

Supporting the Sense of Unity  
between Remote Audiences in  
VR-Based Remote Live Music  
Support System KSA2

Topic: Wearable technology

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# **1. Info. Of paper**

2. Introduction

3. Related Work

4. Prototype System

5. Evaluation

6. Conclusion

# Info. of paper

- Focus on developing a system to support remote audiences of live music shows.
- Research by Kagawa University, JAPAN
  - Author: Tatsuyoshi KANEKO, Hiroyuki TARUMI et al.
- IEEE International Conference on Artificial Intelligence and Virtual Reality 2018
  - Times Cited: 5 (from Google Scholar at 19. Apr 2021)

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# Remote Live Music Performances

- Streaming services
- Only one-way communication from players to audiences, or support only text chat functions between audiences.

# Nonverbal Communication

- In the live music shows, the audience

Wave their  
hands

Holding a  
chemical  
light

Clap

Etc...

# KSA2 System

## Supporting bilateral Communication

- Players, remote audiences and between audiences

## Using VR tech.

- remote audiences would be able to have experiences as if they were enjoying music live shows with other audiences.

# Key idea - Sense of unity

- Often used to describe best experiences at live shows

Cheering &  
shouting  
with other  
audience

Overlooking  
other  
audience



Synergic  
effect



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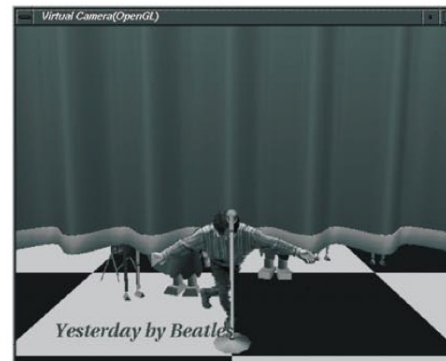
6. Conclusion

# Related Work

C. Sul, K. Lee, and K. Wohn, "Virtual Stage: a location-based karaoke system," IEEE Multimedia, Vol. 5, No. 2, pp. 42-52, 1998.



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)

# Related Work

S. Schertenleib, M. Gutiérrez, F. Vexo, and D. Thalmann,  
“Conducting a virtual orchestra,” IEEE Multimedia, Vol. 11, No. 3,  
pp. 40-49, 2004.



# Related Work

J. Janer, E. Gómez, A. Martorell, M. Miron, and B. de Wit,  
“Immersive Orchestras: audio processing for orchestral music VR  
content,” Proceedings of 2016 8th International Conference on  
Games and Virtual Worlds for Serious Applications, 2016.



Fig. 1. Screen shot of the online production interface to generate the Instrument Emphasis tracks.



Fig. 2. Example of VR content produced by Los Angeles Philharmonic publicly available on Youtube[4].

