Minnesota Department of Transportation

Northland Advanced Transportation Systems Research Laboratory

NATSRL

University of Minnesota Duluth

Decision Support System for Snowplow Operations in Northeastern Minnesota

Version 1.00

User's Manual

Dr. Martha C. Wilson
Yanpeng Zhang
Ravindra Bharadia

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Abstract

This user's manual describes the use of the Decision Support System (DSS) for Snowplow Operations in Northeastern Minnesota computer program. This program is designed to assist winter maintenance supervisors at Minnesota Department of Transportation (Mn/DOT) in making better decisions through simulation methodology, leading to more effective and efficient use of limited resources. Essential information of snowplow operations such as time to bare lane, material application and cost, labor and equipment cost are generated by operating the program based on the snow event scenarios. In addition, time to bare lane of each route is presented and compared against performance measure targets, and the average time to bare lane according to each route class is portrayed as well as that of the routes in the entire sub-district. An optical disc containing the DSS for Snowplow Operations in Northeastern Minnesota program is included. The program requires Windows 95® or higher to operate.

The Authors

DR. MARTHA C. WILSON, PH.D., Assistant Professor at the Department of Mechanical and Industrial Engineering, the University of Minnesota Duluth. She has been the Principal Investigator throughout the duration of the Snowplow Operations and Resource Management Project since 2002.

YANPENG ZHANG, M.S. in Engineering Management, University of Minnesota Duluth. He jointed the research team in the fall of 2003, mainly working on the development of the simulation model.

RAVINDRA BHARADIA, M.S. in Computer Science, University of Minnesota Duluth. He jointed the project in the fall of 2003, developing user interface and output report.

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Chapter 1

1 Overview

1.1 Purpose of the DSS for Snowplow Operations

DSSs in general and simulation in particular provide a platform for conveniently experimenting and analyzing different scenarios in the operations. Decisions in snowplow operations are based on numerous factors. Any appreciable change in a single variable could lead to significant variation in decision-making. For instance, the weather conditions change continuously, which requires the management of operations to adjust their decisions correspondingly. Thus, the capability of running different scenarios in a timely manner will greatly assist the winter maintenance managers in their decision-making and benefit the general public whose life largely relies on the transportation efficiency.

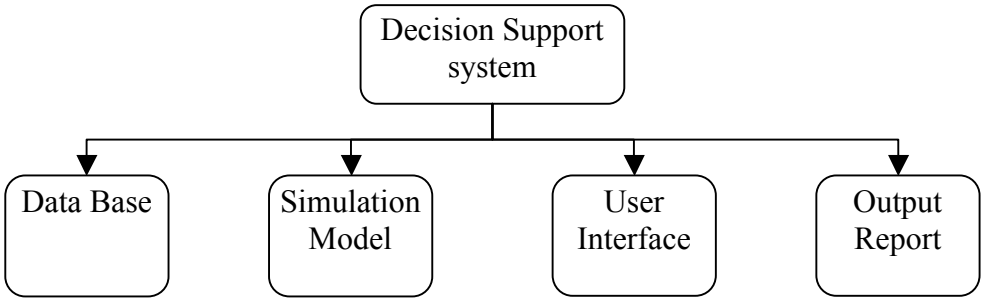
Additionally, successfully developed and implemented, DSSs will serve as a general management tool that can be modified for future needs. The flexibility and ease of updating will be integrated in this DSS, which will enable the software maintenance personnel to conveniently revise the model in case of change in route definition or equipment availability and assignment.

1.2 Who Should Use the DSS

The DSS is intended for use by the winter maintenance managers and supervisors at Mn/DOT Virginia Sub-District 1 B to improve decision-making regarding snowplow operations management.

1.3 Components of the DSS

Generally, the DSS consists of four components: data base, simulation model, user interface, and output report. The data base contains the essential information of snowplow operations for the DSS to operate. The simulation model includes all algorithms and rules necessary for decision making process. The user interface enables effective interaction between DSS users and the machine. The output report presents the simulated results to the users.



1.4 Technical Support (Getting Help)

To make the DSS easier to use, help is available in several ways.

- Go through Running the DSS for Snowplow Operations provided in Chapter 3. This will introduce you to many of the features of the DSS.
- Read this User's Manual and keep it handy as a reference as you begin to use the DSS.
- If the sources above do not answer your questions, we will be glad to help you through any problem you may have with the program. Please contact:

Snowplow Simulation Research
105 Voss-Kovach Hall
1305 Ordean Court
Duluth, MN 55812
Telephone: 218-726-6161
Fax: 218-726-8596

Chapter 2

2 Installation

2.1 System Requirements

2.1.1 Hardware

- 166 MHz Intel Pentium processor or greater
- 32 MB or more of installed RAM
- An optical drive

2.1.2 Software

- Microsoft Windows® Version 95 or higher
- ProModel® 2002 or higher

2.2 Disc Contents

The installation optical disc contains several files necessary to install the DSS for Snowplow Operations for Northeastern Minnesota. The following is a list of the installation disc. If any of the following files are missing, the DSS may have critical problem running.

