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# EXPERIMENTAL STUDY ON HEAVY LOAD CLIMBER APPLYING HYBRID ROLLER MECHANISM FOR SMALL MANNED SPACE ELEVATOR

**Abstract**

Some of the technical challenges needed to realize a space elevator project require the innovative development of a drive mechanism and a control system for a climber traveling on a tether. Usually, since the climber is propelled by the frictional force between the tether and the driving unit, it is desired to devise a more efficient driving method. Until now, mobility experiments and challenges using small model climbers have been conducted around the world, and many excellent climbers have been developed. However, in the development of a climber considering practical use, it is expected that the weight of the climber will be about tens to hundreds of tons, and the travel distance of the climber will be tens of thousands of kilometers. It is quite impossible compared to the climbers that have been developed so far. The purpose of this study is to investigate a design method of a lifting mechanism that can move a long distance even under relatively heavy load, and to develop a small manned climber for a space elevator. In the previous paper, analysis and experimental results showed that the cross roller type arrangement provided a large propulsion force to simultaneously generated the pressing friction force and the surface friction force on the tether surface, and that the energy efficiency during operation was reduced combining with the confrontation roller type roller. Therefore, in this study, based on the above results, we developed a design of a heavy-weight climber that combines the hybrid roller mechanism of the confrontation roller and the cross roller type, and developed a test device that performs an operation experiment. The climber is a mechanism that obtains a propulsion force of 200 kg or more, assuming a future practical machine, and has a manned climber shape that can be mounted by humans. For long-distance travel experiments, we developed a loop-type experimental device in which the tether moves, and examined the problems (safety, operability, and energy efficiency) associated with long-distance travel. The climber mechanism developed with such specifications is a useful technology that can be fully used not only for space but also for vertical transport on the ground, and continuous development and operation are expected. In this paper, we explain the analysis and experiment verification of the developed small manned climber, and report the outline and operation status of the loop type experimental equipment.