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Information handling system mouse adaptive resolution

Abstract

An information handling system mouse includes a position sensor that detects movement of the mouse and reports the movement to generate cursor movement at plural displays interfaced with the information handling system. The mouse automatically changes between a first position resolution and a second position resolution to generate cursor movement based upon a resolution of a display at which the cursor is presented. As the cursor moves between each of plural displays in response to mouse movement, the mouse automatically changes the position resolution so that cursor movement relative to the mouse movement remains consistent even where the cursor is presented at displays having different display resolutions.

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Background/Summary

BACKGROUND OF THE INVENTION
Field of the Invention

(1) The present invention relates in general to the field of information handling system input devices, and more particularly to an information handling system mouse adaptive resolution.

Description of the Related Art

(2) As the value and use of information continues to increase, individuals and businesses seek additional ways to process and store information. One option available to users is information handling systems. An information handling system generally processes, compiles, stores, and/or communicates information or data for business, personal, or other purposes thereby allowing users to take advantage of the value of the information. Because technology and information handling needs and requirements vary between different users or applications, information handling systems may also vary regarding what information is handled, how the information is handled, how much information is processed, stored, or communicated, and how quickly and efficiently the information may be processed, stored, or communicated. The variations in information handling systems allow for information handling systems to be general or configured for a specific user or specific use such as financial transaction processing, airline reservations, enterprise data storage, or global communications. In addition, information handling systems may include a variety of hardware and software components that may be configured to process, store, and communicate information and may include one or more computer systems, data storage systems, and networking systems.

(3) Generally, information handling systems can have a portable or stationary configuration. Stationary configurations generally are tied to a location by external resources, such as a power plug inserted in an outlet, and use external peripherals, such as a peripheral display, keyboard and mouse. Portable information handling systems integrate processing components, a display and a power source in a portable housing to support mobile operations. Portable information handling systems allow end users to carry a system between meetings, during travel, and between home and office locations so that an end user has access to processing capabilities while mobile. Tablet configurations typically expose a touchscreen display on a planar housing that both outputs information as visual images and accepts inputs as touches. Convertible configurations typically include multiple separate housing portions that couple to each other so that the system converts between closed and open positions. For example, a main housing portion integrates processing components and a keyboard and rotationally couples with hinges to a lid housing portion that integrates a display. In a clamshell configuration, the lid housing portion rotates approximately ninety degrees to a raised position above the main housing portion so that an end user can type inputs while viewing the display. After usage, convertible information handling systems rotate the lid housing portion over the main housing portion to protect the keyboard and display, thus reducing the system footprint for improved storage and mobility. Although portable information handling systems integrate a display and input devices, they also typically will work with external peripheral devices, such as a peripheral display, mouse and keyboard, that end user's find more convenient than the integrated display and input devices.

(4) End users often find a peripheral mouse to be a powerful tool with a simple to understand point and click usage model. A typical end user might use a mouse in a low intensity environment, such as web surfing, or a high intensity environment such as gaming. Within a gaming application usage case, a mouse might control inputs by movement of the mouse body over a desktop surface or by clicks at an input button exposed at an upper surface of the mouse body. Mouse movements may provide varying degrees of accuracy so that small end user inputs are precisely translated to mouse cursor motion presented at a display or more loosely translated for less precise inputs. Similarly, mouse input buttons may involve rapid button press inputs, such as for use in a game to trigger a weapon firing, or just occasional presses, such as clicks to open documents or emails. A gamer may, for instance, rely on an expensive and high quality mouse to gain an edge when gaming for movement and input button presses and then use the same high precision mouse in less demanding tasks. A high end mouse can include a higher quality position sensor that detects position changes with high accuracy and robust buttons that distinguish separate inputs made in rapid succession.

(5) One difficulty with higher precision position sensors and push buttons is that the position sensing and button press logic tend to consume increased power relative to less precise mouse devices. In some instances, the high precision position sensing is not necessary and a distraction to more germane mouse usage. Typically, a selection button on the bottom of the mouse allows an end user select whether to operate the mouse in a high precision mode or a lower precision mode so that, for instance, a gamer can use the gaming mouse both for gaming applications and more common application environments that are less demanding. Selecting less precise mouse resolution tends to have a beneficial side effect of increasing mouse battery charge life. End users tend to find selection of mouse resolution as inconvenient, especially where the end user has to turn the mouse over to find the resolution button. Another difficulty with higher precision position sensors is that presentation of the mouse cursor at a display having movement defined by the mouse position sensor resolution can vary based upon the resolution of the display showing the mouse cursor. When an information handling system presents visual images at multiple displays, the movement of the mouse cursor between the displays can disorient the end user by changing based upon the display resolution.

