Effect of Assistive Grouser Mechanism on Lightweight Rover Power Consumption Pattern on Steep Soft Sand Inclines

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Abstract Lightweight wheeled rover locomotion has been the focus of research due to their reliability and simplicity of use. Soft sand inclines remain a challenge for wheeled rovers due to the high slippage and also a high risk for the wheels to dig into the sand and get stuck, due to the flowing nature of soft sand. During our previous work, we had proposed an assistive grouser mechanism that is attached to the sides of a conventional wheel, which had shown promising performance on soft sand inclines up to 30°. Power consumption pattern is important to lightweight rovers powered by onboard batteries traversing over terrain with high wheel rolling resistance such as soft sand. Therefore, this paper investigates the current consumption of a rover when using conventional wheels with fixed grousers compared to a rover using our proposed assistive grousers. The results show that on steep inclines, the assistive grousers are able to provide a relatively stable and lower current consumption when compared to when using a conventional wheel with fixed grousers.

Keywords Rover locomotion · Soft terrain · Mobile robots

1 Introduction

Lightweight wheeled rovers are widely used in various environments, such as in agriculture automation, scientific exploration, search and rescue, and also monitoring in hazardous areas. Wheels possess a large advantage in control simplicity and robustness in irregular terrain when compared to other mechanisms such as

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M. H. A. Hassan (ed.), *Intelligent Manufacturing & Mechatronics*,
Lecture Notes in Mechanical Engineering,
https://doi.org/10.1007/978-981-10-8788-2_30