Modeling and Simulation of a Multi-Unit Tracked Vehicle

by

Amnart Kanarat

Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science

in

Mechanical Engineering

Robert H. Sturges, Jr., Chairman

Charles F. Reinholtz

Arvid Myklebust

September 28, 1999
Blacksburg, VA

Key Words: Multi-Unit Tracked Vehicle, Tracked Vehicle, Dynamic Model, Kinematic Model, System Modeling, Computer Simulation

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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.

Acknowledgements

I would like to express my deepest appreciation to Dr. Robert H. Sturges for his continuous assistance and encouragement in conducting this research and help prepare this thesis. I would also like to thank my other committee members Dr. Charles F. Reinholtz and Dr. Arvid Myklebust for their many useful advice and their efforts in reading and commenting on my thesis. Special thanks to Dr. Scott L. Hendricks, Associate Professor of Engineering Science and Mechanics, Randy Sopher, and Michael Abbott for reinforcing dynamics background to the author.

I would especially like to thank Long-Airdox, Co. for being a pioneer to initiate this challenging research project. I would also like to thank all LA personnel for their supports in providing useful information and conducting the experiments.

Thanks to every team member, Aish, Bruce, Yodyot, and Todd for making the project full of fun and excitement.

I would also like to thank everyone in my family for their incessant love and care. I could not have made it this far without their support.

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