Metaverse with Olfactory Sense for Walking Support

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Background (1/2)

➤ In the forthcoming era, with the increasing demand for healthcare and nursing care.

The prevention of "frailty," which is an intermediate state between a healthy state and a care-needed state, as well as the recovery from frailty, will become crucial.

Frailty

Walking assistance plays a significant role in realizing the objectives, and using a metaverse to extend walking time is a promising approach.
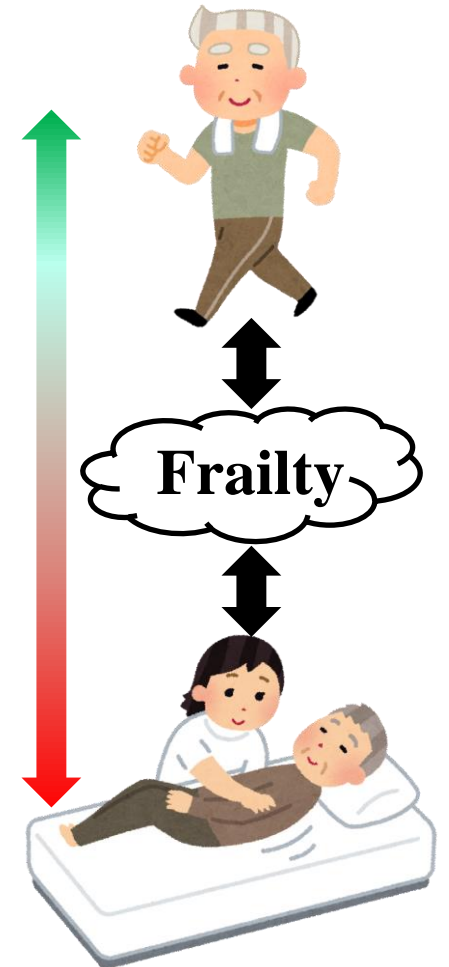
Background (2/2)

Motivation is very important for this walking assistance.

➤ The introduction to olfactory stimulation in the metaverse is considered.
➤ To enhance the sense of presence, enabling dynamic movement in the metaverse based on the walking pace is important.

Purpose of This Work

- Utilization of olfactory and auditory stimuli in the metaverse to further support walking and motivation by outputting the scents of flowers and generating sounds such as birdsong and babbling stream.

- The dynamic adjustment of movement speed in the metaverse based on the walking pace.

