Invalidity of U.S. Patent No. 10,406,432
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U.S. Pat. Pub. No. 20150153913 to Ballard ("Ballard"),
published July 4, 2015.

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1. A computer program product embodied on a non-transitory computer-readable medium, comprising code executable by a virtual image display apparatus having at least a processor and a memory, the memory being configured to store an information providing condition of the virtual image display apparatus and being further configured to store to-be-provided information, to cause the virtual image display apparatus to carry out the following steps:	Ballard expressly or inherently discloses these claim element(s). **[A computer program product embodied on a non-transitory computer-readable medium, comprising code executable by a virtual image display apparatus having at least a processor and a memory,]** "The present disclosure relates generally to an **augmented reality device** and, more particularly, to methods and systems for representing and interacting with augmented reality content using the augmented reality device." [0002] "**Consistent with other disclosed embodiments, non-transitory computer-readable storage media may store program instructions, which are executed by at least one processor** and perform any of the methods described herein." [0024] "**FIG. 1 illustrates an exemplary system 100 for implementing the disclosed embodiments. In one aspect, system 100 may include** a server system 110, **a user system 120**, and network 130. It should be noted that although a single user system 120 is shown in FIG. 1, more than one user system 120 may exist in system 100. Furthermore, although a single server system 110 is shown in FIG. 1, more than one server system 110 may exist in system 100." [0066] "**User system 120 may include a system associated with a user (e.g., a consumer, field technician, equipment operator, or any other individual that may benefit from received AR content)** that is configured to perform one or more operations consistent with the disclosed embodiments. In one embodiment, a user may operate user system 120 to perform one or more such operations. **User system 120 may include a communication interface 121, a processor device 123, a memory 124,** a sensor array 125, a display 122, and/or any other **components that may facilitate the display of AR content**

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	to the user. The processor device 123 may be configured to execute software instructions to perform aspects of the disclosed embodiments. User system 120 may be configured in the form of an AR device, such as a head mounted display (HMD). Although in the present disclosure user system 120 is described in connection with a HMD, user system 120 may include tablet devices, mobile phone(s), laptop computers, a wearable device, such as a smart watch, and any other computing device(s) known to those skilled in the art." [0069] *Accordingly, in view of the above, the Ballard reference anticipates the claim element of A computer program product embodied on a non-transitory computer-readable medium (e.g., non-transitory computer storage media may store program instructions), comprising code executable by a virtual image display apparatus (e.g., the augmented reality device) having at least a processor and a memory (e.g., the processor device 123 and storage media).* **[the memory being configured to store an information providing condition of the virtual image display apparatus and being further configured to store to-be-provided information, to cause the virtual image display apparatus to carry out the following steps:]** "**In some embodiments, a memory of AR device 200 (e.g., positional processing module 378) may be configured to store instructions that when executed by a processing device (e.g., microprocessor 208) of AR device 200, determine the viewing direction of user 1201 (e.g., the orientation of the head of user 1201 and/or the gaze direction of the eyes of user 1201) based on output from the one or more sensors.** The processing device may be further configured to execute instructions to initiate a communication link between AR device 200 and another device (e.g., another AR device), based on the determined viewing direction of user 1201." [0203] "The predetermined horizontal threshold may be pre-configured by user 401 through a user interface of AR device 200 or be pre-set based on a default setting of AR device 200. **For example, display 204 may display a menu with different values of the predetermined horizontal threshold to enable user 401 to make a selection. As another example, display 204 may display a field that enables user 401 to input a desirable value of the predetermined horizontal threshold. The predetermined horizontal threshold may be set in units of degrees, radians, or any other units of angular measurement.** As an example, the predetermined horizontal threshold may be set as 20, 30, or 60 degrees or more according to a preference of user 401." [0112]

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	"Consistent with a disclosed embodiment, a wearable device provides a virtual menu to a user. The wearable device may include a display; at least one sensor configured to provide an output indicative of an orientation of a head of the user; and at least one processing device. The at least one processing device may be configured to monitor an orientation of the head of the user based on the output of the at least one sensor; determine based on the monitored orientation of the head whether the user is looking upward or downward with respect to a predetermined horizontal threshold; and **cause the virtual menu to be shown on the display** if the user is determined to be looking upward or downward with respect to the predetermined horizontal threshold." [0006] *Accordingly, in view of the above, the Ballard reference anticipates the claim element of the memory (e.g., the memory of the AR device) being configured to store an information providing condition of the virtual image display apparatus (e.g., the instructions that determine the viewing direction of the user and whether it is within the predetermined horizontal threshold) and being further configured to store to-be-provided information (e.g., the virtual menu that is caused to display), to cause the virtual image display apparatus to carry out the following steps.*
detecting, with a sensor operationally linked to the virtual image display apparatus, a movement of a body part of a player, the body part comprising at least one of a head of the player and an eye of the player, and the sensor being at least one of the set of: a gyro sensor configured to measure movement of the head of the player, an acceleration sensor configured to measure movement of the head of the player, a geomagnetic sensor configured to measure movement of the head of the player and a line-of-sight	Ballard expressly or inherently discloses these claim element(s). **[detecting, with a sensor operationally linked to the virtual image display apparatus, a movement of a body part of a player, the body part comprising at least one of a head of the player and an eye of the player,]** "At step 1110, **AR device 200 may monitor a viewing direction of the user (e.g., an orientation of the head of the user and/or an orientation of the gaze direction of the user's eyes) based on the output of the at least one sensor associated with the AR device.** For example, the processing device (e.g., microprocessor 208) of AR device 200 may execute instructions of positional processing module 378, discussed above in relation to FIG. 3, to perform this step. **The sensor may be included in AR device 200 and be configured to provide an output indicative of the orientation of the user's head**. For example, the sensor may be configured to provide an output indicative of the viewing direction of the user by tracking a pattern of movement of an orientation of the head of the user. **As another**

