touchpads while a pointer operation is performed on the mouse pointer **104**, the control unit **151** does not output a code assigned to the combined operation. Accordingly, even when the user touches a touchpad by mistake while performing an operation on the mouse pointer **104**, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to an operation on the touchpad. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0096] As described above, when a single operation is performed on any one of the touchpads, a combined operation on the pair of touchpads is invalidated. The input device **100** receives a combined operation only when operations on a pair of touchpads are performed simultaneously while no other operation is ongoing. For example, when performing a pinch operation or a rotation operation, the user first simultaneously touches a pair of touchpads and then performs slides operations on the pair of touchpads. This clearly indicates the intention of the user to operate the pair of touchpads, and the input device **100** can prevent the occurrence of an erroneous operation.

[0097] When the operation signal does not indicate a combined operation in Step S**115**, the control unit **151** determines whether the operation signal indicates the end of a combined operation (Step

S**124**). For example, when the operation status is a combined operation status and the corresponding combined operation being performed is an operation such as a pinch operation or a rotation operation that includes a slide operation, a press operation, or a long press operation, the control unit **151** determines whether the operation signal indicates that the user's fingers are separated from the pair of operated touchpads. When the operation status is a combined operation status and the operation signal indicates that the user's fingers are separated from the pair of operated touchpads, the control unit **151** determines that the operation signal indicates the end of the combined operation.

[0098] When the operation signal indicates the end of a combined operation, the control unit **151** releases the combined operation status (Step S**125**), and the process returns to Step S**101**. In other words, while outputting a code assigned to a combined operation on the pair of touchpads, the control unit **151** determines that the combined operation is ended when the user's fingers are separated from the pair of touchpads. This allows the user performing an operation such as a pinch operation or a rotation operation to keep the current operation ongoing even when the user accidentally touches another component, as long as the user continues to touch the touchpads currently being operated. Further, this allows the user to determine whether the operation is ongoing according to whether the user continues to touch the touchpad currently being operated and correctly recognize the current operation status. As a result, the input device **100** can enhance user convenience.

[0099] When the combined operation being performed is a combination of any operations of a flick operation, a tap operation, and a double tap operation, the control unit **151** may release the combined operation status when a predetermined time has elapsed since the operation status is set to the combined operation status in Step S**122**. In this case, the control unit **151** monitors the elapse of the predetermined time asynchronously with the control process.

[0100] When the operation signal does not indicate the end of a combined operation in Step S**124**, the control unit **151** determines whether the operation signal indicates a key operation on any one of the key switches **102** (Step S**126**). The control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and determines whether the operation signal indicates a key operation to which output information is assigned in the mapping information.

[0101] When the operation signal indicates a key operation, the control unit **151** determines whether the operation status is a combined operation status (Step S**127**). When the operation status is a combined operation status, the control unit **151** determines that the previous combined operation is ongoing, and discards the operation signal without outputting a code assigned to the key operation indicated by the operation signal (Step S**128**). Then, the control unit **151** returns the process to Step S**101**.

[0102] On the other hand, when the operation status is not a combined operation status, the control unit **151** determines whether the operation status is a single operation status (Step S**129**). When the operation status is a single operation status, the control unit **151** determines that the previous single operation is ongoing, and discards the operation signal without outputting a code assigned to the key operation indicated by the operation signal (Step S**128**).

[0103] Then, the control unit **151** returns the process to Step S**101**.

[0104] On the other hand, when the operation status is not a single operation status, the control unit **151** sets the operation status to a key operation status (Step S**130**).

[0105] Subsequently, the control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and identifies output information (code) that is assigned to the operation (key operation) indicated by the operation signal. The control unit **151** outputs the identified code to the information processing apparatus via the communication device **130** (Step S**131**), and the process returns to Step S**101**.

