

【Grant-in-Aid for Scientific Research (S)】

Broad Section J



Title of Project : Development of Next Generation Information Environment Systems Using High-speed Vision and Tracking Technology

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Keyword : High-speed image processing, information environment system, visual information processing

【Purpose and Background of the Research】

Conventionally, there is a trade-off between the large amount of spatial information and temporal density in the interaction in the information environment system, especially in visual information processing. On the other hand, in the system that we have developed so far, the bottleneck elements are decomposed from the viewpoint of high-speed and the amount of spatial information from the top down, and finally the limit performance of each element technology is challenged. By assembling the whole from the bottom up, we have realized an information environment system with excellent spatiotemporal characteristics. Both the ultralow power consumption vision chip, by which imaging and image processing are performed at 1,000 fps with a single chip, and the 1,000-fps high-speed projector achieve world-class performance. We aim to develop these technologies to create an overwhelming performance advantage over existing technologies and pioneer various new application fields.

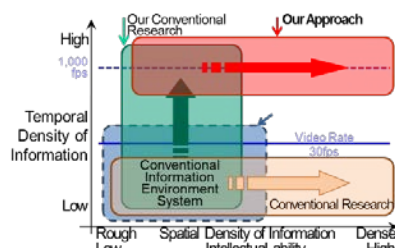


Figure 1 Approach of this study

【Research Methods】

We will integrate high-speed perceptual information processing technology, high-speed information presentation technology, and high-speed perceptual dynamic characteristic evaluation technology into a next generation information environment system to challenge the limits of spatiotemporal density of existing information environments. Specifically, a) we will develop high-speed visual information processing technology that surpasses human vision and b) high-speed information presentation technology that seamlessly supports human movements; these would form the pillars of elemental technologies. Further, c) we will develop a method for evaluating the capacity of human spatiotemporal density and system device synchronization technology. Ultimately, d) we will realize next generation information environment systems that improves performance and quality of life, raises the spatiotemporal information density to the limit of

implementation, systematically improves the academic foundation of ultrahigh-speed perceptual information processing and dynamic interaction.

【Expected Research Achievements and Scientific Significance】

This research significantly improves not only the methodology of each information input/output, but also aims for the following: enhance the basic technology, surpass the limits of immersion feeling and task performance of information environment systems and their interactions, and finally, overturn conventional design theory from the bottom up approach, starting from ultrahigh-speed vision that operates in the ultrahigh-speed time domain invisible to the human eye. Specifically, we propose a design and operating principle that will form the basis of a next-generation information environment system; in addition, the proposed idea would create and develop the core elemental technologies and academic foundation for high-speed interaction technology that exceeds human perception.

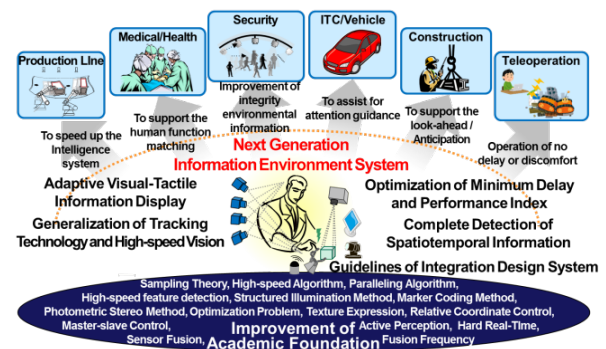


Figure 2 Development and application of the

【Publications Relevant to the Project】

- Taku Senoo, Yuji Yamakawa, et al.: Dynamic Intelligent Systems Based on High-Speed Vision, Journal of Robotics and Mechatronics, Vol.31 No.1, pp.45-56(2019)
- Masatoshi Ishikawa: High-speed Projector and Its Applications, Proc.SPIE 10932, pp.109320N 1-7 (2019)

【Term of Project】 FY2020-2024

【Budget Allocation】 144,900 Thousand Yen

【Homepage Address and Other Contact Information】

<http://ishikawa-vision.org/Booklet/>