algorithms [43–45] conduct matrix multiplications and additions, and these operations can be computed in parallel [50].

Generally, the acceptance angles are proportional to the light sensitivity of ommatidia. But, the large acceptance angles cause overlapping among neighboring ommatidia and necessarily result in low spatial resolution. By resolving the aliasing caused by the overlapping using a DSP technique, COMPU-EYE is expected to have high sensitivity with high resolution. Moreover, the technique for resolution improvements used in COMPU-EYE can be applied to other designs of artificial compound eyes. It would be interesting to compare resolution of Curvace design in [18] consisting of more ommatidia and the hemispherical compound eye in [8] consisting of less ommatidia but equipped with the DSP technique. In this paper, we have focused on the apposition compound eye. But, we note that the concept of COMPU-EYE can also be applied to other types of compound eyes, i.e., superposition compound eyes. For example, in the neural superposition compound eyes which are specialized for light sensitivity, each object point is imaged by multiple photoreceptors from different ommatidia and the related signals are combined to form an image with high sensitivity and high resolution [21]. By applying the design concept of larger acceptance angles and the DSP technique, the neural superposition compound eyes can improve the resolution and sensitivity. In the real implementation of compound eye devices, COMPU-EYE is more efficient in terms of multiple observations. If some ommatidia are disjointed or damaged, the conventional compound eye could lose vision in the corresponding area. However, in COMPU-EYE, each area is observed by multiple ommatidia. Thus, even though some ommatidia are lost, they do not have a significant influence on the overall observation.

Acknowledgments

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the South Korean government (NRF-2015R1A2A1A05001826).