SUMMARY OF THE INVENTION

(6) Therefore, a need has arisen for a system and method which manages power consumption of a mouse having selectable input sensitivity.

(7) A further need exists for a system and method that adapts mouse position sensor sensitivity as the mouse cursor moves between displays of different resolutions.

(8) In accordance with the present invention, a system and method are provided which substantially reduce the disadvantages and problems associated with previous methods and systems for managing power consumption at a peripheral mouse device. Mouse position sensor sensitivity and/or button press sensitivity are adjusted based upon mouse usage context, such as accelerations experienced at the mouse or the time between button press inputs. Adjusting between a high power consumption operating mode that has greater power consumption, such as high position sensor sensitivity and/or rapid button press polling, provides improved mouse performance when desired while a low power consumption operating mode adequate for most tasks helps to prolong battery life when increased performance is not necessary.

(9) In another embodiment, mouse position sensor sensitivity adapts as a mouse cursor position transitions between displays having different resolutions so that mouse movement provides consistent mouse cursor movement at each display. For example, a display scalar reports to the mouse the display resolution at activation of the mouse cursor so that the mouse processing resource can set a mouse position sensor resolution associated with the display resolution.

(10) More specifically, an information handling system processes information with a processor that executes instructions in cooperation with a memory that stores the instructions and information, and presents the information as visual images at a display. A mouse interfaced with the information handling system has a position sensor that detects movement of the mouse and reports the movement to the information handling system for presentation as a cursor movement. The mouse position sensor detects mouse movement with a precision mode that has a greater power consumption and a non-precision mode that has a lower power consumption. The mouse includes a push button that detects end user button presses with a precision mode that has a greater polling rate with a greater power consumption and a non-precision mode that has a reduced polling and a reduced power consumption. A power manager of the mouse monitors mouse operating context to selectively adjust the mouse position sensor and push button between the precision and non-precision modes so power consumption and performance are balanced based upon end user mouse input detection needs. Other mouse functions may be adapted to manage power consumption, such as indication illumination and position sensor illumination. When reporting mouse position sensor inputs to an information handling system for presentation at plural displays, the position sensor resolution of the mouse movement detected by the position sensor is adjusted based upon the

display resolution so that the mouse cursor movement created by mouse housing movement remains consistent as the mouse cursor moves at displays having different resolutions.
(11) The present invention provides a number of important technical advantages. One example of an important technical advantage is that an information handling system mouse balance power consumption with position sensor and push button sensitivity to provide desired performance with minimal power consumption. As a result an end user gets expected performance and extended battery life for an improved end user experience. Adapting mouse resolution based upon the resolution of a display presenting a mouse cursor enhances the end user experience by keeping a consistent mouse performance when multiple displays of different resolutions are in use.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The present invention may be better understood, and its numerous objects, features and advantages made apparent to those skilled in the art by referencing the accompanying drawings. The use of the same reference number throughout the several figures designates a like or similar element.
(2) FIG. **1** depicts a block diagram of an information handling system configured to manage mouse power consumption based upon mouse usage context and mouse resolution reporting based upon mouse and display resolution;
(3) FIG. **2** depicts a block diagram of a mouse that supports power consumption management based upon mouse usage context and mouse resolution reporting based upon mouse and display resolution;
(4) FIG. **3** depicts a flow diagram of a process for adaptive power management based upon application type;
(5) FIGS. **4**A and **4**B depict flow diagrams of a process for managing mouse illumination based upon context;
(6) FIG. **5** depicts a block diagram of a mouse configured to adapt position sensor resolution reporting based upon display visual image presentation resolution; and
(7) FIG. **6** depicts a flow diagram of a process for managing mouse position sensor resolution at transitions of presentation of the mouse cursor between displays of different resolution.
DETAILED DESCRIPTION
(8) An information handling system mouse manages power consumption and position sensor resolution based upon operating context. For purposes of this disclosure, an information handling system may include any instrumentality or aggregate of instrumentalities operable to compute, classify, process, transmit, receive, retrieve, originate, switch, store, display, manifest, detect, record, reproduce, handle, or utilize any form of information, intelligence, or data for business, scientific, control, or other purposes. For example, an information handling system may be a personal computer, a network storage device, or any other suitable device and may vary in size, shape, performance, functionality, and price. The information handling system may include random access memory (RAM), one or more processing resources such as a central processing unit (CPU) or hardware or software control logic, ROM, and/or other types of nonvolatile memory. Additional components of the information handling system may include one or more disk drives, one or more network ports for communicating with external devices as well as various input and output (I/O) devices, such as a keyboard, a mouse, and a video display. The information handling system may also include one or more buses operable to transmit communications between the various hardware components.
(9) Referring now to FIG. **1**, a block diagram depicts an information handling system **10** configured to manage mouse **32** power consumption based upon mouse usage context and mouse resolution

