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# Aggregated color palette generation based on user context and machine learning

## Abstract

Systems and methods described herein may provide a system that utilizes a machine learning algorithm to determine a color palette based on user context and assigning colors of the color palette to connected systems or peripherals to apply lighting effects. A method may include retrieving, by an information handling system, user context; analyzing, by the information handling system, user context to determine a plurality of colors associated with the user context; generating, by the information handling system, a set of color palettes based, at least in part, on the user context; and generating, by the information handling system, an aggregate color palette based, at least in part, on the set of color palettes. Other aspects are also disclosed.

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## Background/Summary

FIELD OF THE DISCLOSURE
(1) The instant disclosure relates to information handling systems. More specifically, portions of this disclosure relate to execution of applications in a multi-room user environment.
BACKGROUND
(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.

SUMMARY

(3) Information handling systems may be used to execute applications such as gaming applications. Aspects of embodiments of this disclosure use a machine learning algorithm to determine a color palette based on user context and assign colors of the color palette to connected systems or peripherals to apply lighting effects. The determined color palette may be used to provide lighting effects in a home gaming environment in which a user operates a controller to interact with a gaming application. The gaming controller or other device interacting with the gaming application may receive input, such as a video feed of the user and environment, and provide the input to a gaming hub. The gaming hub may determine the color palette and provide instructions to devices in the home gaming environment to display lighting effects using the color palette. Examples of devices interacting in a home gaming environment are described in this disclosure.

(4) In some embodiments, the aspects described herein may be used to support the execution of gaming applications in different environments. Gaming sessions may execute on a service, either locally on a device, on another system on the network, or in the cloud. A device may access the gaming session by executing an application that communicates with the service to receive and transmit user input to the service and provide feedback to the user from the service. The device may include its own audio/visual (AV) output for displaying a graphical user interface and/or a rendered display from the gaming session. Different environments at a location may include different AV systems, and the device may be automatically paired with an AV system and may be reconfigured to support interaction with an application session using the paired AV system.

(5) According to one embodiment, a method for execution by an information handling system, such as a hub device, includes retrieving, by an information handling system, user context; analyzing, by the information handling system, user context to determine a plurality of colors associated with the user context; generating, by the information handling system, a set of color palettes based, at least in part, on the user context; and generating, by the information handling system, an aggregate color palette based, at least in part, on the set of color palettes.

(6) In some embodiments, the user context comprises a plurality of components comprising at least one of: gaming application executed by the information handling system; gaming application history; camera feed; audio input; at least one pre-existing color palette; or friends of the user with at least one pre-existing color palette. In another embodiment, generating at least one aggregate color palette based, at least in part, on the set of color palettes uses a machine learning algorithm with the user context as an input. The user may determine a weight for each of a plurality of components of the user context used to generate the aggregate color palette. In certain embodiments, the aggregate color palette comprises: a primary color; a secondary color; a tertiary color; and a quaternary color. In some embodiments, a color of the aggregate color palette is assigned to at least one of a plurality of peripherals connected to the information handling system based, at least in part, on peripheral usage characteristics. The information handling system may receive feedback from the user regarding the assignment of color to peripheral and update the user context based, at least in part, on the user feedback.

(7) The method may be embedded in a computer-readable medium as computer program code comprising instructions that cause a processor to perform operations corresponding to the steps of

the method. In some embodiments, the processor may be part of an information handling system including a first network adaptor configured to transmit data over a first network connection; and a processor coupled to the first network adaptor, and the memory.

(8) As used herein, the term "coupled" means connected, although not necessarily directly, and not necessarily mechanically; two items that are "coupled" may be unitary with each other. The terms "a" and "an" are defined as one or more unless this disclosure explicitly requires otherwise. The term "substantially" is defined as largely but not necessarily wholly what is specified (and includes what is specified; e.g., substantially parallel includes parallel), as understood by a person of ordinary skill in the art.

(9) The phrase "and/or" means "and" or "or". To illustrate, A, B, and/or C includes: A alone, B alone, C alone, a combination of A and B, a combination of A and C, a combination of B and C, or a combination of A, B, and C. In other words, "and/or" operates as an inclusive or.

(10) Further, a device or system that is configured in a certain way is configured in at least that way, but it can also be configured in other ways than those specifically described.

(11) The terms "comprise" (and any form of comprise, such as "comprises" and "comprising"), "have" (and any form of have, such as "has" and "having"), and "include" (and any form of include, such as "includes" and "including") are open-ended linking verbs. As a result, an apparatus or system that "comprises," "has," or "includes" one or more elements possesses those one or more elements, but is not limited to possessing only those elements. Likewise, a method that "comprises," "has," or "includes," one or more steps possesses those one or more steps, but is not limited to possessing only those one or more steps.

