(様式4)

二国間交流事業 共同研究報告書

令和6年4月23日

独立行政法人日本学術振興会理事長 殿

[日本側代表者所属機関・部局] 法政大学・理工学部 [職・氏名] 准教授・周 金佳 [課題番号] JPJSBP 120223210

1. 事 業 名 相手国: <u>フランス</u> (振興会対応機関: <u>MEAE-MESRI</u>)との共同研究

2. 研究課題名

(和文) マシンビジョンのための画像とビデオ圧縮技術の創出

(英文) Image and Video Compression for Computer Vision Applications

3. 共同研究実施期間 2022 年 4 月 1 日 ~2024 年 3 月 31 日 (2 年 0 ヶ月)

【延長前】 年月日~年月日(年_ヶ月)

4. 相手国側代表者(所属機関名・職名・氏名【全て英文】)

INSA Rennes, Associateprofessor, Lu Zhang

5. 委託費総額(返還額を除く)

本事業により執行した委託費総額		1,950,000	円
内訳	1年度目執行経費	950,000	円
	2年度目執行経費	1,000,000	円
	3年度目執行経費	-	円

6. 共同研究実施期間を通じた参加者数(代表者を含む)

日本側参加者等	7名
相手国側参加者等	6名

* 参加者リスト(様式 B1(1))に表示される合計数を転記してください(途中で不参加となった方も含め、 全ての期間で参加した通算の参加者数となります)。

7. 派遣·受入実績

	派遣		
	相手国	第三国	安八
1年度目	2	0	3 ()
2年度目	2	1	2()
3年度目			()

* 派遣・受入実績(様式 B1(3))に表示される合計数を転記してください。

派遣:委託費を使用した日本側参加者等の相手国及び相手国以外への渡航実績(延べ人数)。 受入:相手国側参加者等の来日実績(延べ人数)。カッコ内は委託費で滞在費等を負担した内数。

8. 研究交流の概要・成果等

(1)研究交流概要(全期間を通じた研究交流の目的・実施状況)

The aim of the research exchange was to foster collaboration and deepen mutual understanding between our respective research teams. To this end, we dispatched multiple students from our institution, while they reciprocated by sending several students from their side. Throughout the exchange, we engaged in extensive discussions to familiarize ourselves with each other's research environments, methodologies, and goals. Additionally, we collaborated on various joint experiments, leveraging the expertise and resources from both sides. This exchange provided a valuable opportunity for us to gain insights into each other's research approaches and findings. By working closely together, we were able to identify common ground and synergies between our research areas. As a result, we developed an integrated compression algorithm that addresses the needs of both machine vision and human vision domains.

Overall, the research exchange facilitated not only academic collaboration but also the establishment of strong professional relationships, paving the way for future joint endeavors and advancements in the field.

(2)学術的価値(本研究交流により得られた新たな知見や概念の展開等、学術的成果)

We successfully developed a novel compression system that considers both human vision and machine vision. This achievement represents a significant advancement in the field, as it addresses the complex interplay between visual perception and computational efficiency. Moreover, our collaborative efforts led to the co-authorship of multiple academic conference papers, showcasing the impact of our research exchange on scholarly dissemination. Furthermore, we have submitted two papers to journals, which are currently under review. These submissions underscore the depth and rigor of our research findings, as well as our commitment to contributing to the academic literature.

Building on the outcomes of this research exchange, we have also generated numerous new ideas for future investigations. Specifically, we envision integrating deep learning techniques into our system to further enhance compression performance. By leveraging the power of deep learning, we aim to achieve even higher compression ratios while maintaining perceptual quality—a direction that holds immense promise for advancing the state-of-the-art in compression technology.

In summary, the academic achievements resulting from this research exchange extend beyond individual publications to encompass the development of a groundbreaking compression system, collaborative dissemination efforts, and the generation of innovative ideas for future research endeavors.

(3)相手国との交流(両国の研究者が協力して学術交流することによって得られた成果)

The exchange between researchers from both countries has yielded significant outcomes through collaborative academic endeavors. Firstly, the joint efforts of researchers from both countries have led to the emergence of new insights and research outcomes. By combining different perspectives and expertise from both sides, novel approaches, and solutions about improving the human vision and computer vision in video coding have been proposed. Additionally, two international conferences with contributions from both sides have accepted. Furthermore, one related article has also been accepted by an international conference. Moreover, two journal articles with co-authors from both countries are currently under submission.

Additionally, several other works have yielded results and are in the process of being prepared for submission.

(4)社会的貢献(社会の基盤となる文化の継承と発展、社会生活の質の改善、現代的諸問題の克服と解決に資 する等の社会的貢献はどのようにあったか)

Our research on considering both human vision and machine vision in video compression contributes significantly to society in several ways. Firstly, by integrating insights from human perception and machine analysis into the compression algorithms, we enhance the quality of compressed videos while minimizing the data size. As a result, users experience smoother and more immersive viewing experiences, ultimately enhancing their overall satisfaction and productivity. Secondly, our research addresses the challenge of efficiently transmitting and storing large volumes of video data, which is increasingly crucial in the digital age. This, in turn, enables more efficient utilization of infrastructure, reduces operational costs, and facilitates the widespread dissemination of video content across diverse platforms and devices. Furthermore, our work contributes to advancements in video analysis and understanding, which have applications in various fields such as surveillance, autonomous vehicles, and augmented reality. By improving the accuracy and efficiency of video compression algorithms, we enable faster processing and analysis of video data, leading to enhanced decision-making capabilities and improved safety and security measures in society.

In summary, our research on video compression, considering both human vision and machine vision aspects, not only improves the quality and efficiency of video transmission but also addresses critical societal challenges related to data storage, analysis, and decision-making. Through our contributions, we aim to create a more accessible, efficient, and secure video communication environment for individuals and organizations worldwide.

(5)若手研究者養成への貢献(若手研究者養成への取組、成果)

Our efforts in nurturing young researchers have made significant contributions to the development of the next generation of scholars. Firstly, we have organized joint workshops and meetings specifically tailored to the needs of young researchers. By fostering a supportive and collaborative environment, we empower young researchers to develop their skills, expand their knowledge, and realize their full potential. Secondly, we actively involve young researchers in our research projects, providing them with valuable hands-on experience and exposure to cutting-edge research methodologies and technologies. Furthermore, by providing opportunities for young scholars to present their research and interact with experts in the field, we help them build professional networks, gain recognition for their work, and establish themselves as emerging leaders in their respective disciplines.

(6)将来発展可能性(本事業を実施したことにより、今後どの様な発展の可能性が認められるか)

By implementing efficient video compression techniques that consider both machine vision and human vision aspects, we open up several promising avenues for future development. Firstly, our work lays the foundation for the creation of more immersive and interactive multimedia experiences. As technology continues to advance, there is a growing demand for high-quality video content that can be seamlessly integrated into various applications, such as virtual reality (VR), augmented reality (AR), and immersive gaming. By optimizing video compression algorithms to account for both human perception and machine analysis, we can enhance the realism and fidelity of multimedia content, leading to more engaging and

compelling user experiences in these domains. Furthermore, our work has the potential to drive innovation in healthcare and telemedicine applications. As telemedicine continues to gain traction, there is a need for video compression techniques that can enable high-quality real-time video communication between patients and healthcare providers while minimizing bandwidth requirements. By optimizing video compression algorithms to account for both human perception and machine analysis, we can improve the quality and efficiency of telemedicine services, ultimately enhancing access to healthcare for remote and underserved populations.

(7)その他(上記(2)~(6)以外に得られた成果があれば記載してください) 例:大学間協定の締結、他事業への展開、受賞など