reporting based upon mouse and display resolution. In the example embodiment, information handling system has a stationary configuration built in a housing **12**, such as a desktop or tower housing that couples to external power and peripherals. In alternative embodiments, a portable information handling system may be used instead, such as for a convertible system having an integrated display, battery and keyboard. A central processing unit (CPU) **14** processes information by executing instructions of applications, such as an operating system and gaming applications. A random access memory (RAM) **16** supports CPU **14** by storing the instructions and information for access by CPU **14**. A solid state drive (SSD) **18** provides persistent storage of the instructions and information, such as with flash memory that is read at power up to RAM **16** for execution on CPU **14**. An embedded controller **20** interfaces with CPU **14** to manage physical devices, such as thermal conditions, application of power and interactions with peripheral devices. A wireless network interface controller (WNIC) **22** supports wireless communications, such as with WiFi and Bluetooth, with external networks and peripheral devices. A graphics processor unit (GPU) **24** interfaces with CPU **14** and further processes the information to generate visual images for presentation at a display **28**, such as by defining pixel values that communicate through display cable **26** to display **28** to define colors for the array of pixels of display **28**. For instance, Ultra High Definition (UHD) displays typically have an array of around 3840 horizontal pixels by 2160 vertical pixels and are also generally known as 4K displays. As another example, Quad High Definition (QHD) displays typically have an array of 2560 horizontal pixels by 1440 vertical pixels and are also generally known as 2K displays. Variations of these sizes exist that generally fall within the 2K and 4K display resolution definitions.

(10) To aid end user interactions with content presented at display **28**, a mouse cursor **30** is presented when a mouse **32** interfaces with information handling system **10**. Mouse **32** may present and control cursor **30** in a variety of conventional manners. For example, mouse **32** may interface through a cable with information handling system, such as by a USB port managed by embedded controller **20**. Alternatively, mouse **32** may interface through wireless signals through WNIC **22**, such as Bluetooth. In some instances, mouse **32** may communicate directly with display **28**, which then forwards the mouse cursor **30** positions to embedded controller **20** for use by CPU **14**. Mouse **32** detects changes in position of mouse housing **36** with a position sensor disposed within and also accepts inputs through push buttons **34**, sometimes referred to as right or left mouse clicks. A mouse manager **37** retrieved from non-transitory memory and executed on CPU **14** and/or embedded controller **20** manages interactions with mouse **32**, such as a driver of an operating system. Positions on display **28** of mouse cursor **30** as set by movement of mouse housing **36** interact through the operating system with other applications so that presses on push buttons **34** provide inputs. As an example, a mouse click may be an input to a gaming application, such as a firing of a weapon at an object presented on display **28** at the position of mouse cursor **30**. As is set forth in greater detail below, information handling system **10** and mouse **32** coordinate to manage power usage and pointing input resolution at multiple displays.

(11) Referring now to FIG. **2**, a block diagram depicts a mouse **32** that supports power consumption management based upon mouse usage context and mouse resolution reporting based upon mouse and display resolution. In the example embodiment, mouse housing **36** has a size that fits in a palm of a hand and contains a processing resource **38** that manages mouse operations, such an MCU. An accelerometer **40** interfaces with processing resource **38** to detect accelerations of mouse housing **36** and report the accelerations to processing resource **38**. Push buttons **34** interface with processing resource **38**, which polls for contact of the button due to a push, such as by checking a GPIO periodically based upon a timer. A position sensor **42** is exposed at a bottom surface of mouse housing **36** to detect movement of mouse **32** when resting on a support surface, such as desktop surface. For instance, position sensor **42** is an optical sensor that tracks changes in position by changes in visual images captured over time. A position sensor LED **43**, such as a laser, can provide illumination for position sensor **42** to aid in capture of optical images that show