[0106] As described above, when a key operation is performed on one of the multiple key switches **102**, the control unit **151** outputs a code assigned to the key operation. Further, as described in Step

S**127**, when a key operation is performed on any of the multiple key switches **102** while the control unit **151** is outputting a code assigned to a combined operation, the control unit **151** does not output a code assigned to the key operation. Accordingly, even when the user touches a key switch by mistake while performing a pinch operation, a rotation operation, etc. on a pair of touchpads, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the key switch. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0107] Further, as described in Step S**129**, when a key operation is performed on any one of the multiple key switches **102** while the control unit **151** is outputting a code assigned to a single operation, the control unit **151** does not output a code assigned to the key operation. Accordingly, even when the user touches a key switch by mistake while performing a slide operation etc. on a touchpad, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the key switch. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0108] On the other hand, when the operation signal does not indicate a key operation in Step S**126**, the control unit **151** determines whether the operation signal indicates the end of a key operation (Step S**132**). For example, when the operation status is a key operation status, the control unit **151** determines whether the operation signal indicates that the user's finger is separated from the operated key switch. When the operation status is a key operation status and the operation signal indicates that the user's finger is separated from the operated key switch, the control unit **151** determines that the operation signal indicates the end of the key operation.

[0109] When the operation signal indicates the end of a key operation, the control unit **151** releases the key operation status (Step S**133**), and the process returns to Step S**101**. When the operation status is a key operation status, the control unit **151** may release the key operation status when a predetermined time has elapsed since the user's finger is separated from the operated key switch. In this case, the control unit **151** monitors the elapse of the predetermined time asynchronously with the control process.

[0110] When the operation signal does not indicate the end of a key operation in Step S**132**, the control unit **151** determines whether the operation signal indicates a button operation on any one of the buttons **103** (Step S**134**). The control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and determines whether the operation signal indicates a button operation to which output information is assigned in the mapping information.

[0111] When the operation signal indicates a button operation, the control unit **151** determines whether the operation status indicates a combined operation status (Step S**135**). When the operation status is a combined operation status, the control unit **151** determines that the previous combined operation is ongoing, and discards the operation signal without outputting a code assigned to the button operation indicated by the operation signal (Step S**136**). Then, the control unit **151** returns the process to Step S**101**.

[0112] On the other hand, when the operation status is not a combined operation status, the control unit **151** determines whether the operation status is a single operation status (Step S**137**). When the operation status is a single operation status, the control unit **151** determines that the previous single operation is ongoing, and discards the operation signal without outputting a code assigned to the button operation indicated by the operation signal (Step S**136**). Then, the control unit **151** returns the process to Step S**101**.

[0113] On the other hand, when the operation status is not a single operation status, the control unit **151** sets the operation status to a button operation status (Step S**138**).

[0114] Subsequently, the control unit **151** refers to the mapping information and the operation table stored in the storage device **140**, and identifies output information (code) that is assigned to the operation (button operation) indicated by the operation signal. The control unit **151** outputs the identified code to the information processing apparatus via the communication device **130** (Step

S**139**), and the process returns to Step S**101**.

[0115] As described above, when a button operation is performed on one of the multiple buttons **103**, the control unit **151** outputs a code assigned to the button operation. Further, as described in Step S**135**, when a button operation is performed on any one of the multiple buttons **103** while the control unit **151** is outputting a code assigned to a combined operation, the control unit **151** does not output a code assigned to the button operation. Accordingly, even when the user touches a button by mistake while performing a pinch operation, a rotation operation, etc. on a pair of touchpads, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the button. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0116] Further, as described in Step S**137**, when a button operation is performed on any one of the multiple buttons **103** while the control unit **151** is outputting a code assigned to a single operation, the control unit **151** does not output a code assigned to the button operation. Accordingly, even when the user touches a button by mistake while performing a slide operation etc. on a touchpad, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the button. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0117] On the other hand, when the operation signal does not indicate a button operation in Step S**134**, the control unit **151** determines whether the operation signal indicates the end of a button operation (Step S**140**). For example, when the operation status is a button operation status, the control unit **151** determines whether the operation signal indicates that the user's finger is separated from the operated button. When the operation status is a button operation status and the operation signal indicates that the user's finger is separated from the operated button, the control unit **151** determines that the operation signal indicates the end of the button operation.

