AN APPARATUS FOR CONTROLLING LIGHTING BEHAVIOR OF ONE OR MORE LIGHTING ELEMENTS AND A METHOD THEREFOR

Field Of Invention

The present disclosure generally relates to an electronic device carrying one or more light emitting elements such as Light Emitting Diodes (LEDs) which can be configured to display a lighting behavior/pattern based on real time characterization of a user.

Background

It is fairly common for electronic gadgets to have capability for lightshows/lighting effects so as to enhance entertainment value when the electronic gadgets are in use.

In one example, an electronic gadget such as a speaker device can carry light emitting diodes which can be preset to present lightshows while music is being played. Hence a listener can be afforded both audio enjoyment and visual enjoyment if desired.

In another example, an electronic gadget such as a pointing device or a keyboard can carry light emitting diodes which can be preset to present lighting effects while in use. One common application is in the area of gaming where such lighting effects can enhance gaming mood for gamers during gameplay.

However, such lighting effects/lightshows are quite often preset and may not necessarily suit the preferences of the listener.

Moreover, even if some form of customization is provided, the extent of customization may also be limited such that the listener may not necessarily be able to customize lighting effects/lightshows to fully suit his/her preferences.

It is therefore desirable to provide a solution to address the foregoing problem.

Summary of the Invention

In accordance with an aspect of the disclosure, there is provided an apparatus configured to control lighting pattern that can be visually perceived from an electronic device carrying at least one light emitting element (e.g., at least one light emitting diode).

The electronic device can, for example, be a peripheral device which can be coupled to a computer. Examples of a peripheral device coupled to a computer can include a keyboard and a pointing device such as a mouse.

The apparatus can, in one embodiment, be external to the electronic device and the computer, and can be coupled to the electronic device and/or the computer by manner of one or both of wired coupling and wireless coupling.

The apparatus can, in another embodiment, be carried by the electronic device. Hence, the apparatus can be considered to be a part of the electronic device. For example, the apparatus can be carried by the electronic device internally.

The apparatus can, in yet another embodiment, be carried by the computer. Hence, the apparatus can be considered to be a part of the computer. For example, the apparatus can be carried by the computer internally.

The apparatus can include a sensor and a processor. The sensor can be coupled to the processor by manner of one or both of wired coupling and wireless coupling.

The sensor can be configured to capture input signals based on a user. The input signals can be indicative of real-time user state when the user is using (e.g., for game control during gameplay) the electronic device. The sensor can, for example, be an image capturing device such as a camera. In one embodiment, the input signals can correspond to images of the user's facial expression(s). In another embodiment, the input signals relate to the user's vital signs (e.g., pulse rate, heart beat) detectable by manner of pulse detection. Vital signals can be indicative of one or both of physical condition (e.g., alert, fatigued) and emotional condition (e.g., elation, exhilaration and anger) of the user.

The processor can be configured to receive the input signals and process the input signals in a manner so as to generate control signals. The control signals can be communicated from the processor for controlling lighting pattern displayed by the at least one light emitting element. In one embodiment, the processor can be configured to perform facial expression analysis based processing so as to determine emotional condition (i.e., user mood such as anger, excitement and elation) of the user.

Real-time user state can relate to one or both of emotional condition and physical condition of the user when the user is using the electronic device.

As an option, aside simply controlling lighting pattern, the control signals can be further communicated from the processor for selecting/controlling music genre of audio output. Specifically, the control signals can be further communicated from the processor for selecting/controlling music genre of audio output from the computer.

In another aspect of the disclosure, there is provided a control method. The control method can relate to a method for controlling lighting pattern which can be visually perceived from an electronic device (e.g., a keyboard or a pointing device such as a mouse) carrying at least one light emitting element (e.g., light emitting diode(s)).

The method can include:

1) obtaining user based input signals (e.g., images of user facial expression(s) and/or user vital sign(s)) which are indicative of user state (i.e., physical condition and/or emotional condition) when using the electronic device;

2) processing the input signals in a manner so as to generate control signals; and

3) communicating the control signals for controlling lighting pattern emitted from the at least one light emitting element.

In yet another aspect of the disclosure, there is provided a system. The system can include a plurality of computers.

Each computer (of the plurality of computers) can be coupled to an electronic device (e.g., a keyboard or a pointing device such as a mouse). Each electronic device can carry one or more lighting elements (e.g., light emitting diode(s)).

Additionally, each computer (of the plurality of computers) and/or each electronic device can carry an apparatus which can include a sensor (e.g., an image capturing device such as a camera) and a processor. The sensor can be coupled to the processor by manner of one or both of wired coupling and wireless coupling.

