from M virtual light projectors created by optical splitter **132** to eye **200** and detecting reflections of infrared light signals from eye **200** by infrared detector **144**. Edge detector **176** may detect glints from the output of infrared detector **144** and provide glint timing data to an eye tracking program (**156** in FIG. **6**) that is running on processor **128**. The eye tracking program uses the glint timing data to determine a gaze position of the eye. The tracking program may also receive the detected reflections of the infrared light signals from infrared detector **144** and timing signals indicative of the positions of the optical scanner **112** from scan engine **120** (reflection-position data) or pupil timing data from edge detector **176**, and use the reflection-position data (or pupil timing data) and glint timing data to recalibrate the eye tracking system. The reflection-position data (or pupil timing data) and glint timing data, collectively referred to as "eye tracking data", may be used for other purposes besides eye tracking. (Although not shown in FIG. **9**, one or more infrared holograms with an optical function as previously described may be placed in the optical path between optical splitter **132** and optical combiner **140**.)

FIG. **10** shows that the eye tracking system and display system can share a common projection path to reduce the number of components in the wearable heads-up display. In the example wearable heads-up display **600** of FIG. **10**, the laser module **608** includes visible laser diodes to generate visible light, e.g., red laser diode (R), green laser diode (G), and blue laser diode (B), and infrared laser diode (IR) to generate infrared light. The visible light will be used for displaying content, and the infrared light will be used for eye tracking. Optical scanner **612** receives both visible and infrared light signals and deflects these signals to optical splitter **632**. (Optical splitter **632** may have the same characteristics as described for optical splitter **132** in FIG. **1**. Optical splitter **632** will need to be transparent to both infrared light and visible light.) Optical splitter **632** creates M virtual light projectors, where M>1. For content display, visible light signals from the M virtual light projectors are projected to M exit pupils proximate eye **200** to form a virtual display in a target space in a field of view of eye **200**. Optical combiner **540** receives visible light signals from optical splitter **632** and directs the visible light signals to the M exit pupils. For eye tracking, infrared light from the M virtual light projectors are projected to eye **200** to form M illumination areas on eye **200**. Optical combiner **140** receives infrared light signals from optical splitter **632** and directs the infrared light signals to eye **200** to form the M illumination areas. Optical combiners **140**, **540** may be integrated with lens **510** to form an "optical combiner lens". Controls for the light sources in laser module **608** and controls for the scan element(s) in optical scanner **612** are provided by a display engine **620**. Display engine **620** may be structurally similar to scan engine **120** (in FIG. **6**), with the exception the laser diode driver (or laser driver in general) will now be responsible for driving laser module **608** that includes a combination of visible and infrared light sources. Processor **128** may provide a frame buffer to display engine **620** with display content. In order to accommodate eye tracking, each pixel of the buffer will have values for R, G, B, and IR. The visible laser diodes of laser module **608** will be controlled with R, G, and B values of the pixels, and the infrared laser diode of laser module **608** will be controlled with the IR value of the pixel. In general, eye tracking will occur simultaneously with content display. However, if it is desired to carry out eye tracking without content display, or vice versa, this can be achieved through turning off appropriate ones of the R, G, B, IR channels.

When the eye tracking system is integrated into a wearable heads-up display, the gaze position of the eye can be tracked and used for various purposes. One example is positioning content in the display space. Another example is exit pupil suppression. This applies to the case where the wearable heads-up display uses multiple exit pupils. For example, it is possible to identify multiple glints per scan period and determine a gaze position of the eye in the display space per scan period based on the multiple glints. As the glints are detected during a scan period, it is possible to predict the trajectory of the gaze of the eye based on changes in the position of the glints. Based on this prediction, it is possible to see which exit pupils the eye would be aligned with for the next frame of display. If there are four exit pupils, for example, and the eye is predicted to be aligned with just one of the four exit pupils for the next frame of display, then there may be no point in projecting content to all the four exit pupils. In this case, the three exit pupils that would not be aligned with the eye can be disabled for the next frame of display. Thus, the eye tracking program may predict the trajectory of the eye based on glints detected during a current scan period and indicate to the display system which exit pupil(s) should be enabled or disabled for the next frame of the display.

FIG. **11** shows a near-eye wearable device having the form of glasses (or eyeglasses). Near-eye wearable device may embody the eye tracking system or any of the wearable heads-up display systems incorporating the eye tracking system described above. The near-eye wearable device includes a support frame that carries the devices and electronics that enable eye tracking or both eye tracking and content display. In one example, support frame **102** includes a frame front **106** carrying a pair of lenses **110***a*, **110***b* and temples **114***a*, **114***b* attached to opposite sides of the frame front. Lens **110***a* may be an optical combiner lens including one or more optical combiners (e.g., **140** in FIGS. **1**, **9**, and **10**; **540** in FIGS. **9** and **10**) integrated in a lens. Lens **110***a* is in opposing relation to an eye of the user when the support frame **102** is worn on the head of the user. In this position, the eye tracking system or the wearable heads-up display system incorporating the eye tracking system can be operated to illuminate the eye through the one or more optical combiners. Other components of the eye tracking system or wearable heads-up display system may be carried in the temples **110***a*, **100***b*. In some examples where the near-eye display device embodies a wearable heads-up display system, the optical system of the display system may be carried in one of the temples and the optical system of the eye tracking system may be carried in the other temple. This is possible when the optical system of the eye tracking system is decoupled from the optical system of the display system as shown, for example, in FIGS. **9** and **10**. This means that content is displayed to one eye, and gaze position of the other eye is tracked.

The foregoing detailed description has set forth various implementations or embodiments of the devices and/or processes via the use of block diagrams, schematics, and examples. Insofar as such block diagrams, schematics, and examples contain one or more functions and/or operations, it will be understood by those skilled in the art that each function and/or operation within such block diagrams, flowcharts, or examples can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or virtually any combination thereof. In one implementation or embodiment, the present subject matter may be implemented via Application Specific Integrated Circuits (ASICs). However, those skilled in the art will recognize