(12) The foregoing has outlined rather broadly certain features and technical advantages of embodiments of the present invention in order that the detailed description that follows may be better understood. Additional features and advantages will be described hereinafter that form the subject of the claims of the invention. It should be appreciated by those having ordinary skill in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same or similar purposes. It should also be realized by those having ordinary skill in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. Additional features will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended to limit the present invention.

## Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) For a more complete understanding of the disclosed system and methods, reference is now made to the following descriptions taken in conjunction with the accompanying drawings.

(2) FIG. **1** is a block diagram illustrating aspects of a configurable system for providing services to users according to some embodiments of the disclosure.

(3) FIG. **2** is a block diagram illustrating possible game environments according to some embodiments of the disclosure.

(4) FIG. **3**A is a block diagram illustrating application and services hosted in different gaming environments according to some embodiments of the disclosure.

(5) FIG. **3**B is a block diagram illustrating application and services hosted in different gaming environments according to some embodiments of the disclosure.

(6) FIG. **3**C is a block diagram illustrating application and service hosted in a common gaming environment according to some embodiments of the disclosure.

(7) FIG. **3**D is a block diagram illustrating a cloud-based service arrangement for a gaming environment according to some embodiments of the disclosure.

(8) FIG. **4** is a flowchart diagram illustrating a method of generating an aggregate color palette using user context according to some embodiments of the disclosure.

(9) FIG. **5** is a block diagram illustrating a service arrangement with associated inputs according to some embodiments of the disclosure.

(10) FIG. **6** is a flowchart diagram illustrating a method of utilizing user context components to determine an aggregate color palette according to some embodiments of the disclosure.

(11) FIG. **7** is a block diagram illustrating a method of utilizing user context components to determine an aggregate color palette according to some embodiments of the disclosure.

(12) FIG. **8** is a block diagram illustrating weights associated with each of a plurality of user context components to generate an aggregate color palette according to some embodiments of the disclosure.

(13) FIG. **9** is a block diagram illustrating the assignment of each color of the aggregate color palette to at least one of a plurality of peripherals connected to the information handling system according to some embodiments of the disclosure.

(14) FIG. **10** is a schematic block diagram of an example information handling system according to some embodiments of the disclosure.

DETAILED DESCRIPTION

(15) These example embodiments describe and illustrate various aspects of a configurable and dynamic gaming environment that can be supported through the use of a hub device, which may be an information handling system. A hub device may be located in a user's home and used to arrange game play sessions (or more generically application sessions) between host devices and services. The host devices may execute an application for receiving an AV stream for displaying rendered content from a game play session (or other application session), and in some configurations also receive user input for interacting with the session from a peripheral device, such as a gaming controller. The AV stream presented by the host device may be generated by a service. The service may execute on the hub device or another information handling system, such as a cloud computing resource. A home may include one or several host devices (e.g., televisions, mobile computers, tablet computers, and personal computers) and may include one or several information handling systems executing the service (e.g., a hub devices and personal computers).

(16) The user's home may be divided into different environments defined by a space around a host device. For example, a living room with a television may be one environment and a bedroom with a personal computer may be another environment. A user may use a peripheral device in one of the environments and the hub device may configure a host device, a service, and the peripheral device for operation in the environment by determining the corresponding environment using a knowledge graph. The knowledge graph provides a database of historical information about the environments from which the hub device may use current characteristics of the peripheral device to deduce the location, and thus current environment, of the peripheral device. For example, the knowledge graph may include information about location of rooms (e.g., environments) in the house based on wireless signatures of devices within the different rooms. This difference in signatures reflects that a device on a one side of the house may receive beacon signals from different neighboring access points than a device on an opposite side of the house. When a user carries the peripheral device around the house, the hub device may determine a location of the peripheral device based on visible access points to the peripheral device. Other example characteristics beyond wireless signature for determining location are described in further detail below, and the knowledge graph may be used to combine different characteristics to identify the location, and thus environment, of the peripheral device.

(17) Based on the location of the peripheral device determined from the knowledge graph, the hub device may initialize an application session for the peripheral device by determining an appropriate

host device and service for the application session. For example, if the peripheral device is in the living room and is requesting a game that is within the capabilities of the service on the hub device to execute, the hub device may initialize an application session for the peripheral device between the television as a consumption device and the hub device as a service. The service on the hub device executes the game and streams rendered content to an application executing on the television consumption device.

(18) The hub device may be used to migrate the peripheral device to a different environment and/or migrate the application session between host devices and/or services. For example, initially the application session may use a communication link between the peripheral device and the television host device for receiving user input, in which the application executing on the television host device relays user input to the service through a backhaul communication link from the television host device to the hub device. During the application session, the hub device may monitor characteristics of the peripheral device, including signal strength of connection to other components, and determine that the communication link from the peripheral device to the hub device is stronger than the peripheral device to the television host device. The hub device may migrate the peripheral device to a communications link with the hub device such that the service executing on the hub device directly receives the user input but the streaming session continues from the service to the application executing on the television host device. Such a change is illustrated in the change in configuration from FIG. **3**A to the configuration of FIG. **3**B described in further detail below.