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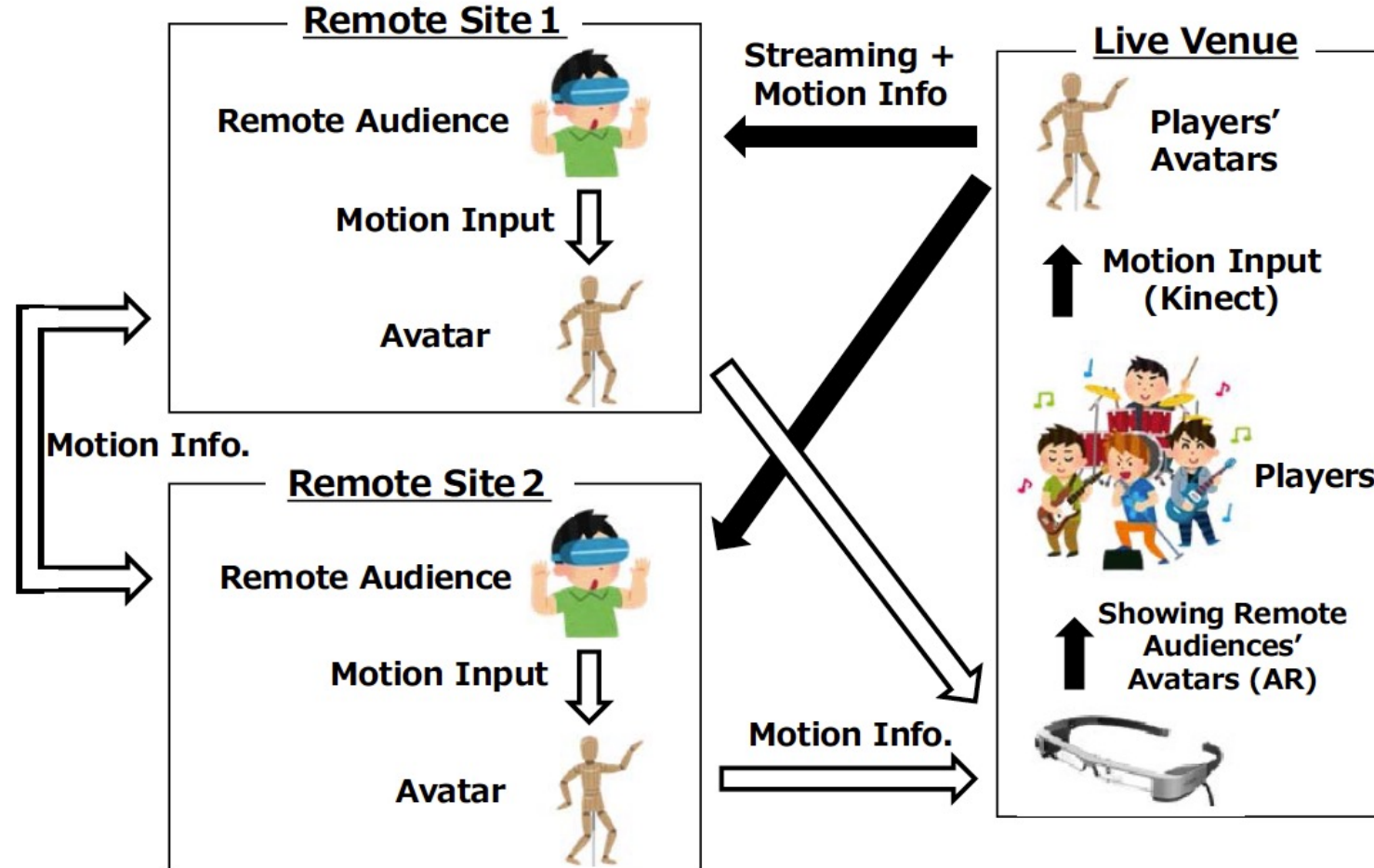
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# System Configuration



# User Actions supported by KSA2



# The application - Virtual live house





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# Evaluation - Questionnaire Results

14 participants

TABLE I. QUESTIONNAIRE AND RESULTS

No.	Question	1 (most negative)	2	3	4 (neutral)	5	6	7 (most positive)
1	I felt as if there were other audiences around me.	0	0	1	2	2	8	1
2	I felt a sense of unity with other audiences.	0	0	1	2	4	6	1
3	One of the reasons of my answer at Q2 is that I was able to overlook other audiences.	0	0	1	0	3	4	3
4	One of the reasons of my answer at Q2 is that I was able to move my body and take actions.	0	0	1	0	1	6	3
5	One of the reasons of my answer at Q2 is that I felt that I took actions with other audiences.	0	0	1	1	1	6	2

# Evaluation - User feedback

1. *“Moshing that occurred at the hook of the song was so realistic and wonderful.”*
2. *“I want to hear voices of other audiences and mine.”*

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# Conclusion - Contribution of the Work

*To develop a system for the remote audiences of live music performances with  
the sense of unity*

# Conclusion - Future Work

1. *To continue the development and evaluation to obtain results that are more reliable*
2. *To evaluate the system at the players' side, to confirm whether or not the affective communication between audiences and players occurs, and how effective it is*
3. *To design the communication between remote audiences and audiences in the real venue*
4. *To design the motions of NPC avatars (more natural)*