The sensor can be configured to capture input signals based on a user. The input signals can be indicative of real-time user state (i.e., physical condition and/or emotional condition) when the user is using the computer.

The processor can be configured to receive and process the input signals in a manner so as to generate control signals.

The control signals can be communicated from the processor for one or both of controlling lighting pattern displayed by the at least one light emitting element and providing an indication of real-time user state of a user of one computer of the plurality of computers to at least one other user of corresponding another computer of the plurality of computers.

Brief Description of the Drawings

Embodiments of the disclosure are described hereinafter with reference to the following drawings, in which:

Fig. 1 shows a system which can include a computer, an apparatus and at least one peripheral device carrying one or more lighting elements, according to an embodiment of the disclosure;

Fig. 2 shows the system of Fig. 1 in further detail, according to an embodiment of the disclosure;

Fig. 3 shows a user interface for use by a user to program/preset lighting pattern(s) displayed by the light emitting element(s) of Fig. 1, according to an embodiment of the disclosure; and

Fig. 4 shows a flow diagram of a control method associated with the system of Fig. 1, according to an embodiment of the disclosure.

Detailed Description

Representative embodiments of the disclosure, for addressing the foregoing problem(s), are described hereinafter with reference to Fig. 1 to Fig. 4.

Referring to Fig. 1, a system 100 is shown in accordance with an embodiment of the disclosure. The system 100 can, for example, be a gamer based system suitable for use by a user (not shown) such as a gamer for playing computer games.

As shown, the system 100 can include a computer 102, one or more peripheral devices 104 and an apparatus 106. The computer 102 can be coupled to the peripheral device(s) 104. The apparatus 106 can be coupled to one or both of the computer 102 and the peripheral device(s) 104. Examples of a computer can include desktop based personal computers and portable type devices such as Smartphones, electronic tablets and laptops. Examples of a peripheral device can include data entry devices such as a keyboard and pointing devices such as a mouse.

Coupling between the computer 102 and the peripheral device(s) 104 can be based on one or both of wired coupling and wireless coupling. Additionally, coupling between the apparatus 106 and one or both of the computer 102 and the peripheral device(s) 104 can be based on one or both of wired coupling and wireless coupling.

Furthermore, the apparatus 106, although illustrated to be external to the computer 102 and the peripheral device(s) 104, can, in one embodiment, be carried by the computer 102. For example, the apparatus 106 can be carried within the computer 102 and is therefore not visually perceivable to the user. In this regard, the apparatus 106 can, effectively, be considered one part of the computer 102 in accordance with an embodiment of the disclosure.

Similarly, the apparatus 106 can, in another embodiment, be carried by a peripheral device 104. For example, the apparatus 106 can be carried within a peripheral device 104 and is therefore not visually perceivable to the user. In this regard, the apparatus 106 can, effectively, be considered one

part of the peripheral device 104 carrying it, in accordance with another embodiment of the disclosure.

In accordance with yet another embodiment of the disclosure, the apparatus 106 can be carried by both the computer 102 and a peripheral device 104. Specifically, one part of the apparatus 106 can be carried by the computer 102 and another part of the apparatus 106 can be carried by a peripheral device 104.

In one exemplary application, as mentioned earlier, the system 100 can be a gamer based system. In this regard, the computer 102 can be configured to execute/run a computer game which can be played by a gamer. The gamer can play the computer game using the peripheral device(s) 104. Specifically, game control by the gamer during gameplay can be via the peripheral device(s) 104. Examples of a peripheral device 104 can include a keyboard and a pointing device such as a mouse.

Preferably, the peripheral device(s) 104 can be configured to display one or more lighting patterns in accordance with the user's physical condition and/or emotional condition. The will be discussed in further detail with reference to Fig. 2 hereinafter.

Referring to Fig. 2, the system 100 of Fig. 1 is shown in further detail in accordance with an embodiment of the disclosure.

Specifically, the system 100 can include a peripheral device 104 which is an electronic device carrying one or more lighting elements 202 and a driver 203. The lighting element(s) 202 can be coupled to the driver 203. Moreover, the apparatus 106 can include a sensor 204 and a processor 206. Additionally, each of the peripheral device 104 and the apparatus 106 can optionally include a transceiver 208.

The sensor 204 can be coupled to the processor 206. The processor 206 can be coupled to the lighting element(s) 202 via the driver 203. Specifically, the processor 206 can be coupled to the driver 203 which is, as mentioned earlier, coupled to the lighting element(s) 202.