(19) Other aspects of the application session may also be migrated. For example, if the peripheral device is determined to move to a different environment, then the hub device may migrate the application session to an application executing on a host device within the new environment. As another example, if a connection between the television host device and the service becomes unstable, the hub device may recommend and/or initiate a migration of the application session to a different host device. One scenario for such a migration may be where the television host device is connected through a wireless link to the service in which the wireless link quality is reducing quality of the streaming and a second host device with a wired connection is available in a nearby environment. Each of these example migrations may be determined based on information in the knowledge graph regarding locations of environments and capabilities within those environments. As yet another example, a user may request execution of an application, such as a particular game, during the application session for which a better configuration exists than the current host device and/or current service. The request for a different application, such as a game requiring a certain GPU capability, may cause the hub device to determine that a second device executing a second service is better for hosting the application and migrate the peripheral device to the second service by, for example, reconfiguring network connections.

(20) The hub device may support connecting to multiple peripheral devices. In one example, the hub device may support two peripheral devices using a shared session on one host device to play the same or different games on the host device. In another example, the hub device may support two peripheral devices in different environments using different sessions with different host devices. The hub device may determine the environment of each of the peripheral devices based on characteristics of the device and the knowledge graph and configure application session for each of the peripheral devices accordingly. Different arrangements of peripherals and players may be supported. For example, one hub device executing a service and one host device executing an application can support a configuration with Game A and one player (P1) with peripheral (C1) and Game B and one player (P2) with peripheral (C2); or can support a configuration with Game A and one player (P1) with peripheral (C1) and Game A and one player (P2) with peripheral (C2); or can support a configuration with Game A and two players (P1, P2) with peripherals (C1, C2).

(21) For purposes of this disclosure, an information handling system may include any instrumentality or aggregate of instrumentalities operable to compute, calculate, determine,

classify, process, transmit, receive, retrieve, originate, switch, store, display, communicate, 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 (e.g., desktop or laptop), tablet computer, mobile device (e.g., personal digital assistant (PDA) or smart phone), server (e.g., blade server or rack server), 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, touchscreen and/or a video display. The information handling system may also include one or more buses operable to transmit communications between the various hardware components.

(22) FIG. **1** is a block diagram illustrating aspects of a configurable system for providing services to users according some embodiments of the disclosure. A system **100** includes users **102** who may have access to a shared library of applications **106** including applications **108**A-**108**N. The users **102** may have separate libraries, with some overlapping applications between the libraries. The users **102** may access the library **106** through devices **110**A-I, such as mobile gaming device **110**A, tablet computing device **110**B, phone computing device **110**C, television **110**D, personal computing device **110**E, desktop computing device **110**F, laptop computing device **110**G, game controller **110**H, VR headset **110**I. The devices **110** may access services at any of locations **112**, including cars, busses, homes, hotels, offices, parks, etc. One or more of the devices **110** may communicate with an application session executing on a computing device **114**, such as a home application hub **114**A, a server **114**B, or a cloud execution environment **114**C. In some embodiments, environments may only exist for fixed devices, e.g., desktop computers, televisions, etc.

(23) FIG. **2** is a block diagram illustrating possible game environments according to some embodiments of the disclosure. A user's home **200** may include rooms **202**A-F, and each of the rooms may have different information handling systems present, different AV equipment present, and/or different characteristics. For example, a living room **202**B may include a large-size television, a bedroom **202**D may include a personal computer, and a dining room **202**C may include a table computing device. Gaming environments **204**A-E in the home **200** may be defined based on spaces where a user is likely to execute an application session. Each gaming environment **204**A-E may include numerous devices and gaming environments, devices that may or may not be capable of hosting games, and/or devices that may or may not be capable of receiving game output. A system **100** may allow multiple users in the home **200** to simultaneously execute an application session. In some embodiments, multiple games may be hosted on a single device. In some embodiments, multiple games may target a single output device. In some embodiments, solution manages where games should be hosted, where game output should go, and how to best route peripheral I/O for users.

(24) A user may move between gaming environments **204**A-E within the home **200** and continue an application session. For example, a user may take a device, such as a gaming controller, from environment **204**A to environment **204**C. The gaming controller may migrate and reconfigure for operation in environment **204**C from a configuration for environment **204**A. For example, the controller may transition from an application hosted on a TV in living room **202**B to an application hosted on TV in dining room **202**C while remaining connected to a host service executing on a PC in bedroom **202**D.

