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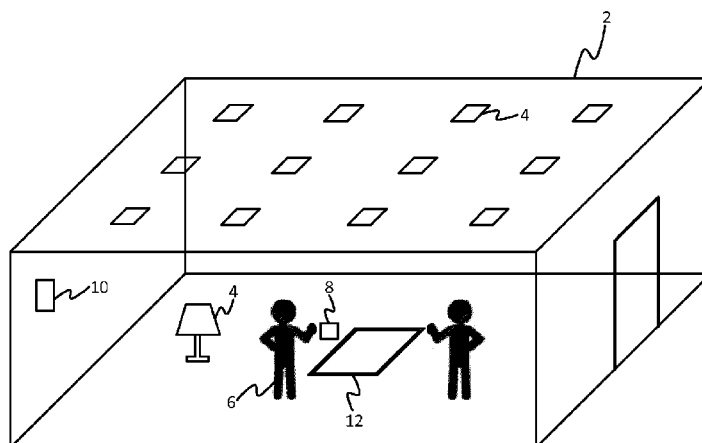
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Figure 1



(57) Abstract: A lighting controller for controlling illumination emitted by one or more luminaires to accompany a board or card. The lighting controller accesses a set of lighting rules, specifying a respective lighting effect mapped to each of multiple respective game events that can occur within the game; and receives input signals from an input device identifying occurrence of each of a plurality of the game events. Based thereon, the lighting controller controls the illumination to produce the respective lighting effect upon occurrence of each of the plurality of game events. The lighting controller is further configured to track a state of the game, the state being dependent on a history of the game; wherein one or more of the events are state-dependent events defined at least in part based on the state of the game, the set of rules specifying a respective lighting effect for each of the state-dependent events.

Lighting for games

TECHNICAL FIELD

The present disclosure relates to controlling the illumination emitted by one or more luminaires (e.g. room lighting) in order to accompany the playing of a board or card game, i.e. either a game in which users conduct the game via physical game pieces placed on a physical game board, or a game in which users conduct the game via physical game cards (or a combination of the two).

BACKGROUND

Connected lighting systems are a class of lighting systems comprising networked illumination sources, preferably connected via a wireless network so that the illumination sources are wirelessly controllable. These illumination sources can be controlled from various user interfaces, such as smartphone and tablet applications, via internet services, or via connected physical devices such as sensors and switches. The behavior that can be assigned to a connected lighting system offers more opportunities than traditional lighting systems. For an end-user it is possible to specify how he wants his lighting system to behave. It is even possible to specify different forms of behavior at different moments in time. In other words the user is now able to use his or her lighting system not only for illumination or atmosphere creation but as a way to support or enhance any other activities happening in the home environment or online e.g. for entertainment, security, notifications, etc.

To make connected lighting systems appeal more to mainstream customers, new applications are being sought. In one such application, it is known to use luminaires to accompany the playing of board games, but this has always been for nothing other than general scene setting (e.g. flash lamps while dice are thrown).

SUMMARY

For board games or card games, lighting can add to the experience of playing the game in different ways. For example, lighting atmospheres can be created that fit the theme of the game. Alternatively or additionally, lighting can help to advance through

sequences of the game and guide players in playing the game, e.g. reminding whose turn it is, helping with time keeping, keeping track of scores, etc.

However, an issue is that defining how the lighting system – or individual components of the system – must behave is a complex task, which is not something that can necessarily be asked of an end-user. Setting up the behavior of a connected lighting system can be a difficult task. Especially if the behavior gets more complex, it would be desirable if the end-user need not be confronted with the (oftentimes) difficult technical implementation to achieve the resulting behavior. Instead the user should be able to select behavior of the lighting system that fits the activity or sequence in question.

Therefore, the present disclosure provides an arrangement by which user may apply various ‘packages’ of lighting system behavior to his or her lighting system. Particularly, there is disclosed a ‘gaming center’ where users can activate certain sets of rules that can be used for the duration of the game to enhance the game experience and/or to support the gaming activity.

According to one aspect disclosed herein, there is provided an apparatus comprising a lighting controller for controlling illumination emitted by one or more luminaires (4) of a lighting system to accompany a game played in an environment illuminated by the illumination from said one or more luminaires, the game being a board game in which players play the game using physical game pieces placed on a physical game board, and/or a card game in which players play the game using a pack of physical game cards. The lighting controller is configured to perform operations of: accessing a set of lighting rules (e.g. stored on a server), the set of lighting rules specifying a respective lighting effect mapped to each of multiple respective game events that can occur within the game; and receiving input signals from at least one input device identifying the occurrence of each of a plurality of said game events during the playing of the game; and based on the input signals received from the at least one input device, and on the lighting rules, controlling the illumination emitted by the one or more luminaires to produce the respective lighting effect upon occurrence of each of the plurality of game events during the playing of the game. The lighting controller is further configured to track a state of the game, the state being dependent on a history of the game; wherein one or more of said events are state-dependent events defined at least in part based on the state of the game, the set of rules specifying a respective lighting effect for each of the state-dependent events.

In embodiments, said set of game events may comprise one or more of: one of the players rolling a die or dice, one of the players spinning a spinner, one of the players

ending a turn, one of the players manipulating one or more of the game pieces, one of the players playing one or more of the game cards, one of the players answering a question, a start of the game, and/or an end of the game.

In embodiments, the state based upon which one or more of the state-dependent events are defined may comprises one or more of: which of the players currently has a turn, a number of turns elapsed since the game started or a predefined stage in the game, an amount of time elapsed since the game started or a predefined stage in the game, a position of one or more of the pieces on the game board, and/or a number of the game cards remaining in a pile.

In embodiments, the lighting controller may be implemented in one or more local control devices of the lighting system, and may be configured to perform said accessing by downloading the set of light rules from a server over a network. E.g. the one or more local control devices may comprise at least a lighting bridge.

In embodiments, the one or more local control devices may comprise at least a user terminal in the form of a smartphone, tablet, laptop, or desktop computer; and the lighting controller may be implemented at least partially in the form of an application arranged to run on the user terminal.

In embodiments, the lighting controller may be implemented on a server storing the set of rules, and may be arranged to perform said control of the luminaires by sending commands over a network to one or more local control devices of the lighting system.