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sensor configured to measure movement of the eye of the player; and	example, the sensor may be configured to provide an output indicative of the viewing direction of the user by tracking a gaze of the user's eyes." [0193] *Accordingly, in view of the above, the Ballard reference anticipates the claim element of detecting, with a sensor (e.g., the at least one sensor associated with the AR device) operationally linked (e.g., associated with the AR device) to the virtual image display apparatus (e.g., the AR device), a movement of a body part of a player (e.g., gaze direction of the user's eyes), the body part comprising at least one of a head of the player and an eye of the player (e.g., the orientation of the head of the user).* [and the sensor being at least one of the set of: a gyro sensor configured to measure movement of the head of the player, an acceleration sensor configured to measure movement of the head of the player, a geomagnetic sensor configured to measure movement of the head of the player and a line-of-sight sensor configured to measure movement of the eye of the player;] "As described above in connection with FIG. 4, **the processing device of AR device 200 may be configured to monitor a viewing direction of user 401 (e.g., an orientation of the head of user 401 and/or an orientation of the gaze of user 401) based on output received from the one or more sensors.** Such sensors may include, for example, one or more components associated with IMU 201 and/or sensor array 125. **Such sensors may also include one or more accelerometers, gyroscopes, magnetometers, eye tracking sensors, etc.** as discussed in detail above. For example, the detected orientation of the head of user 401 may include an angle of the user's head formed with respect to the horizontal plane, which is associated with upward or downward movement of the head of the user, along with a direction of the user's head in the horizontal plane, which may be associated with left or right movement of the head of the user. For example, the one or more sensors of AR device 200 may output three-dimensional coordinates of multiple points of AR device 200 to the processing device, and the processing device may determine the angle of the user's head with respect to the horizontal plane and the direction of the user's head within the horizontal plane based on the received coordinates." [0135] *Accordingly, in view of the above, the Ballard reference anticipates the claim element of and the sensor being at least one of the set of: a gyro sensor configured to measure movement of the head of the player, an acceleration sensor configured to measure movement of the head of the player, a geomagnetic sensor configured to measure movement of the head of the player and a line-of-sight*

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	sensor configured to measure movement of the eye of the player (e.g., sensors may include IMU 201, sensor array 125, accelerometers, magnetometers, eye tracking sensors)
determining, based on the movement of the body part of the player, a position and direction of the body part of a player;	Ballard expressly or inherently discloses these claim element(s). "At step 1110, **AR device 200 may monitor a viewing direction of the user (e.g., an orientation of the head of the user and/or an orientation of the gaze direction of the user's eyes) based on the output of the at least one sensor associated with the AR device.** For example, the processing device (e.g., microprocessor 208) of AR device 200 may execute instructions of positional processing module 378, discussed above in relation to FIG. 3, to perform this step. **The sensor may be included in AR device 200 and be configured to provide an output indicative of the orientation of the user's head**. For example, the sensor may be configured to provide an output indicative of the viewing direction of the user by tracking a pattern of movement of an orientation of the head of the user. **As another example, the sensor may be configured to provide an output indicative of the viewing direction of the user by tracking a gaze of the user's eyes.**" [0193] *Accordingly, in view of the above, the Ballard reference anticipates the claim element of determining (e.g., using the output of the at least one sensor), based on the movement of the body part of the player (e.g., orientation of the head of the user), a position (e.g., orientation of the head) and direction of the body part of a player (e.g., gaze direction of the eyes);*
displaying, on a display operationally linked to the virtual image display apparatus, in accordance with the position and direction of the body part of the player, an image of a virtual space including a first area and a second area; and	**[displaying, on a display operationally linked to the virtual image display apparatus, in accordance with the position and direction of the body part of the player,]** "Consistent with a disclosed embodiment, a wearable device provides a virtual menu to a user. The wearable device may include a display; at least one sensor configured to provide an output indicative of an orientation of a head of the user; and at least one processing device. The at least one processing device may be configured to monitor an orientation of the head of the user based on the output of the at least one sensor; **determine based on the monitored orientation of the head whether the user is looking upward or downward with respect to a predetermined horizontal threshold;** and cause the virtual menu to be shown on the display if the user is determined to be looking upward or downward with respect to the predetermined horizontal threshold." [0006]

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