(25) Example configurations for applications and services in gaming environments are shown in FIGS. **3**A-**3**D. FIG. **3**A is a block diagram illustrating application and services hosted in different gaming environments according to some embodiments of the disclosure. In FIG. **3**A, a first gaming

environment **304**A may include a device, such as a TV or PC, hosting an application **302**, which is an endpoint for an application session such as a gaming session. The application **302** communicates with a service **306**, which may be hosted on a device in a different gaming environment **304**B. A controller **308** may communicate with the application **302** to receive user input for the application session to control, for example, a character in a game. In some embodiments, the controller **308** is connected to the environment **304**A hosting the application and the I/O is configured to be relayed to the environment **304**B hosting the actual game.

(26) Another arrangement for the application and service is shown in FIG. **3**B. FIG. **3**B is a block diagram illustrating application and services hosted in different gaming environments according to some embodiments of the disclosure. In FIG. **3**B, the controller **308** communicates with the service **306** for providing user input to an application session, with the AV rendering target of the application session being application **302** in a different gaming environment.

(27) Another arrangement for the application and service is shown in FIG. **3**C. FIG. **3**C is a block diagram illustrating application and service hosted in a common gaming environment according to some embodiments of the disclosure. In FIG. **3**C, the application **302** and the service **306** are executed in the same gaming environment **304**A, which may be a single device, two devices, or a combination of devices in the gaming environment **304**A. The controller **308** may communicate with either the service **306** and/or the application **302**.

(28) A further arrangement for the application and service is shown in FIG. **3**D. FIG. **3**D is a block diagram illustrating a cloud-based service arrangement for a gaming environment according to some embodiments of the disclosure. In FIG. **3**D, the controller **308** may communicate with a service **306** hosted in a gaming environment **304**B that is remote from the gaming environment **304**A in which the application **302** is executing. The service **306** may be executing, for example, on a remote device, such as when the user's home includes the gaming environment **304**B but the user is engaging with application **302** at a location on a different network from their home (e.g., at a friend's house). The service **306** may also or alternatively be executed, for example, on a cloud computing device available as a subscription service to the user.

(29) An aggregate color palette may be customized for a user of an information handling system, such as a user using a gaming controller in the gaming environments **304**. The color palette may be used, for example, to determine colors to project from various lighting devices embedded in the gaming controller, the AV equipment, and/or other lighting devices in the environment.

(30) FIG. **4** is a flowchart diagram illustrating a method of generating an aggregate color palette using user context according to some embodiments of the disclosure. Method **400** may be performed, for example, by an information handling system, such as a hub device. At block **402**, the information handling system retrieves user context components from a plurality of sources. User context may be retrieved from, for example, a camera feed, a microphone, or external inputs such as information handling systems of the user's friend, in-game contacts, or other co-players in contact with the user. At block **404**, the information handling system analyzes the user context to determine a plurality of colors associated with the user context. At block **406**, the information handling system generates a set of color palettes based, at least in part, on the user context. The information handling system may utilize a machine learning algorithm to determine the set of color palettes with the user context as an input. The machine learning algorithm utilized by the information handling system may further generate an aggregate color palette based, at least in part, on the set of color palettes at block **408**. The aggregate color palette may be generated based, at least in part, on user-determined weights for each of a plurality of components of the user context.

(31) FIG. **5** is a block diagram illustrating a service arrangement with associated inputs according to some embodiments of the disclosure. Block diagram **500** illustrates the server **502** receiving external inputs **504** from a plurality of sources. The external inputs **504** may include, for example, input from information handling systems associated with one or more friends of the user, in-game contacts, or other co-players in contact with the user. The server **502** may retrieve one or more pre-

existing color palettes associated with the one or more friends of the user as a component of the user context. The server **502** utilizes and may update pre-existing color palettes associated with the user. The server **502** communicates with user devices **508**, which may retrieve input from the user's environment. User devices **508** may include, for example, a camera, microphone, or mobile device. The camera feed may be used as an input in an object segmentation step to separate the user from their environment. The information handling system may determine one or more colors associated with the user, such as clothing and accessories, and environment, such as color theme of the room or wall color, which may be used as user context components. The server **502** communicates with the gaming application **510** being executed by the information handling system. For example, one or more colors of a color palette may be determined based on game art or screenshots, game context, in-game notifications, or game history associated with the user, for example. Each of these associated inputs in communication with the server may influence a set of color palettes according to certain embodiments of the disclosure.

(32) FIG. **6** is a flowchart diagram illustrating a method of utilizing user context components to determine an aggregate color palette according to some embodiments of the disclosure. Diagram **600** illustrates a more in-depth analysis of the use of some user context components according to certain embodiments. User context components **602** are used to generate a set of color palettes **614**. User context components may include, for example: a front-facing camera feed; gaming application history associated with the user or context of a current gaming application being executing by the information handling system; pre-existing color profiles of a current user **610** or one or more friends or contacts of the user; audio input from a microphone; or other inputs from peripheral devices and systems. Input from the front-facing camera may be fed through an object segmentation algorithm **604** wherein objects may be detected. For example, the user may be separated from their environment to identify one or more colors associated with the user's clothing, accessories, wall color, or other color theme associated with the user's environment at block **606**. The audio input may undergo sentiment analysis **612** to determine a mood or sentiment of the user. The information handling system may identify appropriate colors associated with the emotion or mood of the user based on, for example, a sentiment color map. Similarly, in-game text or chat with friends or other players may undergo sentiment analysis. The colors associated with the current game or game history may also under color segmentation **608** as part of the theme of the game or game context, such as a user's success or failure during gameplay.