[0118] When the operation signal indicates the end of a button operation, the control unit **151** releases the button operation status (Step S**141**), and the process returns to Step S**101**. When the operation status is a button operation status, the control unit **151** may release the button operation status when a predetermined time has elapsed since the user's finger is separated from the operated button. In this case, the control unit **151** monitors the elapse of the predetermined time asynchronously with the control process.

[0119] When the operation signal does not indicate the end of a button operation in Step S**140**, the control unit **151** determines whether the operation signal indicates a pointer operation on the mouse pointer **104** (Step S**142**).

[0120] When the operation signal indicates a pointer operation, the control unit **151** determines whether the operation status is a combined operation status (Step S**143**). When the operation status is a combined operation status, the control unit **151** determines that the previous combined operation is ongoing, and discards the operation signal without outputting movement information corresponding to the pointer operation indicated by the operation signal (Step S**144**). Then, the control unit **151** returns the process to Step S**101**.

[0121] On the other hand, when the operation status is not a combined operation status, the control unit **151** determines whether the operation status is a single operation status (Step S**145**). When the operation status is a single operation status, the control unit **151** determines that the previous single operation is ongoing, and discards the operation signal without outputting movement information corresponding to the pointer operation indicated by the operation signal (Step S**144**). Then, the control unit **151** returns the process to Step S**101**.

[0122] On the other hand, when the operation status is not a single operation status, the control unit **151** sets the operation status to a pointer operation status (Step S**146**).

[0123] Subsequently, the control unit **151** identifies output information (movement information) that corresponds to the operation (pointer operation) indicated by the operation signal. The control unit **151** outputs the identified output information (movement information) to the information

processing apparatus via the communication device **130** (Step S**147**), and the process returns to Step S**101**.

[0124] As described above, when a pointer operation is performed on the mouse pointer **104**, the control unit **151** outputs movement information corresponding to the pointer operation. Further, as described in Step S**143**, when a pointer operation is performed on the mouse pointer **104** while the control unit **151** is outputting a code assigned to a combined operation, the control unit **151** does not output movement information corresponding to the pointer operation. Accordingly, even when the user touches the mouse pointer **104** by mistake while performing a pinch operation, a rotation operation, etc. on a pair of touchpads, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the operation on the mouse pointer **104**. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0125] Further, as described in Step S**145**, when a pointer operation is performed on the mouse pointer **104** while the control unit **151** is outputting a code assigned to a single operation, the control unit **151** does not output movement information corresponding to the pointer operation. Accordingly, even when the user touches the mouse pointer **104** by mistake while performing a slide operation etc. on a touchpad, the control unit **151** does not cause the information processing apparatus to execute an action corresponding to the operation on the mouse pointer **104**. As a result, the input device **100** can prevent the occurrence of an erroneous operation and enhance user convenience.

[0126] On the other hand, when the operation signal does not indicate a pointer operation in Step S**142**, the control unit **151** determines whether the operation signal indicates the end of a pointer operation (Step S**148**). For example, when the operation status is a pointer operation status, the control unit **151** determines whether the operation signal indicates the stopping of the mouse pointer **104**. When the operation status is a pointer operation status and the operation signal indicates the stopping of the mouse pointer **104**, the control unit **151** determines that the operation signal indicates the end of the pointer operation.

[0127] When the operation signal indicates the end of a pointer operation, the control unit **151** releases the pointer operation status (Step S**149**), and the process returns to Step S**101**. The control unit **151** may release the pointer operation status when a predetermined time has elapsed from the setting of the operation status to the pointer operation status in Step S**146** or when a predetermined time has elapsed from the stopping of the mouse pointer **104**. In this case, the control unit **151** monitors the elapse of the predetermined time asynchronously with the control process.