In embodiments, the at least one input device may comprise comprises a dedicated lighting control peripheral coupled externally to said bridge or mobile user device by a wired or wireless connection.

In embodiments, the at least one input device may comprise a user interface of a smartphone, tablet, laptop or desktop computer.

In embodiments, the at least one input device may comprise one or more sensors arranged to sense one or more actions performed on said game board, using said game pieces, and/or using said game cards.

In embodiments, the lighting controller may be further configured to accept an indication of a printed code detected by a scanning device, and based thereon to identify the set of rules to access from amongst a database of two or more available sets of rules stored on said server.

In embodiments, the lighting controller may be further configured to allow a user to select to only a subset of the set of rules specifying the respective lighting effects for only a subset of the events, and to control the illumination to produce the respective lighting effect only corresponding to the subset of events.

5 In embodiments, in order to produce the lighting effects mapped to said plurality of game events, the lighting controller may be configured to override a previous lighting scene being produced by the luminaires prior to the playing of the game; but wherein the lighting controller is also configured to automatically control the luminaires to revert back to producing said lighting scene after producing the lighting effects mapped to said
10 plurality of game events (i.e. after the last effect of the game has been rendered, so that the lighting scene after the end of the game is returned to the original scene that was being rendered prior to the start of the game).

According to another aspect disclosed herein, there may be provided a lighting control system comprising the lighting controller, and further comprising the input device
15 and a network interface each operatively coupled to the lighting controller by a wired and/or wireless connection, the controller being arranged to use the network interface to perform the downloading of the lighting rules.

According to another aspect disclosed herein, there may be provided a lighting system comprising the lighting control system and the luminaires, the luminaires being
20 operatively coupled to the control system by wired and/or wireless connections (e.g. a wireless network).

According to another aspect disclosed herein, there may be provided a computer program product for controlling illumination emitted by one or more luminaires of a lighting system to accompany a game played in an environment illuminated by the
25 illumination from said one or more luminaires, the game being a board game in which players play the game using physical game pieces placed on a physical game board, and/or a card game in which players play the game using a pack of physical game cards; wherein the computer program product comprises code embodied on a computer-readable medium and configured so as when run on one or more control devices to perform operations of:
30 accessing a set of lighting rules, the set of lighting rules specifying a respective lighting effect mapped to each of multiple respective game events that can occur within the game; and receiving input signals from at least one input device identifying the occurrence of each of a plurality of said game events during the playing of the game; and based on the input signals received from the at least one input device, and on the lighting rules, controlling the

illumination emitted by the one or more luminaires to produce the respective lighting effect upon occurrence of each of the plurality of game events during the playing of the game; wherein the code is further configured so as when run on the one or more control devices to track a state of the game, the state being dependent on a history of the game; and wherein one or more of said events are state-dependent events defined at least in part based on the state of the game, the set of rules specifying a respective lighting effect for each of the state-dependent events.

According to another aspect disclosed herein, there is provided a method of controlling illumination emitted by one or more luminaires of a lighting system to accompany a game played in an environment illuminated by the illumination from said one or more luminaires, the game being a board game in which players play the game using physical game pieces placed on a physical game board, and/or a card game in which players play the game using a pack of physical game cards; wherein the method comprises: accessing a set of lighting rules, the set of lighting rules specifying a respective lighting effect mapped to each of multiple respective game events that can occur within the game; and receiving input signals from at least one input device identifying the occurrence of each of a plurality of said game events during the playing of the game; and based on the input signals received from the at least one input device, and on the lighting rules, controlling the illumination emitted by the one or more luminaires to produce the respective lighting effect upon occurrence of each of the plurality of game events during the playing of the game; wherein the method comprises tracking a state of the game, the state being dependent on a history of the game; and wherein one or more of said events are state-dependent events defined at least in part based on the state of the game, the set of rules specifying a respective lighting effect for each of the state-dependent events.

In embodiments the control system, lighting system, computer program product and/or method may be further configured in accordance with any of the features mentioned above or described elsewhere herein.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Fig. 1 is a schematic illustration of an environment in which one or more users are playing a board or card game,

Fig. 2 is a schematic block diagram of a system for controlling the illumination in said environment in order to accompany the playing of the game.

DETAILED DESCRIPTION OF EMBODIMENTS

5 The following discloses an online platform (“gaming center”) that allows users to download (or share) a set of lighting based rules and behaviors directly to the light controlling system (e.g. bridge) for the game of their choice, and then use this to support or enhance gameplay of said game.

10 The gaming center is an online platform where users can search, select and apply packages of behavior for their connected lighting systems. A package of rules is tailored towards a specific game (or category of game). Game developers can create a rule package for this game and upload this to the game center.

15 Figure 1 illustrates an environment 2 in which one or more players 6 are playing a game 12 in the form of a board game or card game. The environment 2 may comprise a room such as a room of a home, school or communal leisure facility (where a “room” may be any internal division of a building such as a living room, dining room, bedroom, village hall, school hall, etc.). Alternatively the environment 2 may comprise an outdoor space such as a garden or park, or a partially covered space such as a gazebo. Whatever form it takes, the environment 2 is equipped with a connected lighting system
20 comprising one or more luminaires 4 and at least one lighting control device such as a lighting bridge 10 connected to control the luminaires 4. The luminaires 4 are illumination sources for illuminating the environment 2 in which the game 12 is being played. Each luminaire 4 comprises: at least one respective lamp (e.g. LED lamp, filament bulb or fluorescent tube); a wired or wireless communication interface for communicating with the
25 lighting control device (e.g. bridge 10); and any associated socket support, and/or housing. Each of the luminaires 4 may take any of a variety of forms, e.g. a ceiling mounted luminaire, a wall-mounted luminaire, a wall washer, or a free-standing luminaire (and the luminaires 4 need not necessarily all be of the same type).

30 The players 6 are also provided with an input device 8 for identifying events occurring within the game, e.g. comprising buttons the players can press when they wish to roll the dice, complete a turn, or such like. For example this may be the Philips Hue Tap controller.

 Further details and other variants will be discussed shortly in relation to Figure 2.