(33) These user context components are analyzed by the information handling system to determine a plurality of colors. The information handling system may generate a set of color palettes **614** based, at least in part, on the user context. The set of color palettes **614** are used as an input of a machine learning algorithm **618** to generate an aggregate color palette **620**. The machine learning algorithm may use user-assigned weights **616** in order to generate the aggregate color palette **620**. The aggregate color palette **620** may comprise four colors: a primary color; a secondary color; a tertiary color; and a quaternary color. Each color of the aggregate color palette **620** may be assigned **622** to a system or peripheral device connected to the information handling system through a wired or wireless connection. The colors may be assigned, for example, based on peripheral usage characteristics. For example, a peripheral device determined to be used most frequently by the user, such as a gaming controller, may be assigned the primary color, with each subsequent color assigned based on frequency of usage. The user may also identify which peripherals are desired based on the level of interaction, rather than ongoing usage. For example, while some speakers or headsets are capable of RGB lighting, the user may want to prioritize a keyboard, mouse, or gaming controller as the primary peripheral to be assigned the primary color. The speakers and headset are used throughout gameplay, but the user directly interacts with the gaming controller or keyboard and may want to overwrite the assignments to assign another color, such as the secondary or tertiary color, to the speakers or headset. Colors of the aggregate color palette may be applied to any peripheral system or device that utilizes RGB lighting and is

connected to the user's information handling system through a wired or wireless connection such as, for example, room lighting, gaming chair, headphones, microphone, speakers, mousepad, lighting towers, color strips, information handling system casing, or various other components within the information handling system.

(34) The user may choose to overwrite the system or peripheral device color assigned at block **624**. If the user approves of the color assignment, the process ends at block **626**. If the user chooses to make adjustments or changes, the system applies negative feedback on the peripheral and color combination for current user context at block **628**. This negative feedback is used to update the color profile of the user **630** to be used as user context in future determinations by the machine learning algorithm. This may result in, for example, further training of the machine learning algorithm based on the user's negative (or positive) feedback. This method creates a more personalized experience for the user and allows the system to generate more relative color palettes that are desirable to the user.

(35) FIG. **7** is a block diagram illustrating a method of utilizing user context components to determine an aggregate color palette according to some embodiments of the disclosure. Method **700** utilizes one or more user context components at block **702**. The information handling system analyzes the user context to determine a plurality of colors associated with the user context, such as through color segmentation at block **704**. Based on this analysis, the information handling system generates a set of color palettes at block **706** based, at least in part, on the user context. The set of color palettes are used as an input into a machine learning algorithm at block **708**, which also takes into consideration user-assigned weights for each of a plurality of components of the user context. If the user does not apply weights to the user context components, the algorithm may be refined through user feedback toward the outputted aggregate color palette. The outputted aggregate color palette at block **710** may be applied to a plurality of peripheral systems or devices.

(36) FIG. **8** is a block diagram illustrating weights associated with each of a plurality of user context components to generate an aggregate color palette according to some embodiments of the disclosure. Diagram **800** illustrates the weights of each user context component used to generate the set of color palettes **802**. Each color palette may comprise four colors: a primary color; a secondary color; a tertiary color; and a quaternary color. A color palette may be generated for each user context component, each color palette comprising four colors. The machine learning algorithm considers each color of each set to determine an aggregate color palette **812**. In one example, a color palette is associated with the user's environment. The user identified an environment weight to be 0.5, as illustrated in the embodiment of FIG. **8**. In this embodiment, there is also a color palette associated with the current game, with the current game weight defined as, for example, 0.3. The primary color of the environment palette and the primary color of the current game palette are considered by the machine learning algorithm according to their user-defined weights, and an aggregate primary color **804** is determined. There are a plurality of color palettes, each associated with a user context component. The primary color from each color palette is weighed based on the weight associated with its user context component to output an aggregate primary color **804**. The same method is applied for each of an aggregate second color **806**, an aggregate tertiary color **808**, and an aggregate quaternary color **810**, resulting in an aggregate color palette **812**.

