論文 / 著書情報
Article / Book Information

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Title(English)	A Study of 360-Degree I/O System by Integrating Spherical Display with Omnidirectional Camera For Panoramic Video Communication
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学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

（博士課程）
Doctoral Program

論 文 要 旨

THESIS SUMMARY

系・コース： Department of, Graduate major in	情報工学 系 コース	申請学位（専攻分野）： Academic Degree Requested	博士 (工学) Doctor of
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

This thesis introduced full 360° image I/O systems, OmniEyeball (including OEB, OEB2), which combines an omnidirectional camera with a spherical display to support the symmetric 360° panoramic video communication. The system overview is presented in detail, which makes it solid reproducible. The experiment was conducted to prove such 360° panoramic video communication can support multiple users for remote collaboration. Furthermore, a VR application tool named OmniEyeballVR was introduced, which supports communication and cooperation in VR prototyping and design.

Chapter One introduces the background of video communication systems and existing issues, narrow field-of-view. Then, the research motivation of the proposed 360° panoramic I/O system in this thesis is presented.

Chapter Two presents related works of the 360° video communication system, which consists of two parts: video communication systems and spherical display systems. Then, the existing limitations of the previous researches are listed.

Chapter Three explains the research proposal in detail, which presents how the proposed system can solve the existing issue in video communication systems. Meanwhile, a prototype system is introduced, which helps to confirm the implementation method for the OmniEyeball system.

Chapter Four introduces the OmniEyeball system. It supports to explore the possibilities of using 360° hemispherical video communication systems to assist symmetrical remote collaboration. The experimental results showed that the proposed systems enabled two pairs of people to communicate over the distance simultaneously from anywhere around the devices. However, subjective results indicated that participants preferred the spherical display (the OmniEyeball condition) over the 2D flat display. This could possibly be due to better image quality (less distortion) and a better sense of three-dimensional space, directional relation, and telepresence.

Chapter Five firstly analyzes the limitations of the OmniEyeball system. Then, to address these limitations, an improved symmetric full 360° video communication system, OmniEyeball2, is presented. The OmniEyeball2 is designed to have four novel features to support remote observing and increased shared awareness. Based on the evaluation of the comparative experiments, the four features were effective in reducing the inconvenience mainly caused by the partial invisibility of the spherical display. The results also indicate how the proposed features supported the remote space awareness and gazed leading intuitively and effectively.

Chapter Six presents an MR cooperation application of the whole OmniEyeball project, named as OmniEyeballVR. It utilizes the OmniEyeball2 to allow a VR occupant user and multiple designers to cooperate across the virtual and physical world. This allows designers to easily view the physical assets and access the content in the VR space from any point of view. The system also supports sharing gaze awareness cue, facial expression, and body gestures to enhance communication. A user study was conducted to evaluate the system. The results showed that participants mostly preferred the first-person view mode with face window feature as it is quite intuitive to use, as well as providing a good spatial presence, understanding of the partner's focus, and user experience.

Chapter Seven presents the insights and findings of systems and applications described in Chapters four, five, and six (OmniEyeball, OmniEyeball2, and OmniEyeballVR). The user studies on them are summarized, analyzed, and discussed. Furthermore, it discusses how the findings and contribution of the whole OmniEyeball video communication systems (including OEB, OEB2), as well as its VR application, can provide advice and guidelines for future telecommunication and VR collaboration system designs.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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