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香港城市大學
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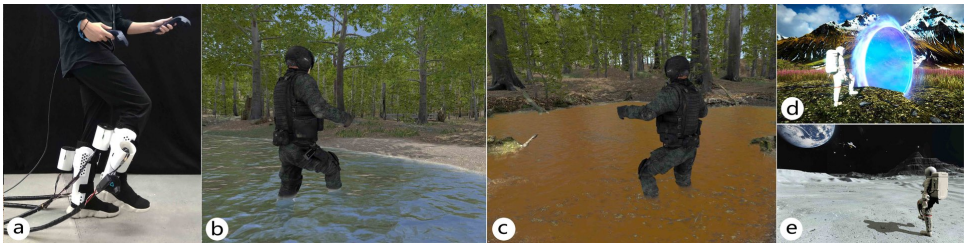
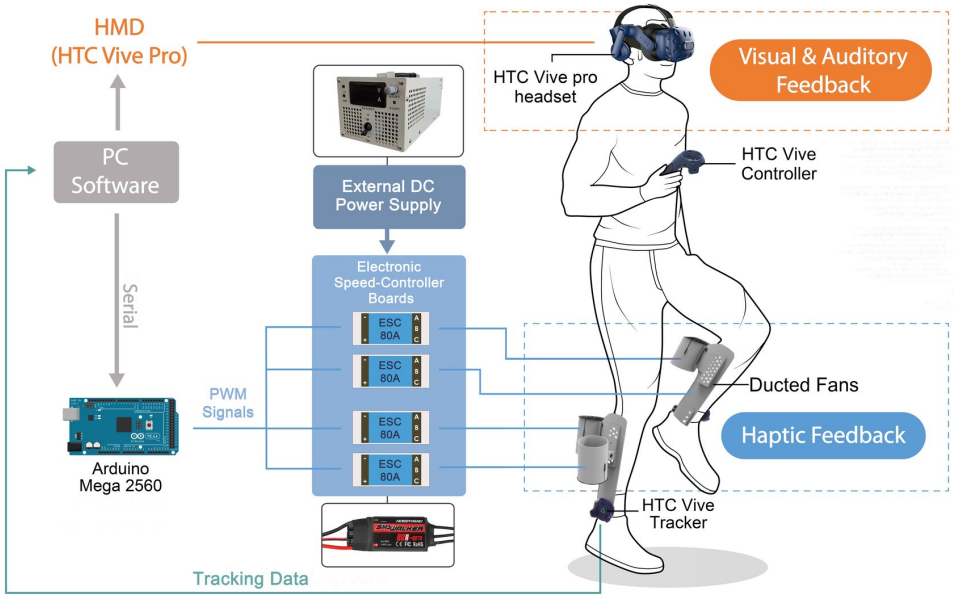
PropelWalker: Wearable Haptics for VR Walking

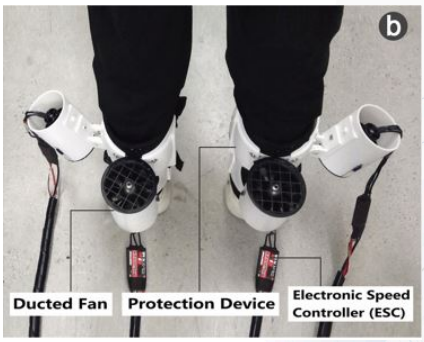
Communications & Information

Computer/AI/Data Processing and Information Technology

Consumer Electronics







Remarks

48th International Exhibition of Inventions Geneva (IEIG) (2023) - Bronze Medal

IP Status

Patent granted

Technology Readiness Level (TRL) ? 7

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Opportunity

Haptic and embodied feedback in virtual reality (VR) can improve users' experience and immersion. One purpose of providing haptic feedback in VR is to simulate the real-world touching experience. Many researchers studied the hand-based haptic devices to simulate the touch or the weight sensation in VR. Besides the hands and the other upper body parts, the lower limbs of the human body, such as the legs and feet, are another important body parts for us to explore the real world. For instance, we can feel different types and

levels of forces while walking on solid ground, in the water, in the sand, and in the mud or swamp. However, compared to hand-based haptics, there is less research on the haptic experience for the low limbs in VR.

Technology

PropelWalker is a pair of calf-worn haptic devices for simulating the buoyancy and the resistant force when the human's lower limbs are interacting with different fluids and materials in virtual reality (VR). By using four ducted fans, two installed on each calf, the system can control the strength and the direction of the airflow in real time to provide different levels of forces. The fans can simulate the forces (buoyancy and fluid resistance) caused by the user's lower limbs when moving in different fluid mediums (e.g., water, sand and mud). The device can also simulate the walking experience in different gravity conditions, such as walking on another planet.

Advantages

- This invention fills the lack of inventions and researches on lower-limb haptic feedback (especially kinesthetic feedback) in virtual reality.
- Our findings demonstrate that the invention can effectively simulate the forces (buoyancy and fluid resistance) generated by the user's lower limbs as they move in different fluids in virtual reality.
- The invention can be applied to different fields, such as games, sports, and rehabilitation.

Applications

- This system can be directly used in games and entertainment and in the field of sports, such as some sports related to foot weights.
- The device is also expected to be applied to rehabilitation, helping users with lower limb injuries recover.
- Another potential application is to provide alternative haptic feedback for users with upper limb disabilities to enhance their experience in VR.