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EFFECTS OF GROUSER MOVEMENT TO SAND-GROUSER INTERACTION ON UNCONSOLIDATED SOFT SAND INCLINE USING DISCRETE ELEMENT METHOD (DEM) SIMULATION

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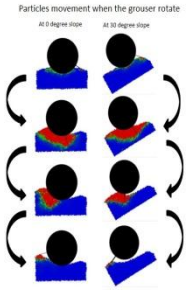
Graphical abstract



ABSTRACT

Wheeled rover is a lightweight robot that is used for driving over rough terrain such as on unconsolidated sandy dune incline. Typically, a rover is equipped with fixed grousers on its wheels (conventional grousers). A problem that usually occurs by using conventional grousers is the rover getting stuck on an unconsolidated sandy dune incline as the wheel tends to slip and sink into the sand. This happens when the conventional grousers rotate and moves the sand from below the wheel to the back of the wheel causing sand accumulation behind the wheel. A solution to minimize sand movement and subsequent sinkage to prevent this problem has been proposed during previous research where a prototype of a wheel rover which uses "adjustable grousers" with adjustable angles. During comparison experiments by the previous research, the result shows that the length of fixed grousers affects the performance of the wheel in soft terrain and shows high tendency to get stuck in the sand. The purpose of this study is to investigate the interaction between the rotating motion of a fixed grouser and the sand movement by means of computer simulation. By utilizing computer simulation, the parameters that affects the movement of sand particles was observed. For the simulation process, Discrete Element Method (DEM) is used. The result shows that the longer grouser has higher average of sand displacement and moves higher volume of sand under the rotating wheel. The result will be used to assist in analyzing the optimal parameters for wheel design for use on soft sand.

***Keywords*:** Discrete Element Method, fixed grousers, wheel rover

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