

Modeling and Planning of Snow Sweeping on Main Roads

Team Members

Qin Yipeng Gao Zhenyuan Su Cong

Teacher

Mr. Cai Bin

School

Suzhou High School of Jiangsu Province

Abstract: Heavy snow will turn to a natural disaster, and will bring big economic losses. We still can not forget the crisis caused by the snow disaster that happened in South China early this year. We hope to establish a mathematic model and a plan to illustrate how to sweep off the snow on main roads in a city to ensure the smooth flow of traffic. The research will become a basis on which the government can work out some plans against the snow disasters.

First we made some assumptions, then studied the working process of snow-sweepers and derived a snow sweeping model. We established a model of snowing speed and snow thickness, a model of relationship between snow-sweeper's working speed and snow thickness, and snow-sweeper's working model. On these models, we got a model to determine the minimum number of snow-sweepers. And then a depth first searching model and a "snow-sweeping tree" model were constructed to deal with the one-stroke problem upon which snow-sweeping plan can be developed. We also made two computer programs in PASCAL, one determining the minimum number of snow-sweepers and the other for the snow sweeping plan on main roads. Thus we finished the research completely and systematically.

We tried several methods and techniques to deal with various problems that appeared in the research, such as using piecewise curve fitting to transform a cubic equation $h \sim v_c$ to a formula $v_c \sim h$, using trial and error method to determine the minimum number of snow sweepers, using depth first searching and the

snow-sweeping tree in one-stroke processing, and also a matrix to deal with the depth first searching.

We successfully used various math knowledge in the research, which involved Calculus, Numerical Analysis, Graph Theory and Data Structure. Through the research, we broadened our academic horizons, enhanced the ability to find, analyze and solve problems creatively and flexibly, and at the same time, we know how to cooperate and coordinate in a research team.

Key Words Modeling Cubic equation Matrix