TEMPORAL CASE-BASED REASONING MODEL FOR RESERVOIR SPILLWAY GATE OPERATION RECOMMENDATION

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ABSTRAK

Pembuatan pemutusan dalam keadaan kecemasan berhadapan dengan masalah kepantasan dan ketepatan. Kelewatan dalam pembuatan pemutusan akan mengakibatkan malapetaka kepada keselamatan awam dan harta benda. Pembuatan pemutusan bagi pintu alur limpahan empangan adalah dinamik, dan ia memerlukan pengalaman pakar dalam pembuatan pemutusan. Dalam kajian ini, sistem sokongan pemutusan telah dicadangkan bagi menyokong pembuat pemutusan menentukan samada pintu alur limpahan empangan buka atau tutup. Dalam kajian ini, teknik Penaakulan Berasaskan Kes Temporal (TCBR) digunakan untuk memodelkan pengetahuan juruteknik empangan, dengan menggunakan pangkalan data pengalaman (pangkalan-kes), untuk menyelesaikan masalah baru. Kajian ini menggunakan kaedah eksperimen, dimana Kaedah Penemuan Pengetahuan dalam Pangkalan Data (KDD) digabungkan dengan Kaedah Penyelidikan Umum dalam Rekabentuk Kajian (GMDR), dimana sebuah prototaip telah dibangunkan untuk membuktikan model yang dicadangkan. Data Empangan Timah Tasoh dari tahun 1998 hingga 2005 telah digunakan sebagai kajian kes model. Model yang dicadangkan ini dapat menyarankan keputusan dengan ketepatan 87.2 peratus dan keserupaan kes 88.75 peratus dengan kes-kes terdahulu.

ABSTRACT

Emergency decision making process faces difficulty in making timely and right decision. Delay in decision making will result catastrophic events that will jeopardize the public safety and properties. Decision making in reservoir spillway gate operation is usually dynamic in nature, and requires expert experiences in order to deliver decision. In this research, a decision support system was proposed that can assist decision maker determining whether to open or close the spillway gate. In this thesis, the Temporal Case-Based Reasoning (TCBR) technique is implemented to model the dam technician knowledge, by utilizing experiences database (case-base), to solve future problems. This is an experimental study, where Knowledge Discovery in Databases (KDD) approach is integrated with General Methodology of Design Research (GMDR), where a prototype was developed to proof the proposed model. Timah Tasoh Dam operation data ranges from year 1998 to 2005 are used to serve as a case study in this model. The proposed model was found to be able to recommended decision with up to accuracy of 87.2 percent and 88.75 percent case similarity with previous cases.

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DEDICATION

for my parents...

ibu, Junaidah Bt. Mad Bakri
and ayah, Mohd Hassin B. Masiman

also for my brother and sisters,

kakak, Haryantie Bt. Mohd Hassin
kak cik, Hartatie Bt. Mohd Hassin
conie, Haryanie Bt. Mohd Hassin
and napi, Mohammad Hanafie B. Mohd Hassin.

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LIST OF ABBREVIATIONS

Acronym	Meaning
AI	Artificial Intelligence
COA	Course of Action
CBR	Case-Based Reasoning
DID	Drainage and Irrigation Department.
EBDM	Experience-Based Decision Making
ES	Expert System
FE	Feature Extraction
F_n	False Negative
F_p	False Positive
FS	Feature Selection
GMDR	General Methodology of Design Research
KA	Knowledge Acquisition
KDD	Knowledge Data Discovery
m	Meter
mm	Millimeter
NN	Neural Networks
RBR	Rule-Based Reasoning
RPD	Recognition-Prime Decision
SA	Situation Assessment
SABBA	Sistem Amaran Banjir Berbilang Agent
t	Time
TCBR	Temporal Case-Based Reasoning
T_n	True Negative
T_p	True Positive

CHAPTER 1

INTRODUCTION

Generally, water reservoir or dam is built to store water for various usage. Sometimes, water reservoir or dam is referred as artificial lake constructed by human to fulfill the purpose of providing; 1) Domestic usage that includes agricultural (irrigation), and industrial, particularly as drinking water, 2) Hydroelectric power that generate electricity or store electricity, 3) Flood control that collect or hold water from connected rivers and heavy rainfall, then slowly release it to the river over the time to prevent flood at the downstream area. In general, water reservoirs offer various benefits to humankind such as the generation of electric power, flood controlling, source of water supply and also for recreational purposes such as water sport and fishing.

Despites of all the above benefits, poor dam management can lead to unexpected disaster. For example, in 2005, after a series of heavy rain in South Western Pakistan, the Shadikor Dam burst up and killing at least 70 residents. In addition, about 30,000 people had been affected and five nearby villages were completely washed away (BBC,

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