File Name	File Type	File Size
PROMOD4	GLB File	191 kb
All_Routes	Microsoft Excel Worksheet	62 kb
Results	Microsoft Excel Worksheet	29 kb
User_Interface	Microsoft Excel Worksheet	338 kb
All_Routes	MOD File	149 kb
ALL_RO~1	Model Package	237 kb

2.3 Installation Procedures

Follow these steps to install the DSS:

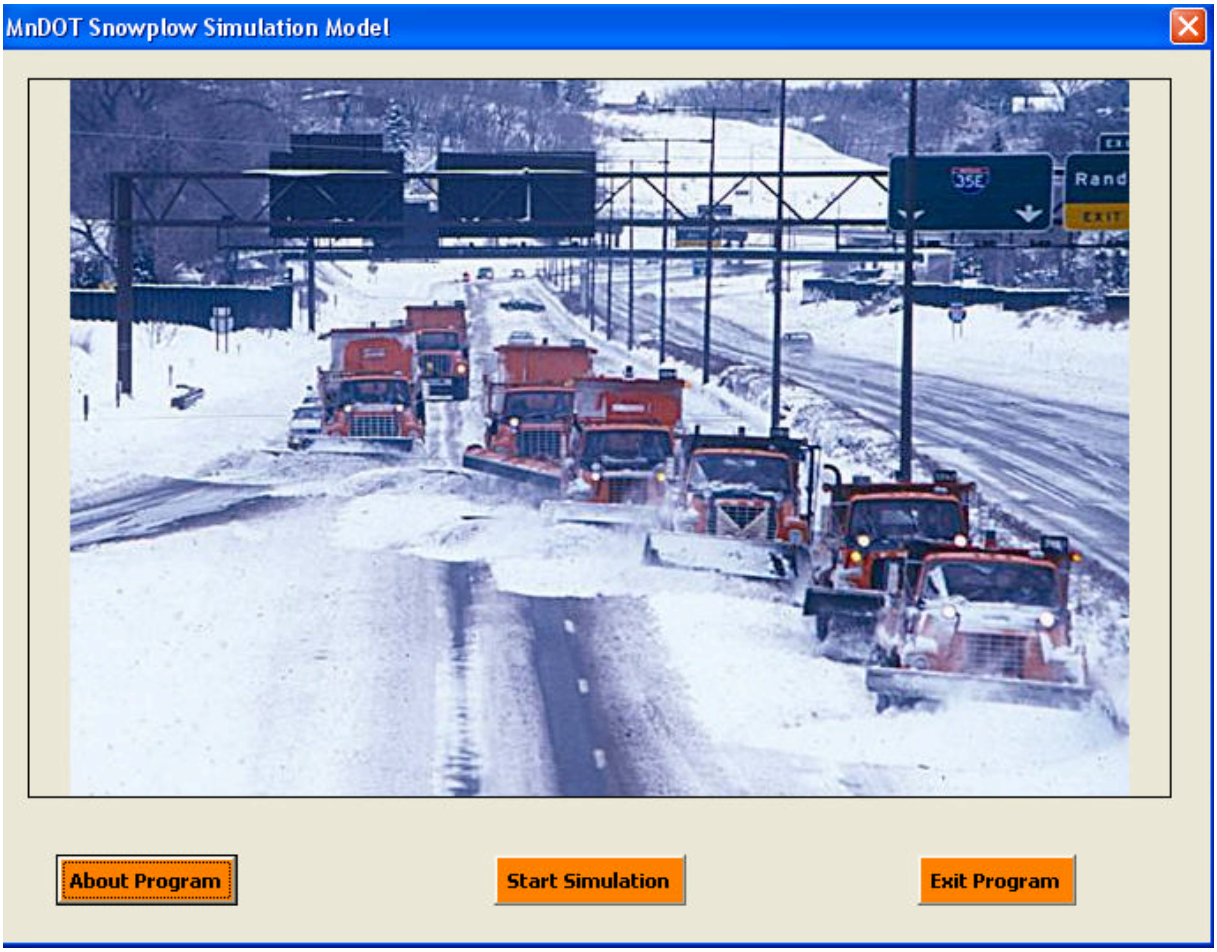
1. Install ProModel® 2002 or higher version, following the installation guide provided by the software vendor.
2. Copy the entire folder “Models&Interface” on the installation disc to the drive C: \ on your hard disc.