(37) FIG. **9** is a block diagram illustrating the assignment of each color of the aggregate color palette to at least one of a plurality of peripherals connected to the information handling system according to some embodiments of the disclosure. Each color of the aggregate color palette **902** is assigned to a plurality of peripheral devices and systems connected to the information handling system **904** based on, for example, peripheral usage characteristics. Mouse **912** and keyboard **906** are assigned the primary color as the most frequently used peripherals. The gaming controller **914** may be assigned as the primary color by the information handling system. The user may provide negative feedback to the information handling system regarding either the color or the color/peripheral combination, and the user's color profile may be updated and the gaming controller

**914** may be re-assigned the secondary color by the user or information handling system. The speakers **908** and headset **910** may be assigned the tertiary color. Various other peripherals **916**, such as the microphone, may be assigned the quaternary color.

(38) FIG. **10** illustrates an example information handling system **1000**. Information handling system **1000** may include a processor **1002** (e.g., a central processing unit (CPU)), a memory (e.g., a dynamic random-access memory (DRAM)) **1004**, and a chipset **1006**. In some embodiments, one or more of the processor **1002**, the memory **1004**, and the chipset **1006** may be included on a motherboard (also referred to as a mainboard), which is a printed circuit board (PCB) with embedded conductors organized as transmission lines between the processor **1002**, the memory **1004**, the chipset **1006**, and/or other components of the information handling system. The components may be coupled to the motherboard through packaging connections such as a pin grid array (PGA), ball grid array (BGA), land grid array (LGA), surface-mount technology, and/or through-hole technology. In some embodiments, one or more of the processor **1002**, the memory **1004**, the chipset **1006**, and/or other components may be organized as a System on Chip (SoC).

(39) The processor **1002** may execute program code by accessing instructions loaded into memory **1004** from a storage device, executing the instructions to operate on data also loaded into memory **1004** from a storage device, and generate output data that is stored back into memory **1004** or sent to another component. The processor **1002** may include processing cores capable of implementing any of a variety of instruction set architectures (ISAs), such as the x86, POWERPC®, ARM®, SPARC®, or MIPS® ISAs, or any other suitable ISA. In multi-processor systems, each of the processors **1002** may commonly, but not necessarily, implement the same ISA. In some embodiments, multiple processors may each have different configurations such as when multiple processors are present in a big-little hybrid configuration with some high-performance processing cores and some high-efficiency processing cores. The chipset **1006** may facilitate the transfer of data between the processor **1002**, the memory **1004**, and other components. In some embodiments, chipset **1006** may include two or more integrated circuits (ICs), such as a northbridge controller coupled to the processor **1002**, the memory **1004**, and a southbridge controller, with the southbridge controller coupled to the other components such as USB **1010**, SATA **1020**, and PCIe buses **1008**. The chipset **1006** may couple to other components through one or more PCIe buses **1008**.

(40) Some components may be coupled to one bus line of the PCIe buses **1008**, whereas some components may be coupled to more than one bus line of the PCIe buses **1008**. One example component is a universal serial bus (USB) controller **1010**, which interfaces the chipset **1006** to a USB bus **1012**. A USB bus **1012** may couple input/output components such as a keyboard **1014** and a mouse **1016**, but also other components such as USB flash drives, or another information handling system. Another example component is a SATA bus controller **1020**, which couples the chipset **1006** to a SATA bus **1022**. The SATA bus **1022** may facilitate efficient transfer of data between the chipset **1006** and components coupled to the chipset **1006** and a storage device **1024** (e.g., a hard disk drive (HDD) or solid-state disk drive (SDD)) and/or a compact disc read-only memory (CD-ROM) **1026**. The PCIe bus **1008** may also couple the chipset **1006** directly to a storage device **1028** (e.g., a solid-state disk drive (SDD)). A further example of an example component is a graphics device **1030** (e.g., a graphics processing unit (GPU)) for generating output to a display device **1032**, a network interface controller (NIC) **1040**, and/or a wireless interface **1050** (e.g., a wireless local area network (WLAN) or wireless wide area network (WWAN) device) such as a Wi-Fi® network interface, a Bluetooth® network interface, a GSM® network interface, a 3G network interface, a 4G LTE® network interface, and/or a 5G NR network interface (including sub-6 GHz and/or mmWave interfaces).

(41) The chipset **1006** may also be coupled to a serial peripheral interface (SPI) and/or Inter-Integrated Circuit (I2C) bus **1060**, which couples the chipset **1006** to system management components. For example, a non-volatile random-access memory (NVRAM) **1070** for storing

firmware **1072** may be coupled to the bus **1060**. As another example, a controller, such as a baseboard management controller (BMC) **1080**, may be coupled to the chipset **1006** through the bus **1060**. BMC **1080** may be referred to as a service processor or embedded controller (EC). Capabilities and functions provided by BMC **1080** may vary considerably based on the type of information handling system. For example, the term baseboard management system may be used to describe an embedded processor included at a server, while an embedded controller may be found in a consumer-level device. As disclosed herein, BMC **1080** represents a processing device different from processor **1002**, which provides various management functions for information handling system **1000**. For example, an embedded controller may be responsible for power management, cooling management, and the like. An embedded controller included at a data storage system may be referred to as a storage enclosure processor or a chassis processor.