System Configuration of Metaverse
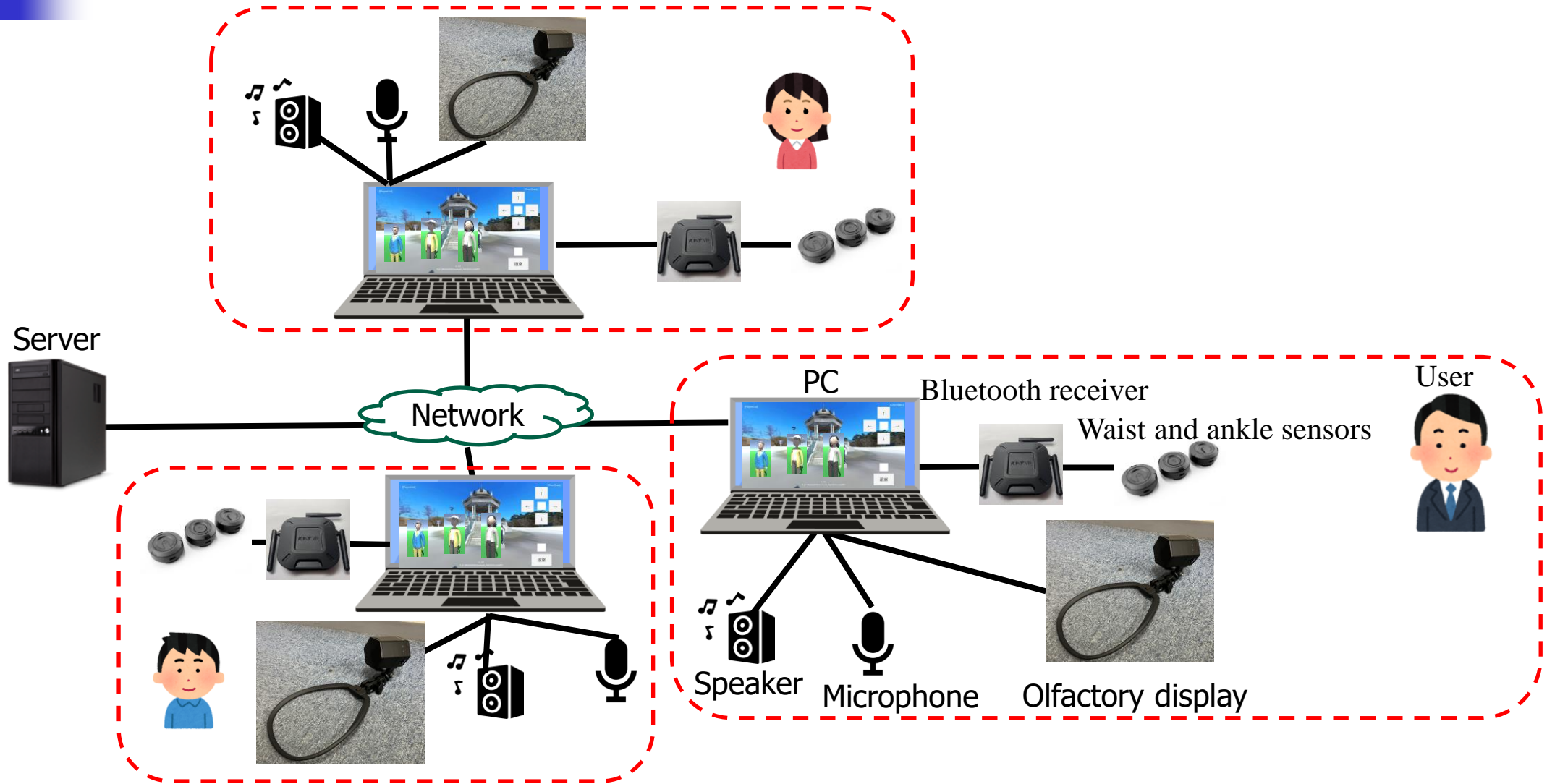
Virtual park

➢ Each users can walk along predetermined routes in the virtual park.

➢ Multiple routes are available, and the user can select favorite route at branching points by selecting left or right paths.

Wearable Sensors

➤ The wearable sensor for walking support consists of two components: a waist sensor and two ankle sensors.

➤ When the user performs a walking motion, the user enables walk-through in the virtual park.

➤ Wearing the waist sensor and changing the body's direction allows the user to alter the direction to which they are facing in the virtual park.