[0128] The processing of Step S**105**, S**107**, S**108**, S**109**, S**110**, S**116**, S**118**, S**119**, S**120**, S**121**, S**127**, S**129**, S**135**, S**137**, S**143**, or S**145** may be omitted. Further, the processing of Steps S**102** to S**103**, the processing of Steps S**104** to S**114**, the processing of Steps S**115** to S**125**, the processing of Steps S**126** to S**133**, the processing of Steps S**134** to S**141**, or the processing of Steps S**142** to S**149** may be omitted.

[0129] As detailed above, when the input device **100** receives a combined operation on the plurality of touchpads **110**, the input device **100** transmits a code assigned to the combined operation on one of two pairs of touchpads **110** to the information processing apparatus. This allows the user to easily perform various operations using the input device **100**, and the input device **100** can enhance user convenience accordingly.

[0130] The input device **100** does not accept a combined operation on a pair of touchpads while receiving a single operation on one of the pair of touchpads, and does not accept a single operation on one of the pair of touchpads while receiving a combined operation on the pair of the touchpads. As a result, the input device **100** can prevent the occurrence of an erroneous operation on the plurality of touchpads.

[0131] The input device **100** does not include a display. The input device **100** is used as an input device of an information processing apparatus separated from the input device **100**. By using the

input device **100**, the user can favorably perform operations on an object displayed on a screen of the information processing apparatus to which the input device **100** is connected.

[0132] Further, since the input device **100** includes the touchpad **110** in addition to the multiple key switches **102**, the user can perform various operations using the input device **100** alone. This can allow the user to cause the information processing apparatus to execute an action such as sliding, pinching, or rotating without moving his or her hand to a device other than the input device **100**. Accordingly, the input device **100** can reduce the time and effort required for user operations.

[0133] Further, functions that have been typically implemented with shortcut keys in an information processing apparatus can be implemented by operating the touchpad **110** of the input device **100**. This allows the user to eliminate the high learning cost such as learning shortcut keys and perform the functions that have been done by using shortcut keys with intuitive user operations.

[0134] Further, the input device **100** appropriately disables access to the touchpad **110**. The input device **100** having such a function can prevent unintentional setting or unintended status transition due to an unintentional touch on the touchpad **110** when the user is carrying the input device **100** or operating the input device **100**. Further, when an operation is received while a specific operation is being received, the input device **100** prioritizes the operation received first and continue the operation. When the user performs an operation after performing a specific operation, the user is likely to explicitly end the specific operation, and is less likely to perform another operation while performing the specific operation. The input device **100** can prevent the occurrence of an erroneous operation by prioritizing and continuing the operation received first.

[0135] FIG. **10** is a schematic block diagram illustrating a configuration of a processing circuit (processing circuitry) **250** of an input device according to another embodiment.

[0136] As illustrated in FIG. **10**, the processing circuit **250** is used instead of the processing circuit **150** of the input device **100**, and executes the control process etc. instead of the processing circuit **150**. The processing circuit **250** includes a control circuit **251** etc. The control circuit **251** may be configured by an integrated circuit etc.

[0137] The control circuit **251** is an example of a control unit and has the substantially the same functions as the control unit **151**. The control circuit **251** receives an operation signal from the operation signal receiving circuit **120**, reads information from the storage device **140**, and transmits output information corresponding to the operation signal to the information processing apparatus via the communication device **130**. The control circuit **251** performs exclusive control on an operation indicated by the received operation signal.

[0138] As detailed above, the input device using the processing circuit **250** can also enhance user convenience and prevent the occurrence of an erroneous operation on the plurality of touchpads.

[0139] Although several embodiments of the present disclosure have been described above, the embodiments are not limited thereto. For example, the touchpad **110** may be arranged on the back side of the housing **101**. For example, the touchpad **110***a* is arranged on the left portion of the back face of the housing **101**, the touchpad **110***b* is arranged on the left face of the housing **101**, the touchpad **110***c* is arranged on the right portion of the back face of the housing **101**, and the touchpad **110***d* is arranged on the right face of the housing **101**. In this case, a command is set to a combination of a pair of touchpads arranged adjacent to the left back corner or the right back corner of the housing, and this allows the user to easily perform a predetermined action to the information processing apparatus using his or her left hand or right hand alone. Each touchpad **110** may be disposed at any position on the housing **101**. Further, one of the touchpads **110***a*, **110***b*, **110***c*, and **110***d* may be omitted.

