

UNIVERSITI TEKNOLOGI MARA

**ARTIFICIAL NEURAL NETWORK SEDIMENT
TRANSPORT MODEL FOR SUNGAI BERNAM**

MUHAMMAD SYAHREEN SA'ADON

Thesis submitted in fulfillment of the requirements
for the degree of
Master of Science

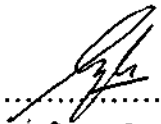
Faculty of Civil Engineering

September 2008

Candidate's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA

Name of Candidate	Muhammad Syahreen Saadon
Candidate's ID No.	2005220532
Programme	EC 780
Faculty	Civil Engineering
Thesis Title	Artificial Neural Network Sediment Model For Sungai Bernam
Signature of Candidate	
Date	6.10.2008

Abstract

Artificial neural network (ANN) model is proposed as an alternative to the conventional sediment transport models for Sungai Bernam. This study evaluates the existing sediment transport equations against the local river data. Equations used in evaluations are Ackers & White, Ariffin, Engelund & Hansen, Einstein-Brown, Graf and Yang equations. Selections of the equations are based on their performance by previous investigator. Accuracy of the proposed sediment model was evaluated using the discrepancy ratio. Discrepancy ratio is the ratio of predicted to measured sediment values. From the evaluations, Engelund and Hansen equation gave the best prediction when tested against the local river data. In this study, an improvement on the equation was made and ANN is used as a tool in analysis. The proposed architecture of the sediment model is a 3 layer multi perceptron model (2:3:3:3:1) with two neurons in the input layer. The hidden layer consisting of three slabs and each slab in the hidden layer has 3 neurons. The output neuron is the total sediment load. The momentum rate parameter and learning rate parameter are 0.4, and 0.3 respectively. The proposed model was trained using 36 sets of field data and was further validated using a different set of field data. In both training and testing phases, the proposed models yield about 90% accuracy. The accuracy of the model was measured using the discrepancy ratio. Range of discrepancy ratio used for measurement of accuracy is 0.5 to 2.0.

Acknowledgement

I would like to express my gratitude to my supervisor Associate Professor Ir. Dr. Junaidah Bte Ariffin and co-supervisor Professor Dr. Nasir Bin Taib for their valuable guidance and patience to enable me to complete my thesis. My appreciation goes to The Institute of Research Development and Commercialisation (IRDC) for the research grants, technical staffs of the Department of Irrigation and Drainage Malaysia (DID) and undergraduate students of the Faculty of Civil Engineering, UiTM Shah Alam for their assistance in the sampling operation.

Last but not least, to my lovely family for their encouragement and motivation during the period of study in UiTM, Shah Alam.

TABLE OF CONTENTS

TITLE PAGE	
CANDIDATE'S DECLARATION	
ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	vii

CHAPTER 1: INTRODUCTION

1.1	Background of Study	1
1.2	Problem Statement	2
1.3	Objective	2
1.4	Scope	3

CHAPTER 2: LITERATURE REVIEW

2.1	Introduction	4
2.2	Established Sediment Transport Equations/Models	4
	2.2.1 The Ackers and White Formula	7
	2.2.2 The Ariffin formula	9
	2.2.3 The Einstein-Brown Formula	9
	2.2.4 The Engelund and Hansen Formula	10
	2.2.5 The Graf Formula	11
	2.2.6 The Meyer Peter and Muller Formula	11
	2.2.7 The Yang Formula	12
2.3	Flow Discharge Measurement	12
	2.3.1 The Ott C31 Current Meter	12
	2.3.2 The Ott C2 Current Meter	13
	2.3.3 The Ott Double Drum Winch	14
2.4	Suspended Load Measurement	15
	2.4.1 Grab Sampling	15
	2.4.2 Depth-Integrating Suspended Sediment Wading Type Hand Samplers, DH-48	16
	2.4.3 Depth-Integrating Hand Line Suspended Sediment Samplers, DH-59	17
2.5	Bed Load Measurement	18
	2.5.1 Basket-Type Sampler	18
	2.5.2 Helley-Smith Bed Load Sampler	19
	2.5.3 Changjiang 78 Bed Load Sampler	20