Coupling between the sensor 204 and the processor 206 can be via one or both of wired coupling and wireless coupling. Similarly, coupling between the processor 206 and the driver 203 can be via one or both of wired coupling and wireless coupling. Wireless coupling between the peripheral

device 104 and the apparatus 106 can correspond to wireless communication between the peripheral device 104 and the apparatus 106 via the transceivers 208.

Operationally, the sensor 204 can be configured to capture user based input signals. The input signals can be indicative of the state of the user at the point in time when using the peripheral device 104 for game control during gameplay. State of the user (i.e., user state) can refer to physical condition and/or emotional condition of the user.

In one example, in relation to physical condition, the user might be tired, distracted or sleepy etc. In another example, in relation to emotional condition, the user might be feeling excited, angry, happy etc.

One possible way to capture such user based input signals can be by manner of pulse estimation via pulse based detection using Intel® RealSense™ technology. Hence, the sensor 204 can be configured to capture input signals based on a user (e.g., a gamer) and the input signals can be indicative of real-time (i.e., at the point in time when using the peripheral device 104) user state (i.e., physical condition and/or emotional condition of the user) when the user is using the peripheral device (e.g., an electronic device such as a mouse) carrying at least one light emitting element 202. The sensor 204 can, for example, be an image capturing device (e.g., camera) capable of capturing images of the user. The input signals can, for example, correspond to images of facial expression of the user or a high resolution image capture of the user's eyeball(s).

The processor 206 can be configured to receive and process the input signals. Preferably, the processor 206 is configured to receive and process the input signals in a manner so as to generate control signals which can be used for controlling lighting pattern from the lighting element(s) 202.

In one example, processing can be by manner of performing facial expression based analysis of the user to determine the emotional condition (i.e., user mood such as happy/excited/sad) of the user. In another example, processing can be by manner of detecting subtle changes in the blood vessels of the user's eyeball(s) to determine physical condition (i.e., tired/sleepy) of the user.

Moreover, by detecting subtle changes in the blood vessels of the user's eyeball(s), vital signs (e.g., heartbeat, pulse rate) can be deduced/derived. Appreciably, user vital signs can be indicative of emotional condition and/or physical condition of the user. In one example, concerning user

emotional condition, a high heartbeat rate can be indicative that the user is excited. In another example, concerning user physical condition, a low heartbeat rate can be indicative that the user is fatigued.

Control signals generated by the processor 206 can be communicated to the peripheral device 104. Specifically, control signals can be communicated from the processor 206 to the driver 203 for controlling lighting pattern displayed by the light emitting element(s) 202. An example of a light emitting element 202 is a light emitting diode (LED).

Lighting pattern(s) displayed by the light emitting element(s) 202 can, for example, be preset/programmed. In an example, a specific lighting pattern can be associated with a particular emotional condition (i.e., user mood) of the user. In one specific example, the light emitting element(s) 202 can be programmed to display a lighting pattern corresponding to fast blinking when control signals communicated from the processor 206 are indicative that the user is feeling excited. In another specific example, the light emitting element(s) can be programmed to display a lighting pattern corresponding to slow pulsing when control signals communicated from the processor 206 are indicative that the user is fatigued. Programming/presetting of lighting pattern(s) will be discussed later in further detail with reference to Fig. 3.

Therefore, it is appreciable that the apparatus 106, in general, can be configured to control lighting pattern visually perceivable from an electronic device (i.e., peripheral device 104) carrying at least one light emitting element based on real time characterization of a user. Real time characterization of a user relates to real time user state (i.e., emotional condition such as happy and/or physical condition such as fatigued) of the user when using the electronic device while, for example, playing a game run by the computer 102.

Referring to Fig. 3, a user interface 300 can, in accordance with an embodiment of the disclosure, be presented by the computer 102 (e.g., via a display screen of the computer 102) for a user to program/preset lighting pattern(s) emitted by the light emitting element(s) 202.

As shown, the user interface 300 can be in the form of a graphics user interface (GUI) which includes a plurality of options 302 (e.g., drop down boxes) for a user to make various selections.

Each of the plurality of options 302 can include a first section 302a and a second section 302b. The first section 302a can be used by the user to select a particular lighting pattern and the second section 302b can be used by the user to specify a particular user state to be associated with the selected lighting pattern.