[0140] The input device **100** may include a changing switch (physical switch) on the housing **101** for changing mapping tables included in mapping information. The input device **100** may store a command for changing mapping table in the mapping information.

[0141] The input device **100** is not limited to a keyboard device, and may be any device having a

plurality of touchpads, such as a tablet terminal or a speaker device, or may be a device that does not include a key switch.

[0142] To provide a keyboard device that enhances user convenience is desired.

[0143] According to an embodiment, a keyboard device, a control method, and a control program can enhance user convenience.

[0144] The above-described embodiments are illustrative and do not limit the invention. Thus, numerous additional modifications and variations are possible in light of the above teachings. For example, elements and/or features of different illustrative embodiments may be combined with each other and/or substituted for each other within the scope of the invention. Any one of the above-described operations may be performed in various other ways, for example, in an order different from the one described above.

[0145] The functionality of the elements disclosed herein may be implemented using circuitry or processing circuitry which includes general purpose processors, special purpose processors, integrated circuits, ASICs ("Application Specific Integrated Circuits"), FPGAs ("Field-Programmable Gate Arrays"), and/or combinations thereof which are configured or programmed, using one or more programs stored in one or more memories, to perform the disclosed functionality. Processors are considered processing circuitry or circuitry as they include transistors and other circuitry therein. In the disclosure, the circuitry, units, or means are hardware that carry out or are programmed to perform the recited functionality. The hardware may be any hardware disclosed herein which is programmed or configured to carry out the recited functionality.

[0146] There is a memory that stores a computer program which includes computer instructions. These computer instructions provide the logic and routines that enable the hardware (e.g., processing circuitry or circuitry) to perform the method disclosed herein. This computer program can be implemented in known formats as a computer-readable storage medium, a computer program product, a memory device, a record medium such as a CD-ROM or DVD, and/or the memory of a FPGA or ASIC.

Claims

1. An input device, comprising: a switch; a communication interface to communicate with the information processing apparatus; a plurality of touchpads; and circuitry, wherein, when a combination of operations on the plurality of touchpads is received, the circuitry identifies a code corresponding to the combination of the operations on the plurality of touchpads and outputs the identified code to an information processing apparatus via the communication interface.

2. The input device of claim 1, further comprising a housing provided with the plurality of touchpads, wherein the housing does not have a display.

3. The input device of claim 1, wherein the circuitry is configured to: distinguish operations on the plurality of touchpads based on at least one of operation direction, duration of contact, frequency of contact, area of contact, or a number of contact areas on the plurality of touchpads; and output a code corresponding to the distinguished operations on the plurality of touchpads to the information processing apparatus via the communication interface.

4. The input device of claim 1, wherein when receiving a combination of operations on the plurality of touchpads and an operation on the switch, the circuitry identifies a code corresponding to the combination of the operations on the plurality of touchpads and the operation on the switch-and outputs the identified code to the information processing apparatus via the communication interface.

5. The input device of claim 1, further comprising a memory to store the code corresponding to combination of operations on the plurality of touchpads as mapping information, wherein the mapping information includes a plurality of mapping tables, and the circuitry is configured to change a mapping table currently used to one of other mapping tables in response to receiving a

mapping table change request.

6. The input device of claim 1, wherein each of the plurality of touchpads is arranged on at least one of a left side, a right side, a front side, and a back side of the input device.

7. A control method, comprising: when a combination of operations on a plurality of touchpads is received, identifying a code corresponding to the combination of the operations on the plurality of touchpads and outputting the identified code to an information processing apparatus via a communication interface.

8. A non-transitory recording medium storing a plurality of instructions which, when executed by one or more processors, causes the processors to perform a method, the method comprising: when receiving a combination of operations on a plurality of touchpads, identifying a code corresponding the combination of the operations on the plurality of touchpads and outputting the identified code to an information processing apparatus via a communication interface.