(42) System **1000** may include additional processors that are configured to provide localized or specific control functions, such as a battery management controller. Bus **1060** can include one or more busses, including a Serial Peripheral Interface (SPI) bus, an Inter-Integrated Circuit (I2C) bus, a system management bus (SMBUS), a power management bus (PMBUS), or the like. BMC **1080** may be configured to provide out-of-band access to devices at information handling system **1000**. Out-of-band access in the context of the bus **1060** may refer to operations performed prior to execution of firmware **1072** by processor **1002** to initialize operation of system **1000**.

(43) Firmware **1072** may include instructions executable by processor **102** to initialize and test the hardware components of system **1000**. For example, the instructions may cause the processor **1002** to execute a power-on self-test (POST). The instructions may further cause the processor **1002** to load a boot loader or an operating system (OS) from a mass storage device. Firmware **1072** additionally may provide an abstraction layer for the hardware, such as a consistent way for application programs and operating systems to interact with the keyboard, display, and other input/output devices. When power is first applied to information handling system **1000**, the system may begin a sequence of initialization procedures, such as a boot procedure or a secure boot procedure. During the initialization sequence, also referred to as a boot sequence, components of system **1000** may be configured and enabled for operation and device drivers may be installed. Device drivers may provide an interface through which other components of the system **1000** can communicate with a corresponding device. The firmware **1072** may include a basic input-output system (BIOS) and/or include a unified extensible firmware interface (UEFI). Firmware **1072** may also include one or more firmware modules of the information handling system. Additionally, configuration settings for the firmware **1072** and firmware of the information handling system **1000** may be stored in the NVRAM **1070**. NVRAM **1070** may, for example, be a non-volatile firmware memory of the information handling system **1000** and may store a firmware memory map namespace **1000** of the information handling system. NVRAM **1070** may further store one or more container-specific firmware memory map namespaces for one or more containers concurrently executed by the information handling system.

(44) Information handling system **1000** may include additional components and additional busses, not shown for clarity. For example, system **1000** may include multiple processor cores (either within processor **1002** or separately coupled to the chipset **1006** or through the PCIe buses **1008**), audio devices (such as may be coupled to the chipset **1006** through one of the PCIe busses **1008**), or the like. While a particular arrangement of bus technologies and interconnections is illustrated for the purpose of example, one of skill will appreciate that the techniques disclosed herein are applicable to other system architectures. System **1000** may include multiple processors and/or redundant bus controllers. In some embodiments, one or more components may be integrated together in an integrated circuit (IC), which is circuitry built on a common substrate. For example, portions of chipset **1006** can be integrated within processor **1002**. Additional components of information handling system **1000** may include one or more storage devices that may store machine-executable code, one or more communications ports for communicating with external

devices, and various input and output (I/O) devices, such as a keyboard, a mouse, and a video display.

(45) In some embodiments, processor **1002** may include multiple processors, such as multiple processing cores for parallel processing by the information handling system **1000**. For example, the information handling system **1000** may include a server comprising multiple processors for parallel processing. In some embodiments, the information handling system **1000** may support virtual machine (VM) operation, with multiple virtualized instances of one or more operating systems executed in parallel by the information handling system **1000**. For example, resources, such as processors or processing cores of the information handling system may be assigned to multiple containerized instances of one or more operating systems of the information handling system **1000** executed in parallel. A container may, for example, be a virtual machine executed by the information handling system **1000** for execution of an instance of an operating system by the information handling system **1000**. Thus, for example, multiple users may remotely connect to the information handling system **1000**, such as in a cloud computing configuration, to utilize resources of the information handling system **1000**, such as memory, processors, and other hardware, firmware, and software capabilities of the information handling system **1000**. Parallel execution of multiple containers by the information handling system **1000** may allow the information handling system **1000** to execute tasks for multiple users in parallel secure virtual environments.

(46) The schematic or flow chart diagrams of FIG. **4**, FIG. **6**, and FIG. **7** is generally set forth as a logical flow chart diagram. As such, the depicted order and labeled steps are indicative of aspects of the disclosed method. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method. Although various arrow types and line types may be employed in the flow chart diagram, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

(47) Machine learning models, as described herein, may include logistic regression techniques, linear discriminant analysis, linear regression analysis, artificial neural networks, machine learning classifier algorithms, or classification/regression trees in some embodiments. In various other embodiments, machine learning systems may employ Naive Bayes predictive modeling analysis of several varieties, learning vector quantization artificial neural network algorithms, or implementation of boosting algorithms such as Adaboost or stochastic gradient boosting systems for iteratively updating weighting to train a machine learning classifier to determine a relationship between an influencing attribute, such as received device data, and a system, such as an environment or particular user, and/or a degree to which such an influencing attribute affects the outcome of such a system or determination of environment.

