A system that allows users to communicate with others remotely while embodying a humanoid robot

October 31 2022, by Ingrid Fadelli

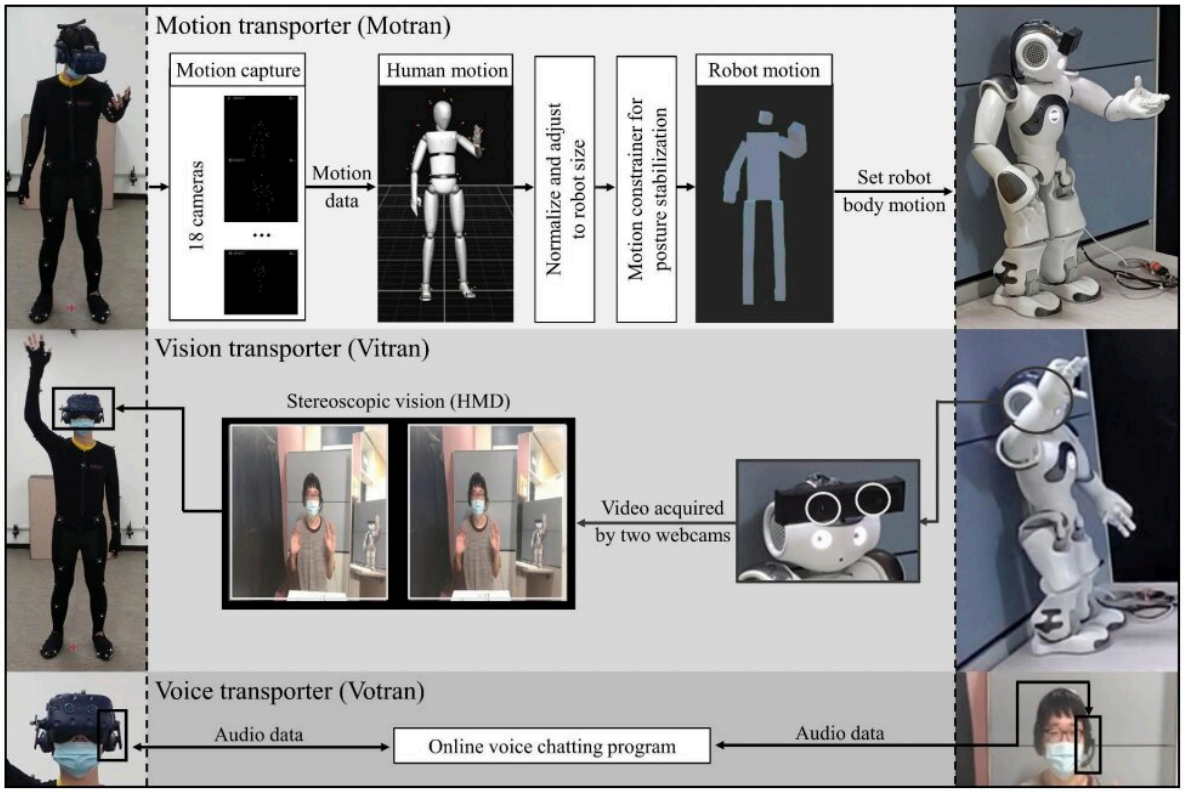

Fig. 1 Three modules of the proposed beaming system. The motion transporter (Motran) measures the human's body motion, normalizes it to adjust for body size differences, and calculates a stabilized robot motion to make the humanoid robot mimic the user's movement. The vision transporter (Vitran) uses two webcams mounted on the forehead of the humanoid robot to transmit visual information to each screen of the head-mounted display. The voice transporter (Votran) uses a telecommunication program to transmit voice information between visitor and local

Credit: *International Journal of Social Robotics* (2022). DOI: 10.1007/s12369-022-00922-w

Recent technological advancements are opening new and exciting opportunities for communicating with others and visiting places remotely. These advancements include telepresence robots, moving robotic systems that allow users to virtually navigate remote environments and interact with people in these environments.

Researchers at Hanyang University and Duksung Women's University in South Korea have recently developed a promising telepresence system based on a humanoid robot, a head mounted display, a motion transporter, a voice transporter, and a vision transporter system.

This system, introduced in a paper published in the *International Journal of Social Robotics*, allows users to take full-body ownership of a humanoid robot's body, thus accessing remote environments and interacting with both humans and objects in these environments as if they were physically there.

"The present study aims to develop a beaming system that provides full body ownership through a humanoid robot and investigate users' telecommunication experiences as roles of visitor and local with different levels of controllability," Myeongul Jung, Jejoong Kim, Kyungsik Han and Kwanguk (Kenny) Kim wrote in their paper.

The primary objective of the recent work by Jung and his colleagues was to develop a telepresence system that would allow human users to fully embody a humanoid robot in a remote location, using its body to navigate the environment and interact with others in it. To evaluate their system, the researchers carried out a series of experiments, in which users were asked to either directly use their system, taking on the role of "visitors," or interact with the robot operated by another user, taking on the role of "locals."

"Forty participants were assigned to both visitor and local roles, and their

copresence, usability, eye-contact, emotion, verbal, and gesture communications were investigated," Jung, Kim, Han and Kim wrote in their paper.

In the researchers' experiment, participants interacted with each other in pairs, where one controlled the humanoid robot and the other interacted with it. The pairs completed three trials. In the first, the robot was static and could not be moved at all by users, in the second it could only turn its head and its movements were synchronized with those of users, and in the third its whole body could move in ways that mirrored a user's movements.

"The results suggested that the subjective reports on the telecommunication experience of the visitors were generally controlled in a stepwise manner depending on the level of embodiment controllability, whereas that of the locals were not," Jung, Kim, Han and Kim wrote in their paper. "However, participants' emotion, verbal, and gesture communications showed synchronizing tendencies between the visitor and the local."

The findings gathered by this team of researchers highlight the potential value of telepresence systems that allow users to embody a humanoid robot. In their tests, Jung and his colleagues found when users had greater control over a humanoid robot's body and the robot mirrored their movements, their eye contact, emotional, verbal, and gesture communication style was more aligned with those of humans they were interacting with.

In the future, the system proposed by the team of researchers could be used to enhance telepresence applications that entail user's remote interaction with other humans. In addition, it could inspire the creation of similar systems based on humanoid robots.

More information: Myeongul Jung et al, Social Telecommunication Experience with Full-Body Ownership Humanoid Robot, *International Journal of Social Robotics* (2022). DOI: 10.1007/s12369-022-00922-w