The game 12 is a game conducted (played) by means of physical tokens, these being either physical game pieces placed on a physical game board, and/or physical game cards. By “physical” herein, or the like, it is meant to exclude virtual entities appearing on-screen in a video game, and also to exclude controllers for controlling such entities in a video game. Rather, the game tokens are tangible objects that the user can manipulate by means of direct contact with his or her body (typically by hand). Typically the game tokens have no electronic or even moving parts. In embodiments, the game 12 does not involve a screen in any way, though it is not excluded that it could involve for example an accompanying companion application running on a user device 13 such as a smartphone, tablet or laptop. In many applications, the game 12 is a turn-based game, i.e. the players take turns to perform actions within the game 12.

According to embodiments disclosed herein, the lighting control device (e.g. bridge 10) is arranged to download a set of game rules specific to the particular game 12 being played (or particular category of game), and to identify events occurring within the game based on the input from the input device 8. The rules map a respective lighting effect to each of a plurality of the events that may occur as part of playing the game 12. Once downloaded, the lighting controller (e.g. bridge 10) is configured to act in accordance with these rules, so as to control the illumination emitted by the one or more luminaires 4 to render the corresponding lighting effect to accompany the respective event. The system also keeps track of the game status based on the input from the input device 8 (where the status depends on the game history), and controls the light output based on this determined game status.

Further details of an exemplary implementation are illustrated in Figure 2.

The arrangement of Figure 2 comprises a lighting system connected to a wide area network 18, preferably a wide area internetwork such as that commonly referred to as the Internet. The following will be described in terms of the Internet 18, but it will be appreciated this is not necessarily limiting. The lighting system comprises a local lighting network, comprising the one or more luminaires 4, a lighting control device in the form of a lighting bridge 10, and at least one input devices 8, with the luminaires 4 and input device 8 each being arranged to connect to the lighting bridge 10 by means of a wired or wireless connection. Preferably the local lighting network is a wireless network, with the luminaires 4 and input device 8 each being arranged to connect to the lighting bridge 10 by means of a wireless connection using a wireless access technology such as Wi-Fi, ZigBee or Bluetooth, or the like. The bridge 10 connects to the Internet 18 via a router 14, with the bridge 10 connecting by a wired or wireless connection, preferably a wireless connection such as a Wi-

Fi, ZigBee or Bluetooth connection or the like. In a particular embodiment the lighting network between the bridge 10 and the luminaires 4 and input device 8 is ZigBee network, while the router 14 is a Wi-Fi router. The following examples may be described in these terms, but again it will be appreciated this is not limiting to all possible embodiments.

5 The various interactions described herein between the various components 4, 8, 10, 13 and 14 may be conducted via any of the above means or others, and for brevity the means of connection will not be repeated each time.

10 The lighting bridge 10 comprises a lighting controller 24 arranged to receive input from the (at least one) input device 8a (or more generally 8) via the above-described connection within the lighting network, and to control the one or more luminaires 4 via the above-described connection within the lighting network. The lighting controller 24 may be implemented in the form of software stored on a memory of the lighting bridge 10 and arranged to run on a processor of the lighting bridge 10 (the memory comprising one or more memory devices and the processor comprising one or more processing units). Alternatively
15 the lighting controller 24 may be implemented in the format of dedicated hardware circuitry, or configurable or reconfigurable circuitry such as a PGA or FPGA, or any combination of software and hardware.

20 The input device 8 may take the form of a dedicated lighting control peripheral 8a, comprising a user interface in any suitable form such as mechanical buttons or a touch technology. In one particular implementation the input peripheral is the Philips Hue Tap, but this is not limiting.

25 In alternative or additional embodiments, the input device 8 (or one of the input devices 8) may take the form of the user interface 8b of a general purpose user terminal 13, e.g. a mobile user terminal such as a smartphone, tablet or laptop. For instance the user interface 8b may comprise a touch screen interface or point-and-click interface. The user terminal 13 may connect to the bridge 10 to provide the input from the user interface 8b via any of the same communication means discussed above in relation to the lighting control peripheral 8a. For instance the user terminal 13 may be arranged to run a companion application (or “app”) designed to accompany the game 12 or games in general, which
30 displays a suitable on-screen user interface through which to receive the input, and forwards an indication of the inputs to lighting controller 24 on the lighting bridge 10. Examples may be described in terms of the lighting control peripheral 8a being the input device 8, but it will be appreciated this is not limiting to all possible embodiments.

As yet another alternative or additional example, the one or more input devices 8 may comprise one or more sensors (not shown) for automatically detecting game events, or individual actions upon which game events depend. For instance, one or more of the physical tokens of the game may each be fitted with a sensor such as a contact sensor, pressure sensor or light sensor which can detect when they are being manipulated in a certain way, e.g. when moved or placed on a board, or when a card is played. Similarly (but conversely), the board or a card receptacle could be fitted with a sensor such as a pressure sensor, contact sensor or light sensor to detect the movement or placement of a piece.

As another example of sensor-based approach, the one or more input devices 8 may comprise one or more cameras arranged to capture still or video images of some or all of the players 6 and/or game equipment 12 in the environment 2, combined with an image recognition algorithm configured to recognize certain actions occurring within the game, e.g. that the user has moved a piece, played a card, or performed a certain gesture in a gesture-based game. For instance, the camera could be an in-built camera of a user terminal 13 such as a smartphone, tablet or laptop, or could be a camera peripheral (e.g. "webcam") connected to a user terminal 13 such as a laptop or desktop computer; and the image recognition algorithm could be implemented in an application running on the user terminal. Or the camera could be a home security camera connected to a user terminal 13 such as a home computer, or to local server (not shown) in the home, with the image recognition algorithm being implemented in the user terminal 13 or home server. In such cases the image recognition algorithm processes the captured images at the user terminal 13 or home server to detect the relevant actions, and then sends an indication of this to the lighting controller 24 on the bridge 10. Alternatively, the image recognition algorithm could be implemented as part of the lighting controller 24, this being arranged to receive the raw images from the camera and process them to identify the relevant actions at the bridge 10.

The sensor based approach has the advantage that the user need not explicitly inform the system that a certain action has been performed within the game, but rather just performs the action as normal, as he or she would do anyway as part of playing the game, and the lighting controller 24 automatically detects this based on the input from the sensor(s).