(48) If implemented in firmware and/or software, functions described above may be stored as one or more instructions or code on a computer-readable medium. Examples include non-transitory computer-readable media encoded with a data structure and computer-readable media encoded with a computer program. Computer-readable media includes physical computer storage media. A storage medium may be any available medium that can be accessed by a computer. By way of example, and not limitation, such computer-readable media can comprise random access memory (RAM), read-only memory (ROM), electrically-erasable programmable read-only memory (EEPROM), compact disc read-only memory (CD-ROM) or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to store desired program code in the form of instructions or data structures and that can be accessed by a

computer. Disk and disc includes compact discs (CD), laser discs, optical discs, digital versatile discs (DVD), floppy disks and Blu-ray discs. Generally, disks reproduce data magnetically, and discs reproduce data optically. Combinations of the above should also be included within the scope of computer-readable media.

(49) In addition to storage on computer readable medium, instructions and/or data may be provided as signals on transmission media included in a communication apparatus. For example, a communication apparatus may include a transceiver having signals indicative of instructions and data. The instructions and data are configured to cause one or more processors to implement the functions outlined in the claims.

(50) Although the present disclosure and certain representative advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the disclosure as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. For example, although processors are described throughout the detailed description, aspects of the invention may be applied to the design of or implemented on different kinds of processors, such as graphics processing units (GPUs), central processing units (CPUs), and digital signal processors (DSPs). As another example, although processing of certain kinds of data may be described in example embodiments, other kinds or types of data may be processed through the methods and devices described above. As one of ordinary skill in the art will readily appreciate from the present disclosure, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps.

## Claims

1. A method, comprising: retrieving, by an information handling system via a gaming application executed by the information handling system, user context comprising a plurality of components comprising: user input for interacting with the gaming application; and gaming application history; and applying, by the information handling system, the user context as an input to a machine learning algorithm to generate: a set of color palettes based, at least in part, on the user context; and an aggregate color palette based, at least in part, on the set of color palettes.

2. The method of claim 1, wherein the plurality of components further comprises at least one of: camera feed; audio input; at least one pre-existing color palette; or friends of the user with at least one pre-existing color palette.

3. The method of claim 1, further comprising: receiving, from the user a weight for each of a plurality of components of the user context used to generate the aggregate color palette.

4. The method of claim 3, wherein the aggregate color palette comprises: a primary color; a secondary color; a tertiary color; and a quaternary color.

5. The method of claim 4, wherein a color of the aggregate color palette is assigned to at least one of a plurality of peripherals coupled to the information handling system based, at least in part, on peripheral usage characteristics.

6. The method of claim 1, further comprising receiving feedback from the user to update the machine learning algorithm.

7. An information handling system, comprising: a memory; a processor coupled to the memory, wherein the processor is configured to perform steps comprising: retrieving, by the information handling system via a gaming application executed by the information handling system, user

context comprising a plurality of components comprising: user input for interacting with the gaming application; and gaming application history; and applying, by the information handling system, the user context as an input to a machine learning algorithm to generate: a set of color palettes based, at least in part, on the user context; and an aggregate color palette based, at least in part, on the set of color palettes.

8. The information handling system of claim 7, wherein the plurality of components further comprises at least one of: camera feed; audio input; at least one pre-existing color palette; or friends of the user with at least one pre-existing color palette.

9. The information handling system of claim 7, wherein the user determines a weight for each of a plurality of components of the user context used to generate the aggregate color palette.

10. The information handling system of claim 9, wherein the aggregate color palette comprises: a primary color; a secondary color; a tertiary color; and a quaternary color.

11. The information handling system of claim 10, wherein a color of the aggregate color palette is assigned to at least one of a plurality of peripherals coupled to the information handling system based, at least in part, on peripheral usage characteristics.

12. The information handling system of claim 7, further comprising receiving feedback from the user to update the machine learning algorithm.

13. A computer program product, comprising: a non-transitory computer readable medium comprising code for performing steps comprising: retrieving, by an information handling system via a gaming application executed by the information handling system, user context comprising a plurality of components comprising: user input for interacting with the gaming application; and gaming application history; and applying, by the information handling system, user context as an input to a machine learning algorithm to generate: a set of color palettes based, at least in part, on the user context; and an aggregate color palette based, at least in part, on the set of color palettes.

14. The computer program product of claim 13, wherein the plurality of components further comprises at least one of: camera feed; audio input; at least one pre-existing color palette; or friends of the user with at least one pre-existing color palette.

15. The computer program product of claim 13, wherein the user determines a weight for each of a plurality of components of the user context used to generate the aggregate color palette.

16. The computer program product of claim 15, wherein the aggregate color palette comprises: a primary color; a secondary color; a tertiary color; and a quaternary color.

17. The computer program product of claim 16, wherein a color of the aggregate color palette is assigned to at least one of a plurality of peripherals connected to the information handling system based, at least in part, on peripheral usage characteristics.