

Handy Self-propelled Force Feedback Device

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Abstract. We propose a method of force presentation using a device in the form of a large lint roller. Two motors attached to the tires change the ease of progress. We applied the mechanism of PHANToM to provide force at the handle.

Keywords: Grounded haptic interface· Self-propelled

1 Introduction

Grounded haptic interfaces can present force in any direction, but the range of motion is tend to narrow. We propose a force feedback device in the form of a large lint roller, in which the device itself can move to control depth, tilt, etc. The demonstration shows the collision with a wall and the resistance of a large object to adhere to it. The device has a variety of potential applications, including user guides, force feedback for fishing, and presentations of obstacles and doors.

2 Proposal

The device (Figure 1) adds force feedback to XR experiences by presenting the sensation of colliding with something or suddenly starting to move forward, even though the user is carrying on an empty floor. The tire part is divided into two



Fig. 1. Device

parts, left and right, and by applying torque to them, the force is extended to the handle. There are two pipes connecting the handle to the tire section, one at the front and the other at the back, and they form part of a parallel link. The pipe on the front side is fixed to the base, and the pipe on the back side is driven by a mechanism based on the deceleration mechanism of PHANTOM[1]. The shaft of the motor attached to the foundation is made into an M6 screw, and a wire is wound along the screw and both ends are attached to the pipe at the back side of the movable. Rotating the motor and moving the pipe up and down via wires controls the tilt of the handle.

3 Demo

The user wears a HMD and holds the device. The feedback strategy is shown in Figure 2.

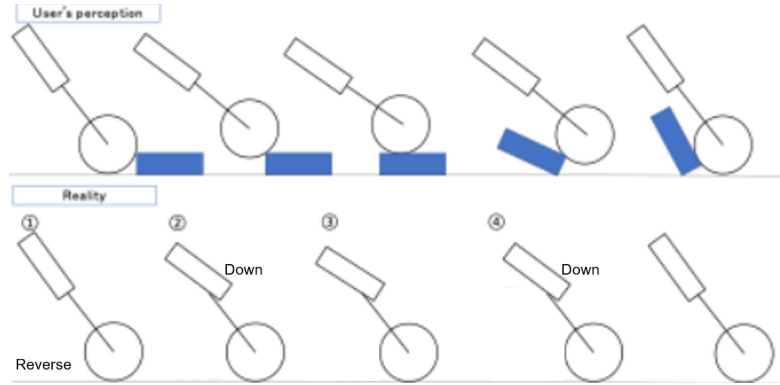


Fig. 2. The feedback when riding over a small obstacle

1. When the roller contacts the cube in VR, the tire's motors are reversed to apply a strong force.
2. When riding up, the wire's motor pulls the pipe and the handle goes down and the user feels as if the roller rift off the ground. Also, the tire's motors make a reverse force to represent the force riding up.
3. No force is applied.
4. When getting down from the cube, the roller weights are presented in the same way as in 2.

References

1. T. H. Massie and J. K. Salisbury, The PHANTOM Haptic Interface: A Device for Probing Virtual Objects, Proc. Haptic Symposium 1994, Chicago, Nov. 1994