Nonetheless, this is not essential, and the use of explicit input means such as a switch 8a or UI 8b is also useful in various embodiments. Generally, the input from the input devices 8 may comprise: (i) only explicit inputs from one or more explicit user input devices such as one or more switches 8a and/or user interfaces 8b, or (ii) only implicit inputs from one or more sensors, or (iii) a combination of such explicit and implicit inputs.

In operation, the lighting controller 24 on the bridge 10 receives an indication of identifying the game 12 being played (or about to be played), e.g. a name or ID of the game 12 (or of a category of game in which the game 12 falls, such as a particular series of game of which the game 12 in question is an instance of, or a standard format of game which the game 12 complies with). This may be received through any suitable input means, such as one of the input devices 8. E.g. the user could input the name or ID through the application running on the user terminal 13, or through a user interface incorporated in the bridge 10 itself. As another example, the user may use a scanning device to scan a printed code printed on packaging, a rule book or other accompanying paperwork of the game 12, wherein the code encodes the name or ID of the game 12 (or again of a category of game in which the game 12 falls). E.g. this could be a 1D or 2D barcode, such as QR code. The scanning device may take the form of a general purpose camera, e.g. integrated into the user device 13, with the application running on the user device 13 being configured to use the camera to detect the name or ID based on the printed code and submit the name or ID to the controller 24 on the lighting bridge 10. Alternatively the scanning device could take the form of a dedicated scanning peripheral (not shown) connected to the lighting network using any of the various communication means discussed above.

However received, the lighting controller 24 on the lighting bridge 10 uses the name or ID of the game 12 or category of game to look up a corresponding set of lighting rules 16, or “package”, from a server 20 via the Internet 18. The server 20 comprises one or more server units at one or more geographical sites. It hosts a database and accompanying host software which may be referred to herein as the “game center”. The database comprises a plurality of sets of lighting rules defined by one or more game developers 22 who also have access to the database 20 (and are also able to write to it). The database 20 comprises a set of rules for each of a plurality of different games or category of games, mapped to respective names or IDs. Thus by accessing the database 20, the lighting controller 24 on the lighting bridge 10 (remote from the server 20) can look up the set of lighting rules corresponding to the submitted name or ID for the game 12.

A given one of the sets of lighting rules comprises a respective lighting effect mapped to each of multiple game events that can occur within the corresponding game 12 (or category of game). The effects defined in the rule set may comprise for example a particular color of lighting, a particular intensity of lighting, a particular spatial pattern of lighting to be rendered over a plurality of luminaires 4, or a dynamic lighting effect (e.g. flashing or pulsing, perhaps specifying a particular speed and/or depth of variation, or a time-varying

spatial pattern). The game events to which such effects are mapped by the rules may for example comprise any one or more of: one of the players rolling a die or dice, one of the players spinning a spinner, one of the players ending a turn, one of the players manipulating one or more of the game pieces (e.g. moving one or more of the pieces on the game board), one of the players playing one or more of the game cards, a start of the game, and/or an end of the game.

Furthermore, as well as having the possibility of reacting to individual, instantaneous actions, the controller 24 also tracks a current state of the game. The state means one or more factors that are a function of the history of the game, e.g. time elapsed, turns elapsed, or an event that is a function of one or more other, past events in the game 12. In this case, one or more of the events are defined not in terms of (or not only in terms of) a certain instantaneous action being performed, but rather reaching a certain state, or the combination of a certain action being performed when the game 12 is at a certain state. That is, while prior lighting systems may have adapted the light output of a general lighting system merely based on a single, momentary user action in isolation (e.g. rolling dice causing a luminaire to flash); the controller 24 of the present disclosure instead (or in addition) determines the state of a game, which includes updating the state throughout the playing of the game 12 based on ongoing inputs from the input device(s) 8 relating to events in the game 12, and/or an ongoing assessment of one or more other history-dependent variables such as the passage of time and/or turns, and/or a state of a card deck and/or pieces on a board, or the like. The determined state may be tracked by a rule set, script, application, or the like, implemented in or accessed by the lighting controller 24, based on a suitable input to the lighting controller 24 (e.g. user input from the input device or devices 8, and/or from a timer). Thus the events based on which the lighting controller 24 adapts the lighting can thus comprise one or more state-dependent events, which may depend on one or more past events or past player activity, instead of or in addition to just the player's current activity.

For instance, such state-dependent events may comprise any one or more of: which of the players' turn it is, a number of turns elapsed since the game started or a predefined stage in the game, an amount of time elapsed since the game started or a predefined stage in the game, a position of one or more of the pieces on the game board, and/or a number of the game cards remaining in a pile.

Note that the game state as tracked for the present purposes can be 'lighting rules' based, i.e. the state to the extent it is relevant to making lighting decisions and not necessarily the full state of the game taking into account all possible variables. So for

instance if a game has ten different states, but these ten states are related to a total of two light effects then only these need to be tracked (i.e. applying a simplified state model, assuming the state transitions can be simplified). As an example, the number of states in a chess game is very large, but if the light effect only indicates which player's turn it is, the state engine is less complex.

The controller 24 on the lighting bridge 10 downloads the appropriate set of rules for the game 12 from the server 20, via the Internet 18. Subsequently, during the playing of the game, the controller 24 identifies the occurrence of instances of the events based on the input from the input device 8 (and in embodiments based on tracking the state of the game over multiple such inputs as the game progresses). For instance, in embodiments one or more of the players press a certain button or activate a control on the input peripheral 8a upon performing certain actions that form part of the game, e.g. when rolling the die or dice, when taking or playing a card, when ending their turn, or such like. Alternatively one, some or all of the events could be detected automatically, e.g. based on an input from another input device or devices 8 (not shown) such as one or more sensors such as pressure or contact sensors built into the board, pieces or other game equipment; or a camera device directed at the board or playing area, combined with image recognition software configured to recognize the relevant game event(s) (or actions making up the event).

In response to detecting occurrence of each of a plurality of game events, the controller 24 on the lighting bridge 10 controls the one or more luminaires 4 to output the corresponding lighting effect mapped to the respective event by the downloaded rules 16, as downloaded from the game center on the server 20. Thus the players are emerged in a lighting atmosphere appropriate to the events occurring in the game, enhancing the game experience.