position changes. For instance, position sensor LED **43** may provide illumination to help locate the support surface, such as when the mouse is lifted up and away from the support surface or when high precision is desired and extra illumination helps enhance position sensor accuracy. A flash memory **44** or other non-transitory memory, stores instructions that execute on processing resource **38** to detect mouse inputs and report the mouse inputs to an information handling system. In the example embodiment, flash memory **44** stores a power manager **46** that executes on processing resource **38** to manage power use of mouse **32**. An indicator illumination LED **48**, such as to illuminate a product logo at the mouse upper surface, or other illumination source provides an illumination indicator at the upper surface of mouse **32**, such as a visual indication that the mouse is on.

(12) By reference to FIGS. **1** and **2**, power and position reporting are managed at mouse **32** to adapt to a context of the mouse usage. With respect to power management, mouse manager **37** and power manager **46** cooperate to adjust mouse position sensor, push button polling and light illumination so that battery discharge is efficiently applied to achieve end user performance. Position sensor **42**, for example may detect changes in position of the mouse housing with various degrees of precision, such as by increasing the sample rate at the position sensor, increasing or applying illumination at the position sensor to improve sensitivity, performing a more detailed analysis of information captured by the position sensor by dedicating more processing resources to position sensing, and increasing wireless communications of position changes. Push button **34**, as another example, can more precisely differentiate rapid push button inputs by monitoring the push button contact with more frequent polling by processing resource **38**. Illumination at indicator illumination LED **48** and position sensor LED **43** provide another pathway for power management by limiting illumination, for instance, when indicator illumination LED **48** is covered by an end user hand or position sensor **43** is too distant to a support surface to be effective for increasing position detection or unnecessary for a selected position sensor sensitivity. Processing resource **38** manages power consumption in balance against mouse usage context by selectively adjusting position sensor sensitivity, push button sensitivity and illumination settings.

(13) In one example embodiment, position sensor and push button sensitivities each have high, low and off power states. A high power consumption state of the position sensor detects position changes with a high accuracy, such as by increased sampling and illumination; a low power consumption state detects position changes with a low accuracy, such as by a reduced sample rate and without illumination; and an off power state powers down the position sensor to reduce power consumption to zero or near zero. A power consumption state of the push button detects button presses with a high polling rate of the processing resource that distinguishes button pushes with greater accuracy at a high processing cycle and power use; a low power consumption having a lower polling rate of the processing resource that is less accurate at distinguishing push button inputs at a lower processing cycle and power use; and an off power consumption in which the processing resource does not poll for push button inputs and may sleep. One manner to manage power consumption state is by monitoring of accelerations by accelerometer **40**. For instance, when high or frequent accelerations are detected, a high power consumption mode is commanded, and when the mouse housing movements are smaller and less frequent a low power consumption mode is commanded. Another manner to manage power consumption state is by tracking how often mouse push button press inputs are detected so that more frequent presses results in greater polling and less frequent presses results in less polling. In one embodiment, the position sensor and push buttons may have different power consumption states based upon the context, such as having high position sensor tracking with a low push button polling and vice versa. Indicator illumination LED **48** can selectively power up and down based upon an analysis of context to determine when an end user hand is placed on the mouse upper surface, as is set forth in greater detail below.

(14) In one alternative embodiment, power manager **46** and mouse manager **37** cooperate to analyze mouse operations for different applications so that execution of an application on

information handling system **10** results in a proactive setting of the mouse to configure to a setting associated with the activity. For example, a gaming application that has a pattern of active movement and input clicks is classified as a high power consumption application that has both the position sensor and input button in a high accuracy state at initiation of the application. Monitoring of actual end user interactions at the mouse may result in changes to other power states as the end user engages in active use of the application or rests. Other gaming applications that have a pattern of rapid push button inputs, such as to fire a weapon, with less mouse movement will have an application type that initiates to high power state for polling of the input button and a low power state for position tracking. Alternatively, some gaming applications that have a pattern of rapid mouse movements with fewer push button inputs initiate to a type having high power consumption for the position sensor and a low power consumption for push button polling. When the mouse is used with non-gaming applications, such as word processing or web browsing, a type is defined to initiate in low power consumption operations for both the position sensor and the input button polling. Mouse manager **28** communicates the type of application to mouse power manager **46** for initiation at the mouse to the appropriate position sensor and polling sensitivity. Over time, power manager **46** tracks the mouse inputs to define the application type as feedback to the information handling system. Alternatively, embedded controller **20** tracks mouse cursor and input button inputs over to time to develop a type of application and stores the type of application so that the type is communicated to the mouse at power up to initiate in the appropriate sensitivity.