Chapter 3

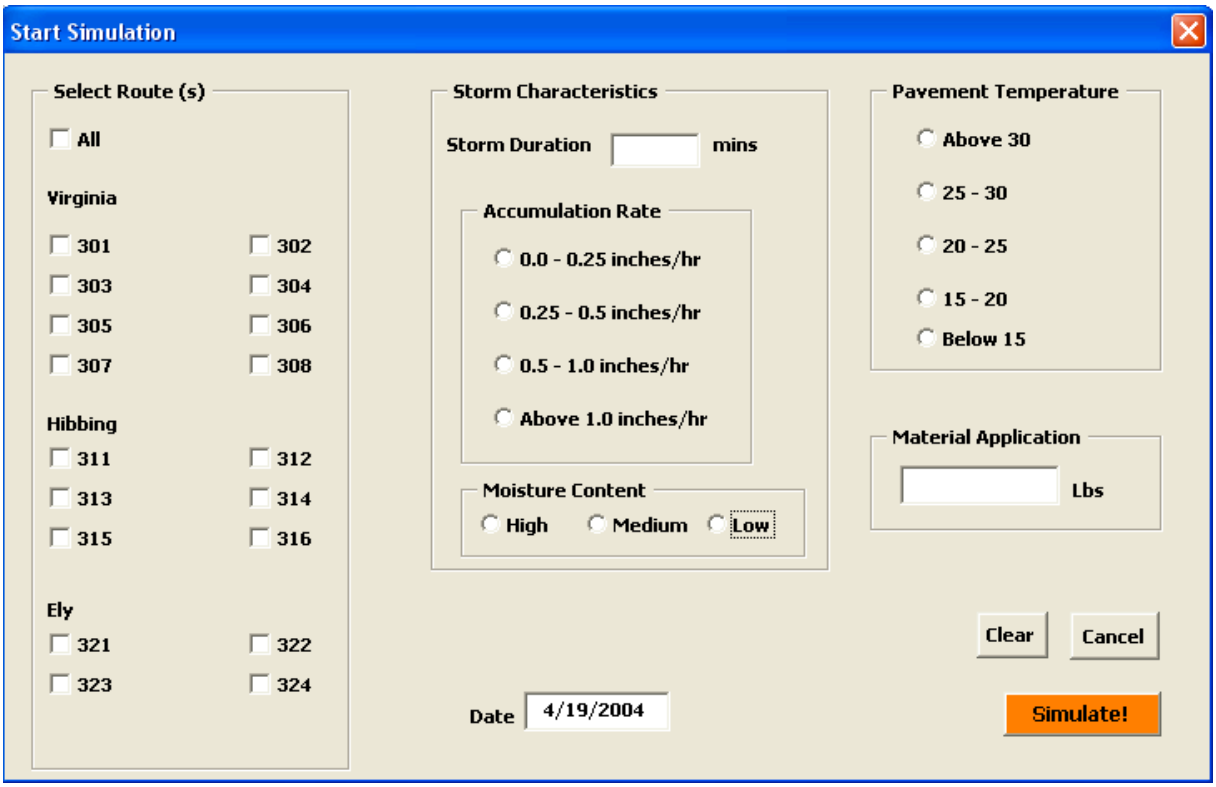
3 Running the DSS for Snowplow Operations

Follow the steps below to simulate a snowplow operation.

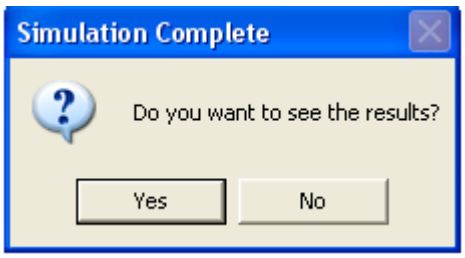
1. Double click on C: drive and then trouble click on the folder “Models&Interface”.
2. Open the Excel® file “User_Interface” in the “Models&Interface” folder and a general interface will show up as follows.



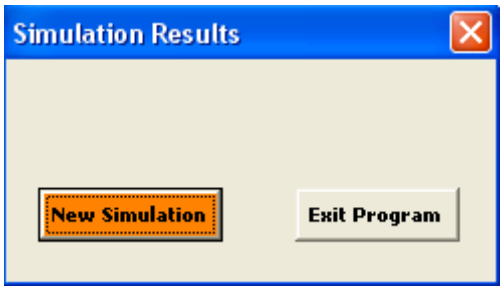
3. Click on “About Program” to gain a brief introduction of the program; Click on “Exit Program” to exit the DSS; Click on “Start Simulation” to start simulation and then a dialogue window requiring the user to input critical parameters of snowplow operations will appear as follows.



4. In the dialogue window shown above, select the routes you want to simulate by checking "All" or a combination of several route numbers. Continue to fill out "Storm Characteristics", "Pavement Temperature", and "Material Application". If you want to erase all the inputs and start over, click on "Clear" button at the lower right corner. Otherwise, make sure all the inputs are correct and click on the orange "Simulate!" button and the system will automatically launch ProModel® to run the simulation.
5. The simulation process may take a few minutes. When it is completed, a small window as follows will pop up.



6. Click on "No" button in the above window because another more advanced output report has been created when the simulation was completed. To view the output report, activate the Excel® file "Results" by clicking on the window named "Results" on your taskbar at the lowest of your computer screen.
7. Close the dialogue window "Simulation Results" shown as follows.



8. By clicking on the corresponding tabs in this Excel® file, you can view the simulated results, performance plots of the different route classes and the entire sub-district, and information you just inputted at the beginning of the simulation, in different spreadsheets.
9. You can now print the output reports by the appropriate operations in Excel®. Close the active files including ProModel® simulation file "All_Routes" and Excel® files "User_Interface" and "Results" when all inquiries are completed.
10. Repeat these steps if you want to simulate other snow events.