In embodiments, the lighting controller 24 is configured to override a previous lighting scene that was being rendered by some or all of the luminaires 4, but only temporarily. Thus when the lighting controller 24 receives an indication that a user has selected to play a particular game 12, or that the game 12 is about to begin, or the first time an event occurs for which an effect is specified in the lighting rule set 16, then the lighting controller 24 temporarily overrides any existing behaviors of the lighting system (at least within the environment 2 where the game is being played) in order to render the lighting effect(s) specified by the rules 16. However, when the lighting controller 24 receives an indication that a user has deselected the game 12, or that the game 12 is about to begin, or when the last event occurs for which an effect is specified in the lighting rule set 16, then the

lighting controller 24 automatically reverts back to the original lighting scene that was being rendered by the luminaires 4 before being overridden by the game-related lighting rules 16.

Some more detailed examples are discussed in the following.

A game package 16 on the gaming center 20 may contain any one or more of the following elements, which the game developer 22 can use to set lighting effects to accompany their game 12.

- Ambient light settings: a static or dynamic lighting atmosphere to match the theme of the game 12.
- Color indication: the lights 4 of the system can be set to a specific color (for a specified amount of time) to indicate objects or players 8 in the game 12.
- Timing indication: timers can be started and the lighting system can either change color, pulsate or blink to indicate how much time a player 6 has left. If time is over lights 4 can become bright, or a specific color.
- Specific triggers that mark different parts of the gameplay.
- Randomized events (e.g., rolling dice, drawing cards).
- Sequenced actions: the above actions can be put in a specific order that has to be followed to guide the player 6 in the order of events.
- The game developer 22 also refers to one or more input devices 8 such as the Tap Switch 8a to provide additional input to trigger the relevant aspects of the game package 16, e.g. tap switch 8a is used as a buzzer which players 8 press when they think they know the answer or when they have completed a task first. Other input sources may include apps running on another device 13 that also works in unison with the game package 16.

This game package 16 contains the intended rules for the bridge 10 of the lighting system. As the user activates a specific game package 16, the rules are applied to the bridge 10, preparing it for the game. Other rules for the same (group of) luminaires 4 may be manually or automatically disabled to avoid conflicting behavior, e.g. replacing the functions on the tap switch 8a with those for the game 12 and returning the original scenes at the end of the game.

Thus the system uses the tap switch 8a (or other input device) to determine light output based on game related rules. The light output then matches the phase of the board game that users 8 are playing.

For instance: a user starts the game play by pressing button 1 – the color of the first participant is emitted (e.g. randomized to determine who starts); this participant chooses to move his/her pawn instead of performing a transaction and as such presses button 2 – the

luminaire 4 shows the user's position (e.g. it has rolled the dice and determines the color of the square the user ends up on based on current position + number rolled); it is then the next user's turn – the luminaire 4 shows the color of the next user to signal that it is his/her turn. This user needs to answer a question based on the square he is on – the luminaire 4 starts to provide a countdown signal by dimming up until the 30 seconds a user has to answer the question are up (and flashing when time is full up). The game then continues in a similar fashion, outputting various lighting effects as appropriate to various events in the game 12.

A first example application is now described in relation to the game 'Settlers of Catan' (SoC). Here, the lighting is used to create ambient lighting to accompany the game and to signal the sequence of game events. Particularly, a package 16 can be downloaded for the game SoC that creates an engaging ambient lighting atmosphere and helps users 6 to keep track of player's turns and scores. The SoC rule package allows users 6 to use the hue tap switch 8a in their game. Rules are automatically assigned to the four buttons of the hue tap switch 8a to help each player. A smart phone application can be used to review the scores in more detail.

As the players start the game, they connect to the gaming center 20 and select the SoC gaming package 16. As they activate the game, the game developer 22 has created a nice ambient setting, which is then activated. The tap switch 8a replaces rolling the dice during the game. When a player 6 starts his turn, he presses button 1 (the large button) on the hue tap 8a. The current player could be indicated by matching the light to the colors of the play pieces of that user. Pressing this button is associated to the first activity in the rules: collecting resources. Each resource is associated to a color and the lighting system displays the color of the resource that players 6 can gather. The behavior of the large button is now automatically changed to the next stage in the player's turn. The small buttons are associated to actions a player 6 can take: build a house, build a city, play a card. As the user 6 presses the large button again, his turn advances to the next player 6. The lighting system indicates this by displaying the color of that player for a brief moment. The first player hands over the hue tap to the second player, and the sequence starts again.

Another example application is quiz gaming. For example, the game '30 Seconds' is a fast-paced quiz game. Players 6 have to describe up to five items within 30 seconds to other players 6 in their team. For each correct answer, they acquire one point. The first team to reach a predefined score limit wins the game. As the game package for Thirty Seconds is used, each team assigns a color to their team. The first press of the button on the hue tap 8a pulses the lights in the color of the team that is about to play. Pressing the button

again starts a 30 second countdown timer. The light color slowly changes over time. In the last 10 seconds, the light starts to blink. After 30 seconds, the lights 4 turn off for a brief moment to indicate time has passed. The team counts their scores and hand over the hue tap to the next team.

5 As another example, Buzz is another fast-paced quiz game. Players have to answer trivia questions. After the lead of the game has asked the question, the first player to respond with the correct answer, wins a point. Using the gaming center 20 players 6 can assign a color to an input device 8 of their lighting system (e.g., smartphone, hue tap). When the question is asked, the lights 4 display the color of the person that pressed the button first, 10 ignoring other hue tap activations within X seconds after the first push

As mentioned, the game center would be located on an accessible server 20 such as the MeetHue portal. In embodiments, those companies or users 22 who like to develop can also upload their game behavior packages 16 for particular games 12, e.g. in a similar way as they may upload a new app to an app store. Those who wish to use a game 15 behavior can browse the game center 20 to see which games are supported and then select the game behavior packet they would then like to use. Some games may have a QR code on their box or manual that will automatically connect and download the correct game behavior package 16.

Once selected the game behavior package 20 will be accessed from the server 20 20, via the user's router 14, and placed on the user's bridge 10. When the user then activates the game 12, i.e. the game is about to begin, the bridge 10 can then send the relevant commands to the luminaires 4. The bridge 10 may also reassign for the duration of the game the commands associated with the tap switch 8a or other hardware. Some luminaires 4 may have dynamics or scenes loaded onto the luminaire's own hardware for faster recall speeds 25 during the game 12. These scenes may then be replaced with the originals once the game is over.

