Operating Device for Biped Vehicle

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We have developed the biped vehicle "Waseda Leg – No. 16 Refined V (WL-16RV)" as shown in Fig. 1. The barrier-free concept has been disseminated in order to allow the elderly and disabled wheelchair users to be self-reliant and lead an active social life. However, realizing the barrier-free concept is very expensive and complex through infrastructure improvements alone. The final goal of this research is to build a biped vehicle having locomotion and mobility equivalent to a human being. We consider that a biped vehicle is a viable solution in barrier-free engineering that is much more effective and low-cost than infrastructure improvements.

This paper describes the operating device for the biped vehicle. A control stick is mounted on the passenger seat (see Fig. 2). A passenger can change the walking speed and the direction of the robot freely by operating the control stick. Fig. 3 shows the mechanism and sensors equipped with WL-16RV.

The biped vehicle must be able to carry a heavy load. Therefore, the DOF configuration of the leg mechanism consists of a Stewart Platform. The weight of WL-16RV is 74 kg including 11 kg battery weight. Each leg mechanism has six linear actuators and passive joints at the both sides of each linear actuator. Each linear actuator consists of a 150W DC servo motor and a ball screw. For upper passive joints, we adopted commercial universal joints using needle bearings which are small, lightweight and have little backlash. For lower passive joints, new lightweight 3-DOF combination passive joints were developed in cooperation with HEPHIST Seiko Co., Ltd. The control computer is arranged at the rear of the pelvis, and the batteries, DC servo drivers and a body angle detector are arranged inside the pelvis.

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Fig. 1. Waseda Leg – No.16 Refined V (WL-16RV).

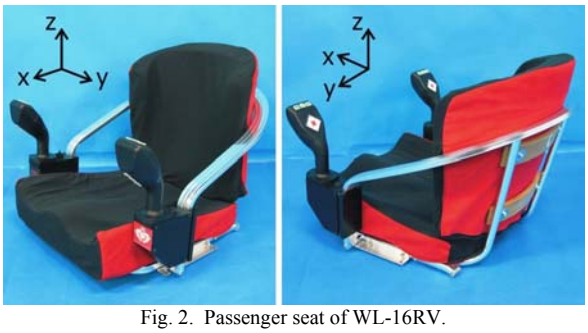

Fig. 2. Passenger seat of WL-16RV.

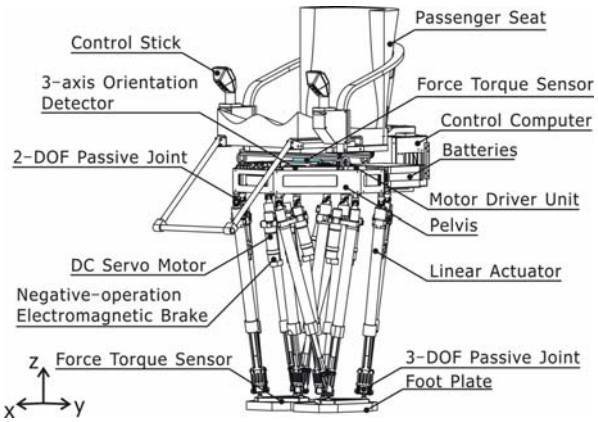

Fig. 3. Mechanism and sensors equipped with WL-16RV.