For example, via the first section 302a, a lighting pattern corresponding to "fast blinking" can be selected by the user. Moreover, via the second section 302b, the user state corresponding to "excited" can be specified by the user. Therefore, when the control signals communicated from the processor 206 are indicative that the user is feeling (i.e., real time emotional condition of the user) excited, the light emitting element(s) 202 can be configured to display a lighting pattern corresponding to "fast blinking". That is, when it is determined that a user is feeling excited at a particular point in time while using the peripheral device 104 during gameplay, the, for example, LEDs carried by the peripheral device 104 can blink rapidly to reflect the user's emotional condition of excitement while using the peripheral device 104.

Hence lighting pattern visually perceivable from the peripheral device 104 can be varied in real-time based on real-time characterization of the user (i.e., real-time user state) who is using the peripheral device 104. Therefore, it is appreciable that a high degree of personalization/customization in terms of user experience can be afforded. It is further appreciable that lighting pattern visually perceivable can be varied in real-time in accordance with user state.

Additionally, other than general improvement in user experience, other practical advantages can also be provided. For example, lighting pattern(s) displayed can function or serve as a form of health monitor where the user should consider having a rest (i.e., take a break from gameplay) if the light pattern emitted is indicative that the user is fatigued/over excited.

Referring to Fig. 4, a flow diagram of a control method 400 associated with the system 100 is shown, in accordance with an embodiment of the disclosure.

Specifically, the control method 400 relates to a method for controlling lighting pattern visually perceivable from one or more electronic devices (i.e., the aforementioned one or more peripheral devices 104) carrying one or more light emitting elements 202.

The control method 400 can include a capture step 402, a processing step 404 and a communication step 406, in accordance with an embodiment of the disclosure.

In regard to the capture step 402, user based input signals which are indicative of user state (i.e., emotional condition and/or physical condition of the user) when using the electronic device can be obtained. As mentioned earlier, the sensor 204 can be configured to capture user based input signals.

In regard to the processing step 404, the input signals can be processed in a manner so as to generate control signals. Specifically, the input signals captured by the sensor 204 can be communicated to the processor 206 for processing to generate the control signals.

In regard to the communication step 406, the control signals can be communicated for controlling lighting pattern emitted from the one light emitting element(s) 202. Specifically, communication signals can be communicated from the processor 206 to the electronic device(s) and light pattern(s) displayed by the light emitting element(s) 202 carried by the electronic device(s) can be based the received control signals.

In the foregoing manner, various embodiments of the disclosure are described for addressing at least one of the foregoing disadvantages. Such embodiments are intended to be encompassed by the following claims, and are not to be limited to specific forms or arrangements of parts so described and it will be apparent to one skilled in the art in view of this disclosure that numerous changes and/or modification can be made, which are also intended to be encompassed by the following claims.

In one example, the system 100 can include one or more other computers (not shown) aside the aforementioned computer 102 and one or more other peripheral device(s) aside the aforementioned peripheral device(s) 104. The one or more other computers can be analogous to the aforementioned computer 102. In this regard, the one or more other computers can be structurally and/or functionally similar to the aforementioned computer 102. Moreover, each of the one or more other computers can be coupled to corresponding each of the another one or more peripheral devices (not shown) analogous to the aforementioned peripheral device(s) 104.

The one or more other computers can be coupled to the aforementioned computer 102 via one or both of wired coupling (e.g., local area network type cable(s)) and wireless coupling (e.g., a wireless communication network). The one or more computers can, for example, be used by corresponding one or more other users such as corresponding one or more other gamers playing the same game as the user (e.g., gamer) of the aforementioned computer 102. In this regard, the user of the computer 102 and the corresponding one or more other users (of the aforementioned one or more other computers) can, for example, be gaming team mates (e.g., members of a gaming team playing the same computer game).

Appreciably, control signals generated by the processor 206 (i.e., which is carried by the aforementioned computer 102) can be communicated to one or both of the one or more other computers and the peripheral device 104 (i.e., which is coupled to the aforementioned computer 102). In one embodiment, control signals generated by the processor 206 carried by the aforementioned computer 102 can be communicated to the one or more other computers and the peripheral device 104 coupled to the aforementioned computer 102. In another embodiment, control signals generated by the processor 206 carried by the aforementioned computer 102 can be communicated to the one or more other computers but not to the peripheral device 104 coupled to the aforementioned computer 102.

Where the control signals generated by the processor 206 (i.e., which is carried by the aforementioned computer 102) are communicated to one or more other computers, the aforementioned corresponding one or more other users can be alerted to the real-time user state (i.e., physical condition and/or emotional condition) of the user using the aforementioned computer 102.