The user might also be able to select which aspects of the game 12 he or she want to augment with lighting so that it will only use part of the game behavior package 16.

It will be appreciated that the above embodiments have been described by way 30 of example only.

For instance, the lighting controller 24 need not necessarily be implemented on the bridge 10. Instead for example, the lighting controller could be implemented as an application 26 stored on a memory of a general purpose user terminal 13 and arranged to run on a processor of the user terminal 13, e.g. a mobile user terminal such as a smartphone,

tablet or laptop. In this case anything said above of the lighting controller 24 on the bridge 10 can equally apply to the possibility of a lighting controller application 24 implemented on a user terminal 13. The user terminal may be arranged to communicate with the luminaires 4 and/or input device(s) 8 for the purpose of the various interactions discussed herein by any suitable wired or wireless means, preferably a wireless network using a wireless access technology such as Wi-Fi, ZigBee or Bluetooth, but potentially instead a wired network such as an Ethernet or DMX network. Either way, the communication between the lighting controller applications 26 on the user terminal may be conducted via the lighting bridge 10 and/or via the router 14, or by a direct connection (no intermediate node, i.e. one hop) between the user terminal 13 and each luminaire 4 and/or each input device 8, or a combination of these approaches may be used for different ones of the luminaire(s) 4 and input device(s) 8.

Further, in some alternative embodiments, one or more of the luminaires 4 may receive their commands from the router 14 directly, as opposed to the bridge 10. E.g. this could be the case for Wi-Fi lamps or luminaires and a Wi-Fi router 14. In such cases the lighting controller may be incorporated on the router 14 itself instead of a bridge 10 or user terminal 13, or the lighting controller 24 or 26 on the bridge 10 or user terminal 13 may be configured to send the lighting control commands to the luminaires 4 via the router 14.

In general, anywhere where any functionality is described herein in relation to the lighting controller 24 implemented on the bridge 10, the same may be said of a lighting controller 24 implemented on a user terminal 13, or a lighting controller implemented on a router 14 or in another unit.

Note also that in each of the above examples the lighting controller 24, 26 is an on-site controller, i.e. part of the local lighting system, located at the same geographical site as the lighting system and the environment 2 being illuminated, e.g. either within the environment 2 being illuminated (e.g. room), or at least the same building, complex or campus as the illuminated environment. However, this is not necessarily the case in all possible embodiments. Alternatively, the lighting controller could be implemented on the server 20 of the game center itself. In this case, instead of downloading the rules, the bridge 10 just reports inputs to the server 20 and receive back control commands from the server, with all the rules being access and evaluated at the server 20 without downloading them to the bridge 10 (only the results of them in the form of lighting commands). The bridge 10 then in turn controls the luminaires 4 to render the relevant effect based on the commands from

the server 20 (either forwarding them to the luminaires 4 or translating them to a different format, depending on implementation).

Alternatively, even where the lighting controller 24, 26 is implemented on the bridge 10, user terminal 13 or other on-site device (i.e. a local device of the lighting network), then some of the functionality could still be offloaded to the game center server 20 (or indeed another server). For instance, the tracking of the game state by the lighting controller 24, 26 could be achieved by the lighting controller 24, 26 maintaining a record of the game state itself, or by referring to a record maintained the game center (i.e. server 20). In the latter case onsite lighting controller 24, 26 on the bridge 10 or user terminal 13, or the like, does download the rules 20 and evaluates them locally; but the onsite controller 24, 26 does not track the game state (i.e. the history dependent factors). Instead, it reports individual game events to the game center 20, and based on these the game center tracks the current status (i.e. the history dependent factors) and reports this back to the onsite controller 24, 26 on the bridge 10, user terminal 13 or the like, in order for the rules to be evaluated there.

In yet further alternatives, a server 20 accessed via a network 18 such as the Internet need not be involved at all. Instead, the lighting rules may be loaded directly onto the lighting bridge 10 or user terminal 13 (or other such on-site lighting control apparatus), e.g. some or all of the rules being loaded in at the time of manufacture, and/or some or all of the rules being programmed in manually by an end-user. The lighting rules are then access from the locally stored database of the bridge 10, user terminal 13 or other such lighting control apparatus by an application or script of the lighting controller 24, 26 running on the bridge 10, terminal 13 or other apparatus. Or in some embodiments, some of all of the rules may be configured directly into the hardware circuitry of the bridge 10 or other lighting control apparatus implementing the lighting controller. Note also that the source of the set or database of rules could even be distributed throughout multiple sources, e.g. some of the rules being downloaded from a server, some being already present in hardware or software from the time of manufacture, and/or some being manually added by an end-user. Whether the rules are programmed, or executed as a script, or fetched from a server is not necessarily essential to any particular embodiment.

Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single processor or other unit may fulfil the functions of several items recited in

the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. A computer program may be stored/distributed on a suitable medium, such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may
5 also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems. Any reference signs in the claims should not be construed as limiting the scope.

CLAIMS:

1. Apparatus for controlling illumination emitted by one or more luminaires (4) of a lighting system to accompany a game (12) played in an environment (2) illuminated by the illumination from said one or more luminaires, the game being a board game in which players (6) play the game using physical game pieces placed on a physical game board,
5 and/or a card game in which players play the game using a pack of physical game cards; wherein the apparatus comprises:

one or more input devices (8) comprising one or more sensors arranged to sense one or more actions performed on said game board, using said game pieces, and/or using said game cards; and

10 a lighting controller (24, 26) for controlling the illumination emitted by said one or more luminaires to accompany the game, wherein the lighting controller is configured to perform operations of:

- accessing a set of lighting rules (16), the set of lighting rules specifying a respective lighting effect mapped to each of multiple respective game events that can occur
15 within the game;

- receiving input signals from each of the one or more input devices (8) identifying the occurrence of each of a plurality of said game events during the playing of the game; and

- based on the input signals received from the one or more input devices, and on
20 the lighting rules, controlling the illumination emitted by the one or more luminaires to produce the respective lighting effect upon occurrence of each of the plurality of game events during the playing of the game; wherein the lighting controller is further configured to track a state of the game, the state being dependent on a history of the game; and

wherein one or more of said events are state-dependent events defined at least
25 in part based on the state of the game, the set of rules specifying a respective lighting effect for each of the state-dependent events.

