

Modeling and Simulation of a Multi-Unit Tracked Vehicle

by

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(ABSTRACT)

A multi-unit tracked vehicle such as a continuous haulage system is widely used in underground mining applications due to its high mobility and payload capacity on rugged and soft terrain. To automate such a system, a high fidelity model of a tracked vehicle is essential in designing a controller for each tracked vehicle in the system, and a system model is required to simulate its response to input commands.

This thesis presents the 2-D mathematical models of a tracked vehicle and a multi-unit tracked vehicle. All existing track-terrain interaction models are investigated and modified. By employing the modified track-terrain interaction model and applying Newton's second law of motion, the equations of motion of both single and multi-unit tracked vehicles can be derived. Computer programs for simulating the motions of these tracked vehicles on level ground have been implemented on a digital computer based on the derived system of differential equations. The fourth-order Runge-Kutta and Keun's methods are adopted to numerically integrate these differential equations.

The simulation results clearly show that the programs can accurately predict the motion of a tracked vehicle maneuvered on horizontal plane, and closely predict the response of a multi-unit tracked vehicle operated on level ground its command inputs.

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