

DWARF & COOPERATION

Cooperative Transportation by Quadruped Robots

Cooperation of legged robots is useful to transport autonomously a large-sized object on irregular terrain such as steps or slopes. In this research, we propose the cooperative transportation method by quadruped robots.

The legged robot vibrates its body while walking and so does the object on it (Fig. 1). Then, the robot senses the object's vibration and decides its own motion without explicit communication with each other; the robot controls walking parameters, that is, walking cycle, step, and walking phase as well as the relative deviation from the other. The approach is detailed as follows; Firstly (1) we decide how to suitably distribute the object's degree of freedom to two quadruped robots. Secondly (2) we create the vibration model for the periodic gait of the quadruped robot. This model enables us to estimate the deviation of an object on the robot and the vibration parameters of the other robot (Fig. 2). Then, (3) we create the unresponsive section of the robot velocity for a little deviation of the object that is close to zero. This makes the transporting system robust against vibration. The effectiveness is verified by experiments using two quadruped robots equipped with the end-effectors (Fig. 3).

For environmental recognition, we equip the robot with a camera table. The robot actuates it to cancel out the vibration in the image caused by the body vibration while walking.

Keywords: Cooperative Transportation, Quadruped Robot, Multiple Mobile Robots

References

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- 2) Mitsuhiro HARA et al.: "Motion Control of Cooperative Transportation System by Quadruped Robots Based on Vibration Model in Walking", Proc. 1999 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS'99), pp.1651-1656, 1999.

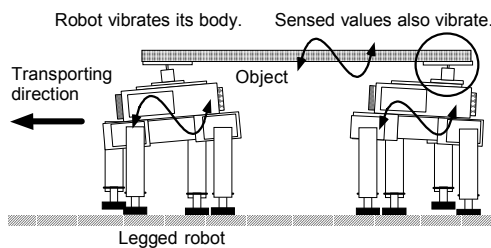


Fig. 1 Cooperative transportation with vibration

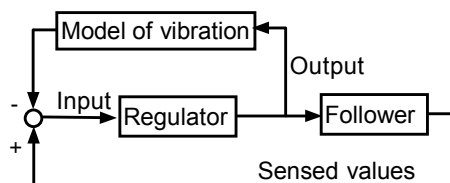


Fig. 2 Sensed value mode

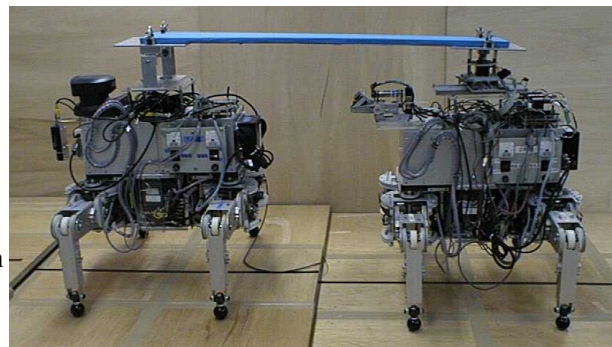


Fig. 3 Overview of quadruped robots equipped with end-effectors and cameras