2. The apparatus of claim 1, wherein said set of game events comprises one or more of:

- one of the players (6) rolling a die or dice,
 - one of the players spinning a spinner,
 - one of the players ending a turn,
 - one of the players manipulating one or more of the game pieces,
 - 5 - one of the players playing one or more of the game cards,
 - one of the players answering a question,
 - a start of the game, and/or
 - an end of the game.
- 10 3. The apparatus of claim 1 or 2, wherein the state based upon which one or more of the state-dependent events are defined comprises one or more of:
- which of the players (6) currently has a turn,
 - a number of turns elapsed since the game started or a predefined stage in the game,
 - 15 - a position of one or more of the pieces on the game board, and/or
 - a number of the game cards remaining in a pile.
4. The apparatus of claim 1 or 2, wherein the state based upon which one or more of the state-dependent events are defined comprises:
- 20 an amount of time elapsed since the game started or a predefined stage in the game.
5. The apparatus of any preceding claim, wherein the lighting controller (24, 26) is implemented in one or more local control devices (10, 13) of the lighting system, and is
- 25 configured to perform said accessing by downloading the set of light rules (16) from a server (20) over a network (18).
6. The apparatus of claim 5, wherein the one or more local control devices comprise at least a lighting bridge (10).
- 30 7. The apparatus of any of claim 5 or 6, wherein the one or more local control devices comprise at least a user terminal (13) in the form of a smartphone, tablet, laptop, or desktop computer; and the lighting controller (26) is implemented at least partially in the form of an application arranged to run on the user terminal.

8. The apparatus of any of claims 5 to 7, wherein the input devices (8) further comprise a dedicated lighting control peripheral (8a) coupled externally to said bridge or mobile user device by a wired or wireless connection.

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9. The lighting controller of any of claims 1 to 3, wherein the lighting controller is implemented on a server (20) storing the set of rules (16), and is arranged to perform said control of the luminaires (4) by sending commands over a network to one or more local control devices of the lighting system.

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10. The apparatus of any of claims 5 to 9, wherein the lighting controller (24, 26) is further configured to accept an indication of a printed code detected by a scanning device, and based thereon to identify the set of rules (16) to access from amongst a database of two or more available sets of rules stored on said server (20).

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11. The apparatus of any preceding claim, wherein the one or more input devices (8) comprise a user interface (8b) of a smartphone, tablet, laptop or desktop computer.

12. The apparatus of any preceding claim, wherein the lighting controller (24, 26) is further configured to allow a user to select to only a subset of the set of rules (16) specifying the respective lighting effects for only a subset of the events, and to control the illumination to produce the respective lighting effect only corresponding to the subset of events.

13. The apparatus of any preceding claim, wherein in order to produce the lighting effects mapped to said plurality of game events, the lighting controller (24, 26) is configured to override a previous lighting scene being produced by the luminaires prior to the playing of the game (12); but wherein the lighting controller is also configured to automatically control the luminaires (4) to revert back to producing said lighting scene after producing the lighting effects mapped to said plurality of game events.

14. The apparatus of any preceding claim, wherein the lighting rules (20) are stored on a server (20), the lighting controller (24, 26) being configured such that said accessing of the lighting rules comprises accessing the lighting rules from the server.

15. A method of controlling illumination emitted by one or more luminaires (4) of a lighting system to accompany a game (12) played in an environment (2) illuminated by the illumination from said one or more luminaires, the game being a board game in which

5 players play the game using physical game pieces placed on a physical game board, and/or a card game in which players play the game using a pack of physical game cards; wherein the method comprises:

using one or more input devices (8) to identify occurrence of each of a plurality of game events during the playing of the game, wherein the one more input devices
10 comprise one or more sensors arranged to sense one or more actions performed on said game board, using said game pieces, and/or using said game cards; and

using a lighting controller (24, 26) to control the illumination emitted by said one or more luminaires in order to accompany the game, the lighting controller performing operations of:

15 - accessing a set of lighting rules (16), the set of lighting rules specifying a respective lighting effect mapped to each of multiple respective game events that can occur within the game; and

- receiving input signals from each of the one or more input devices (8) identifying the occurrence of said plurality of game events during the playing of the game;

20 and

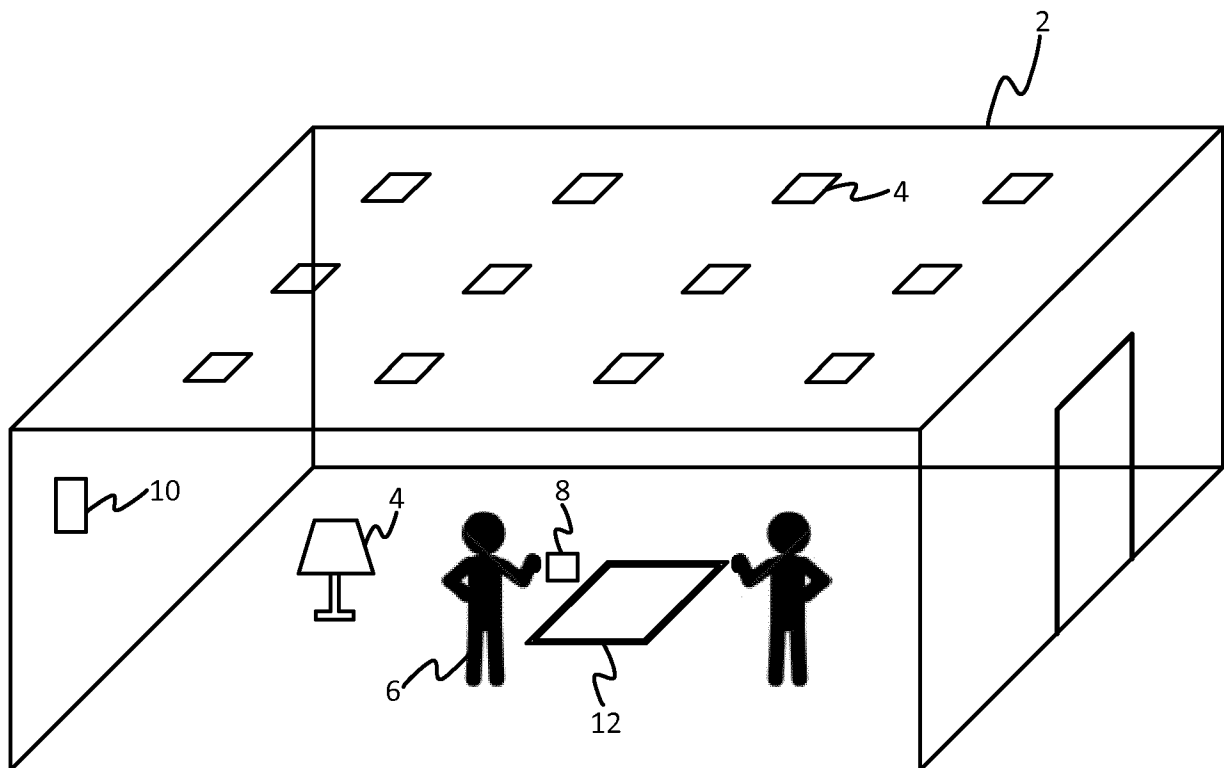
- based on the input signals received from the one or more input devices, and on the lighting rules, controlling the illumination emitted by the one or more luminaires to produce the respective lighting effect upon occurrence of each of the plurality of game events during the playing of the game;