(15) Referring now to FIG. **3**, a flow diagram depicts a process for adaptive power management based upon application type. In the example embodiment, four different application types are defined: First Person Shooter (FPS); Role Playing Game (RPG); Multi-online Battle Arena (MOBA); and Real Time Strategy (RTS). The process starts at step **50** with the processing resource, such as an MCU monitoring mouse activities based upon sensor speed and accelerations and upon mouse push button click rates and numbers. As set forth above, mouse housing movement may be tracked by an accelerometer; alternatively, position sensor inputs may be used to track the amount of mouse housing movement. At step **52** a determination is made of whether the position sensor or accelerometer have a high or low acceleration, such as with a threshold stored in an accelerometer that counts accelerations of greater than a defined amount in a defined time. If the mouse movement exceeds the threshold, the process continues to step **54** to configure the position sensor in high sensitivity and high power consumption mode. If at step **52** the mouse housing movement does not exceed the threshold, the process continues to step **56** to configure the position sensor to the low sensitivity and low power consumption. From step **50**, the mouse push button inputs are monitored at step **58** to determine if the number of mouse clicks in a defined time exceeds a defined threshold. If the threshold is exceeded, the process continues to step **60** to use the high polling rate with higher power consumption, such as 1000 Hz. If the threshold is not exceeded, the process continues to step **62** to apply a lower polling rate with a lower power consumption, such as 500 to 1000 Hz.

(16) Once the position sensor sensitivity and input button polling are determined, the process continues to steps **64**, **68**, **72** and **76** to assign the mouse a power management configuration based upon the position sensor and input button context determinations. From steps **54** and **60** the process continues to step **64** to determine if the application meets the FPS game play type requirement having a high position sensor sensitivity and a high input button sensitivity. If so, the process continues to step **66** to keep the FPS mode and to step **80** to collect the selection data to refine mouse power settings for future use. If at step **64** the FPS mode is not an appropriate selection, the process continues to step **68** for the determination described below. At steps **56** and **62**, if the position sensor has a high sensitivity setting and the input button has a low input button sensitivity, the process continues to step **68** to determine if the context meets the RPG game play type requirement. If so, the process continues to step **70** with the RPG game play type set and to step **80** to collect and analyze the data. If the RPG game play type is not appropriate, the process continues

to step **72** for the determination described below. If at step **56** and **60** the position sensor sensitivity is set low and the input button polling rate is set to high, the process continues to step **72** to determine if the MOBA game play type requirement is met. If at step **72** the MOBA game type is appropriate, the process continues to step **74** to keep the position sensor and input button settings for the MOBA mode and to step **80** to track the mouse type selection data. If at step **72** a determination is made that the MOBA game type is not appropriate, the process continues to step **76** as described below. At step **54** and **62** if the position sensor sensitivity is set high and the button polling sensitivity is set low, the process continues to step **76** to determine if the RTS game play requirement type is appropriate. If so the process continues to step **78** to keep the RTS mode and to step **80** to track the mouse type selection data. In various embodiments, a default mode of low power may be applied if an error occurs in the selection of the position sensor and input button sensitivities.

