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Optimal Design of a Wheelchair Suspension Based on a Compliant Mechanism

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Abstract

In recent years, a compliant mechanism has been paid to attention as a new mechanism to replace a traditional rigid link mechanism. A compliant mechanism achieves a specified motion by deforming the structure elastically instead of relying on traditional joint movements. Compared to traditional mechanisms, compliant mechanisms have several merits due to their monolithic structure without joints. Thus, the use of compliant mechanisms in mechanical products, medical instruments and MEMS can be expected to increase. In our previous research [1], we focused on a vehicle suspension as a promising application target of a compliant mechanism and proposed an optimal design method for a suspension based on a compliant mechanism or a compliant suspension consisting of topology and shape optimization.

In this research, we now apply a compliant suspension to a wheelchair and design a compliant suspension for a wheelchair using the method developed in the previous research. Most wheelchairs except some expensive ones don't have a suspension and only rely on tires for absorbing vibration and shock from a road. Since a compliant suspension consists of fewer parts than a traditional suspension and can be potentially integrated into a frame of a wheelchair, a compliant suspension can be added to a wheelchair at low cost. In this research, we design and manufacture a compliant suspension, retrofit an existing wheelchair with it and test ride quality of a wheelchair with a compliant suspension.

References

[1] M. Kobayashi, S. Omoto and M. Higashi, Optimal Design Method for a Vehicle Suspension Using a Compliant Mechanism Considering Static and Dynamic Characteristics, *The Seventh China-Japan-Korea Joint Symposium on Optimization of Structural and Mechanical Systems*, June, 18-21, 2012, Huangshan, China.