Specifically, corresponding processor(s) carried by the one or more other computers can be configured to process the control signals (i.e., communicated from the aforementioned computer 102) to generate one or more indications (e.g., graphic based indications) on-screen (i.e., at the one or more other computers) so that the aforementioned corresponding one or more other users can be privy to the real-time user state of the user of the aforementioned computer 102.

It is appreciable that aside/other than on-screen based indication(s), corresponding processor(s) carried by the one or more other computers can be configured to process the control signals so as to control lighting pattern from the lighting element(s) carried by the aforementioned corresponding

one or more peripheral device(s). Therefore, lighting pattern from the lighting element(s) carried by the aforementioned corresponding one or more peripheral device(s) can, as an option, be based on the communicated control signals from the aforementioned computer 102.

In one application, the communicated control signals can be used to estimate stress levels (per, for example, on-screen graphics based indication(s) based on the communicated control signals) of gaming team mates during gameplay. Indication(s) indicative of alleviated stress levels of team mate(s) can signify that assistance will be required and other team mate(s) can, therefore, be alerted to assist such stressed team mate(s) during game play.

In another application, the communicated control signals can be used to ascertain health condition of gaming team mates during gameplay. Indication(s) can be indicative (e.g., excessive heart beat rate) that a team mate may be in need of medical attention and other team mate(s) can, therefore be alerted to the need of such medical attention and provide appropriate assistance.

In another example, other than using the control signals for controlling lighting pattern from the lighting element(s) 202, the control signals can further be used for selecting/controlling music genre of audio output from the computer 102. Specifically, an audio file from a particular music genre can be played based on the control signals. For example, if a user of the computer 102 is determined to be anxious/stressed (i.e., emotional condition), an audio file belonging to a soothing type music genre can be selected and played to calm the user. Additionally, for example, if a user of the computer 102 is determined to be fatigued (i.e., physical condition), an audio file belong to a fast paced type music genre can be selected and played to perk up the user.

In this regard, the computer 102 can include a database (not shown) of audio files categorically organized based on music genres for selection by the processor 206. The computer 102 can further include an audio processor (not shown) connected to speaker units (not shown) of the computer 102. The audio processor can be coupled to the database and/or the processor 206. After an audio file is selected, it can be communicated to the audio processor for further processing for output via the speaker units so that the audio file can be audibly perceived by the user. In one embodiment, the database can reside locally in the computer 102 in the form of a memory module (e.g., a hard disk drive). In another embodiment, the database can be remotely located from the computer 102 in the form of, for example, an internet based database.

Claims

1. An apparatus configured to control lighting pattern visually perceivable from an electronic device carrying at least one light emitting element, the apparatus comprising:

a sensor configured to capture input signals based on a user, the input signals being indicative of real-time user state when using the electronic device;

a processor receiving and processing the input signals in a manner so as to generate control signals,

wherein the control signals are communicable from the processor for controlling lighting pattern displayed by the at least one light emitting element.

2. The apparatus as in claim 1 wherein the sensor is an image capturing device and the input signals correspond to images of facial expression of the user.

3. The apparatus as in claim 2

wherein the processor is configured to perform facial expression analysis based processing so as to determine emotional condition of the user, and

wherein real-time user state relates to user emotional condition when using the electronic device.

4. The apparatus as in claim 1 wherein the input signals are based on pulse detection usable to derive vital signs of the user.

5. The apparatus as in claim 4

wherein the vital signals are indicative of at least one of physical and emotional condition of the user, and

wherein real-time user state being based on at least one of physical and emotional condition of the user.

6. The apparatus as in claim 1, wherein the control signals are further communicable from the processor for selecting music genre of audio output.

7. A method for controlling lighting pattern visually perceivable from an electronic device carrying at least one light emitting element, the method comprising:

obtaining user based input signals which are indicative of user state when using the electronic device;

processing the input signals in a manner so as to generate control signals; and

communicating the control signals for controlling lighting pattern displayed by the at least one light emitting element.

8. A system comprising:

a plurality of computers, each of the plurality of computers being coupled to an electronic device and each electronic device carrying at least one light emitting element; and

an apparatus carried by one or both of each of the plurality of computers and each electronic device, each apparatus comprising:

a sensor configured to capture input signals based on a user, the input signals being indicative of real-time user state when using the computer; and

a processor receiving and processing the input signals in a manner so as to generate control signals,

wherein the control signals are communicable from the processor for one or both of controlling lighting pattern displayed by the at least one light emitting element and providing an indication of real-time user state of a user of one computer of the plurality of computers to another user of another computer of the plurality of computers.