(17) Referring now to FIGS. **4**A and **4**B, flow diagrams depict a process for managing mouse illumination based upon context. In the example embodiment mouse position sensor focus and mouse click inputs provide indications of mouse use that are applied to determine when the logo illumination indicator LED is covered by an end user hand and can therefore be powered off. The process starts at step **82** with the mouse moving and the position sensor focused on the mouse mat or other support surface. At step **84** a determination is made of whether the sensor continues to detect movement focused on the mouse mat or other support surface. If not, then the context indicates that the mouse is not resting on the mat or support surface and at step **86** the logo illumination indicator LED is turned off and the position sensor resolution LED is turned on. The context indicates that a hand is over the indicator LED lifting the mouse from the support surface so that turning on the position sensor resolution LED aids in locating the mat or support surface when the mouse is placed down again for use. At step **88** a determination is made of whether the position sensor has returned to within a range of the mat or support surface so that a position sensor focus can be achieved. If not, the process continues to step **90** to keep the logo indicator LED off and to turn off the position sensor resolution LED based on a context indication that the mouse has been placed in a storage location, such as bag. At step **92** after a one minute timeout, the mouse is placed in an off power state, such as a deep sleep that wakes with a sharp acceleration or button press. If at step **88** the position sensor obtains focus, the process continues to step **94** to keep the logo indicator LED turned off and to turn off the position sensor resolution LED. When the position sensor is focused after not being focused, the context suggests that the end user has lifted and placed back down the mouse. From step **94** a determination is made at step **96** whether the mouse moves position, indicating an end user hand over the indicator LED, or stops moving, indicating the end user has removed the hand. At step **98**, if the mouse has not stopped moving for two seconds, the logo indicator LED and resolution LED are turned off based upon a context of active use of the mouse. If at step **96** the mouse does stop moving within the two seconds, the process continues to step **112** to turn the logo indicator LED on and the resolution LED off based upon a context that the end user has raised a hand away from the mouse but may be prepared to start using the mouse again. At step **114**, after two minutes without detection of movement at the mouse, a deep sleep may be entered with the indicator and resolution LEDs off and the position sensor and processing resource in an off power state.

(18) Returning to step **84**, if the mouse is moving and the position sensor is focused on the mat or other support surface, the process continues to step **100** to determine if any mouse clicks are detected at the mouse push buttons. If mouse input button clicks are detected, such as with in a predetermined time, the process continues to step **102** to turn the logo indicator LED off and keep the resolution LED off based upon a context that the mouse is in active use with an end user hand over the mouse housing. From step **102** the process continues to step **104** to monitor the mouse movement and detect a failure to move for a period of two seconds. While movement is detected, the process continues to step **106** to keep the logo indicator light and LED resolution LED off and

returns to step **104** to continue monitoring the mouse for use. At step **100** when a mouse input button click is not detected and step **104** when movement of the mouse has stopped for two seconds, the context indicates that the mouse use has ended and the end user has lifted his hand from the mouse. In response, at step **108** the logo indicator LED is turned on and the resolution LED remains off. At step **110**, after two minutes of no mouse movement, the mouse enters the deep sleep mode with the processing resource and position sensor in the off state. The context derived from the mouse provides a basis for saving power from the illumination of the indicator LED when hidden by an end user.

(19) Referring now to FIG. **5**, a block diagram depicts a mouse configured to adapt position sensor resolution reporting based upon display visual image presentation resolution. In the example embodiment, information handling system **10** executes applications on CPU **14** and RAM **16** to generate visual images with GPU **24** for presentation at a first display **120** having 2K resolution and a second display **122** having a 4K resolution. Each of displays **120** and **122** include a timing controller **128** that scans pixel values to the display panel to define the visual images and a scalar **126** that adjusts visual images to the resolution of the display panel. Mouse **32** controls a location of presentation of a mouse cursor at each display **120** and **122** by reporting changes in position of the mouse detected by a position sensor of the mouse. In the example embodiment, mouse **32** reports position changes to embedded controller **20**, which forwards the position to scalar **126** to present the mouse cursor at the appropriate location. In alternative embodiments the mouse position changes may be presented as changes to the mouse cursor position with various communication flows, such as directly from the mouse to the scalar, through a USB hub controller and through a WNIC interface. Mouse **32** has selectable resolution for detecting changes in the mouse position, such as a 1K resolution and a 2K resolution. Higher and lower resolution of mouse position changes may be selected by a manual switch on the mouse and/or configured through a user interface supported by the mouse driver. In the example embodiment, a mouse cursor resolution manager **124** stored in non-transitory memory of the information handling system and executed on CPU **14** and/or embedded controller **20**.

