

Application of Rough Sets to Environmental Engineering Modeling

Robert H. Warren (rhwarren@uwaterloo.ca)
School of Computer Science, University of Waterloo
Waterloo, ON, N2L 3G1, Canada

Julia A. Johnson (julia@cs.laurentian.ca)
Department of Mathematics and Computer Science
Laurentian University, Sudbury, Ontario, P3E 2C6, Canada

Guo H. Huang (gordon.huang@uregina.ca)
Environmental Systems Engineering, Faculty of Engineering
University of Regina, Regina, SK, S4S 0A2, Canada

keywords: environmental modeling, applied rough sets, solid waste

Since Pawlak's original publication of the Rough Sets method, several applications of the method have been reviewed, including control problems, weather prediction and medical diagnosis. We explore the use of Rough Sets to reduce the complexity of Environmental Engineering problems.

Modeling large Environmental Engineering problems can be difficult because of both the volume of information processed and the number of modeling decisions being made. In many cases, a chicken and egg problem presents itself when modeling new or one-of-a-kind systems: The model is needed to gain the knowledge necessary to constructing the model.

A generally accepted solution is an iterative one where the effects of a parameter or model change are recorded. Elements of the models which do not affect the system performance metrics are dropped in favor of a simpler model.

This process can be shortened considerably by using a Rough Sets approach to actively search for the simplifying assumptions which lead to concise, accurate models. We apply this approach to the case of the Hamilton-Wentworth solid waste management case where several alternatives can be chosen to satisfy the community's needs. The case demonstrates Rough Set's ability to identify the critical model elements of the system.