Waist sensor

Ankle sensor
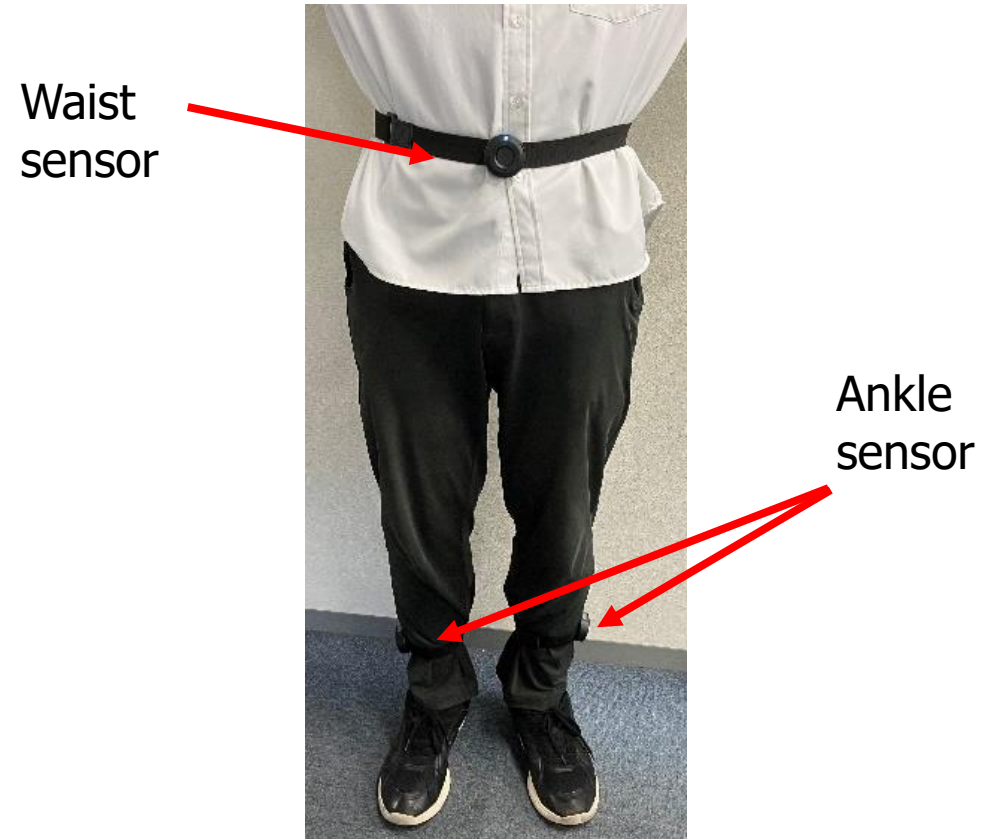
Olfactory Display

➢ In the virtual park, when approaching flowers, the olfactory display outputs the corresponding flowers' scents.

➢ While the user is near flowers, the olfactory display cyclically starts and ceases to output the scent of the flowers.

Olfactory display

Walking Supports (1/4)

- To improve in the experiential immersion in the metaverse, the movement speed in the virtual park changes dynamically according to the walking pace.

- The metaverse consists of two kinds spaces: video spaces and CG spaces.

Video space

➢ Movement is restricted to the forward and backward directions to encourage the user to focus walking.

➢ Utilizing video captured by a 360° camera, the user can enjoy surrounding views while moving by using the waist sensor.

➢ At branching points along the routes in the virtual park, the waist sensor is employed to select left or right paths, determining the route to follow.

CG space

➤ Users can move in the left and right directions as well as the forward and backward directions.

➤ Each users and the other users exist as avatars, allowing interaction and conversations through the speakers and microphones.
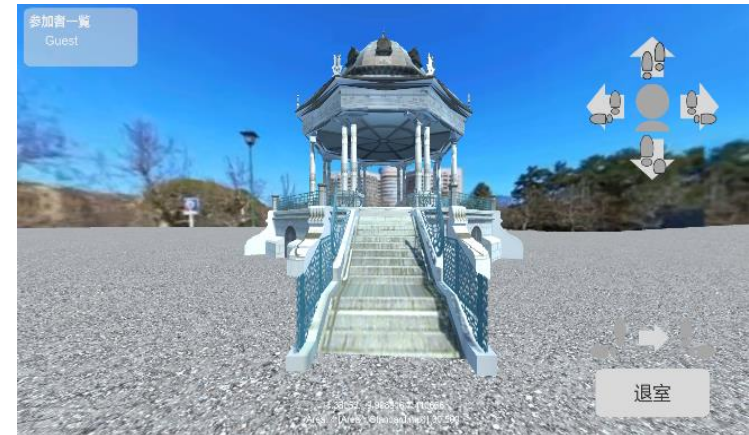
➢ When approaching flowers, the olfactory display outputs the corresponding flowers' scents.

➢ While walking, sounds such as birdsong and babbling stream are outputted from the speakers.

By utilizing both olfaction and audition to enhance the sense of presence during walking, we can expect to extend walking time.

Conclusion

We explain metaverse designed to support the walking activities of elderly individuals.

➤ The user wears a waist and ankles sensors and can walk-through a virtual park while looking at a display.

➤ In the metaverse, when the user approaches a flower with scents, the olfactory display outputs the corresponding flowers' scents, and sounds like birdsong and babbling stream are generated to enhance the experience.

➤ The metaverse adjusts the movement speed dynamically based on the user's walking pace.

Future Work

➢ Conducting usability studies on the metaverse and investigating the effectiveness of scents and sounds.

➢ Extending the metaverse's capabilities to include virtual shopping districts and to visit virtual historical landmarks could be crucial for providing more comprehensive experiences.