(20) A difficulty with selectable mouse resolution is that the position changes reported will have different mouse cursor movements at displays that have different display resolutions. To address this problem, when a scalar **126** of a display initiates a presentation of a mouse cursor, the scalar communicates the display resolution to the mouse so that the mouse can set a position sensor resolution associated with the display resolution. By way of example, first display **120** presents visual images, such as an FPS game, with a display resolution of 2K and moves the cursor with a 1K position sensor resolution; second display **122** presents visual images, such as a MOBA game, with a display resolution of 4K and moves the cursor with a 2K position sensor resolution. In this example, when the mouse cursor transitions from the 2K display to the 4K display, the mouse position sensor resolution transitions from 1K to 2K so that mouse movements provide the same mouse cursor movements at the different displays. At a transition of the mouse cursor to a different display, the scalar of the display that initiates presentation of the mouse cursor will report the display resolution to the mouse so that the mouse processing resource can automatically adjust the mouse position sensor resolution to the display resolution, such as by comparing against a table stored in non-transitory memory of the mouse that relates display resolutions and mouse resolutions. In alternative embodiments, other resources and logic may be used to adjust the mouse resolution. For instance, embedded controller **20** may act as an intermediary that commands mouse position sensor resolution based upon cursor location and display resolution reported to the embedded controller. In another alternative embodiment, the mouse may receive an initial mouse cursor position and display resolution from the display and then track position changes commanded from the mouse to estimate when the mouse cursor transitions between displays. Alternatively a similar map may be used in the embedded controller. Although the example embodiment depicts first and second peripheral displays interfaced with a stationary information handling system, in an

alternative embodiment, one of the displays may be integrated in a portable information handling system so that the display resolution and cursor movement are managed between the integrated display and a peripheral display. In some instances where a large surface area discrepancy exists, such as a smaller integrated display and larger peripheral display, the mouse position sensor resolution may include a further adjustment that maintains a consistent mouse cursor movement taking in consideration both the difference in display surface area and display resolution.

(21) Referring now to FIG. **6**, a flow diagram depicts a process for managing mouse position sensor resolution at transitions of presentation of the mouse cursor between displays of different resolution. The process starts at step **130** when the display scalar integrated circuit detects that a mouse cursor is active at the display. In response, at step **132** the display sends its display resolution settings to the display USB hub or other communication medium. At step **134**, the display USB hub receives the display resolution from the scalar, such as through an I2C interface, as both an indication that the mouse cursor is initiated and a value for the display resolution on which the mouse cursor is presented. At step **136**, the mouse processing resource receives the display resolution from the USB hub or other communication medium, such as a wireless interface, as both an indication that the mouse cursor is presented at a display and the resolution of the display. At step **138** a determination is made of whether the display resolution matches the position sensor resolution set on the mouse, such as by comparing the display resolution against a table that relates display and position sensor resolutions. If the position sensor resolution matches that called for with the display resolution, the process continues to step **140** to keep the mouse position sensor resolution setting. If the position sensor resolution does not match that called for with the reported display resolution, the process continues to step **142** to command position sensor resolution changed to that associated with the reported display resolution.

(22) Although the present invention has been described in detail, it should be understood that various changes, substitutions and alterations can be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.

Claims

1. An information handling system comprising: a housing; a processor disposed in the housing operable to execute instructions that process information; a memory disposed in the housing and interfaced with the processor and operable to store the instructions and information; a controller disposed in the housing and interfaced with the processor and operable to accept inputs from peripheral devices for communication to the processor; first and second peripheral displays interfaced with the processor and operable to present the information as visual images, the first peripheral display being separate from the housing, the second peripheral display being separate from the housing and from the first peripheral display, the first peripheral display having a first display resolution, the second peripheral display having a second display resolution, each of the first and second peripheral display having a scalar operable to scale the visual information for presentation at the resolution of each of each of the first and second peripheral display; and a mouse interfaced with the controller, the mouse having a mouse housing separate from the housing and the first and second peripheral displays, a processing resource, a non-transitory memory, a position sensor operable to detect movement of the mouse housing as a pointer input to the controller at first and second position resolutions, the non-transitory memory storing instructions that when executed on the processing resource causes the position sensor to report positions with the first position resolution when a cursor of the mouse is presented at the first peripheral display having the first display resolution and to report positions with the second position resolution when the cursor of the mouse is presented at the second peripheral display having the second display resolution, the instructions further receiving directly from each of the first and second display scalars communication of when the cursor is initiated at each of the first and second peripheral

displays, the communication including the display resolution each time when the cursor is initiated for active presentation at the peripheral display, the instructions applying the scalar communication to set the position sensor resolution.

2. The information handling system of claim 1 wherein the instructions further cause: detection that the second peripheral display has transitioned to present visual images with the first resolution when the display scalar communication has the first resolution at initiation of the cursor at the second peripheral display; and in response to the detection, transitioning the position sensor to report with the first position resolution when the cursor of the mouse is presented at the second peripheral display.

3. The information handling system of claim 1 wherein: the first display resolution comprises 4k resolution; and the second display resolution comprises 2k resolution.

4. The information handling system of claim 3 wherein: the first position resolution comprises 2k resolution; and the second position resolution comprises 1k resolution.