25 - wherein the method comprises tracking a state of the game, the state being dependent on a history of the game; and

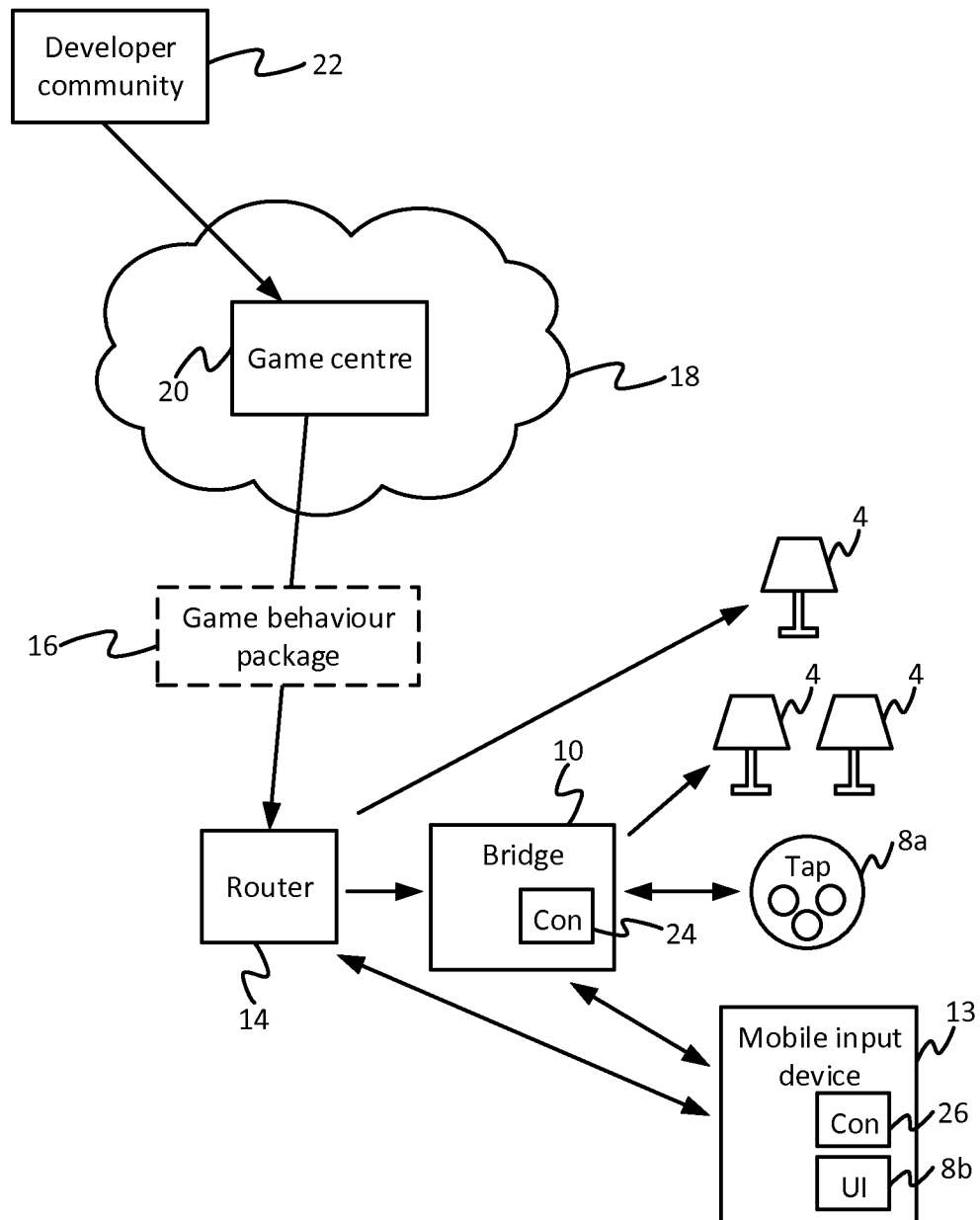
- wherein one or more of said events are state-dependent events defined at least in part based on the state of the game, the set of rules specifying a respective lighting effect for each of the state-dependent events.

1/2

Figure 1



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Figure 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/067362

A. CLASSIFICATION OF SUBJECT MATTER

INV. H05B37/02 A63F1/00 A63F3/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H05B A63F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	WO 2007/017848 A2 (N TRIG LTD [IL]; ZACHUT RAFI [IL]; PERSKI HAIM [IL]; RIMON ORI [IL]; K) 15 February 2007 (2007-02-15) page 10, line 10 - line 26; figure 1C -----	1,4,15
X	WO 2014/047675 A1 (PETER VOGEL INSTR PTY LTD [AU]) 3 April 2014 (2014-04-03) claims 1, 2 ----- -/-	1,5-7, 11,15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/067362

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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