5. The information handling system of claim 1 wherein the instructions further cause: mapping at the mouse processing resource cursor location versus display resolution across both the first and second peripheral displays; estimating cursor location at the mouse processing resource from analysis of a known cursor location communicated to the mouse and changes communicated from the mouse based upon mouse position sensor position resolution; and automatically adjusting between the first and second position sensor resolutions based upon the estimated cursor position relative to the mapping.

6. The information handling system of claim 1 wherein: the controller sets the mouse position sensor resolution to the first position resolution or the second position resolution; and the first and second peripheral displays communicate to the controller when the mouse cursor becomes active.

7. The information handling system of claim 1 wherein the instructions further cause: receiving of display resolution at the mouse; comparing the received display resolution with a set position resolution; and adjusting the position resolution when the received display resolution does not match the set position resolution.

8. A method for managing mouse position resolution, the method comprising: moving a mouse to generate a cursor input using a first position resolution at a first display having a first display resolution; detecting a transition associated with the cursor input of the cursor from presentation at the first display to presentation at a second display having a second display resolution; in response to the detecting, changing from the first position resolution to a second position resolution to generate the cursor input; estimating at the mouse with a mouse processing resource included in the mouse a cursor position based upon analysis at the mouse processing resource of an initial cursor position adjusted at the mouse processing resource by cursor inputs generated at the mouse; and automatically adjusting between the first and second position resolutions based upon whether the estimated cursor position is on the first or second display; wherein each of the first and second peripheral display has a scalar operable to scale the visual information for presentation at the resolution of each of each of the first and second peripheral display; and wherein the detecting includes receiving directly from the scalar of each of the first and second displays a communication-when the cursor is initiated at each of the first and second displays.

9. The method of claim 8 wherein: the first display has a 2K resolution and the first position resolution is 1K; and the second display as a 4K resolution and the second position resolution is 2K.

10. The method of claim 8 further comprising: detecting a transition associated with the cursor input of the cursor from presentation at the second display to presentation at the first display; and in response to the detecting, changing from the second position resolution to a first position resolution to generate the cursor input.

11. The method of claim 8 further comprising: communicating the first display resolution to the mouse; setting the first position resolution at the mouse based at least in part on the first display

resolution; communicating the second display resolution to the mouse; and in response to receiving the second display resolution at the mouse, setting the second position resolution at the mouse based at least in part on the second display resolution.

12. The method of claim 8 further comprising: communicating from a scalar of each of the first and second displays to the mouse a resolution of the first and second display at each initiation of presentation of the mouse cursor; and in response to receiving the communicated display resolution at the mouse, applying the display resolution communicated from the scalar at the mouse to set the position resolution.

13. The method of claim 8 further comprising: monitoring mouse cursor position with a controller on an information handling system; and commanding from the controller to the mouse the first or second position resolution based upon the mouse cursor position and the display resolution of the display associated with the mouse cursor position.

14. The method of claim 8 wherein detecting further comprises: storing plural display resolutions in the mouse non-transitory memory; and associating a position resolution with each of the plural display resolutions.

15. A mouse comprising: a housing; a processing resource disposed in the housing and operable to execute instructions to process information; a position sensor interfaced with the processing resource, the position sensor detecting and reporting movement of the housing with a selected of plural position resolutions; and a non-transitory memory storing instructions that, when executed on the processing resource, causes the position sensor to report positions with a selected first of the plural position resolutions when a cursor of the mouse is presented at a first display having a first display resolution and to report positions with a selected second of the plural position resolutions when the cursor of the mouse is presented at a second display having a second display resolution, the instructions further receiving a first cursor position on the first display, reporting position sensor movement with the first of the plural position resolutions, detecting from the position sensor movement added to the first cursor position that a second cursor position is on the second display, and in response to detecting, reporting the position sensor movement with the second of the plural position, the instructions receive directly from a scalar in each of the first and second displays, a communication of each of the first and second displays, when the cursor is initiated at each of the first and second displays, wherein the scaler is operable to scale the visual information for presentation at the resolution.

16. The mouse of claim 15 wherein: the first display resolution comprises 4k resolution; the second display resolution comprises 2k resolution the first position resolution comprises 2k resolution; and the second position resolution comprises 1k resolution.

17. The mouse of claim 16 wherein: the first display interfaces with an information handling system as a peripheral display; and the second display integrates in a portable information handling system housing.