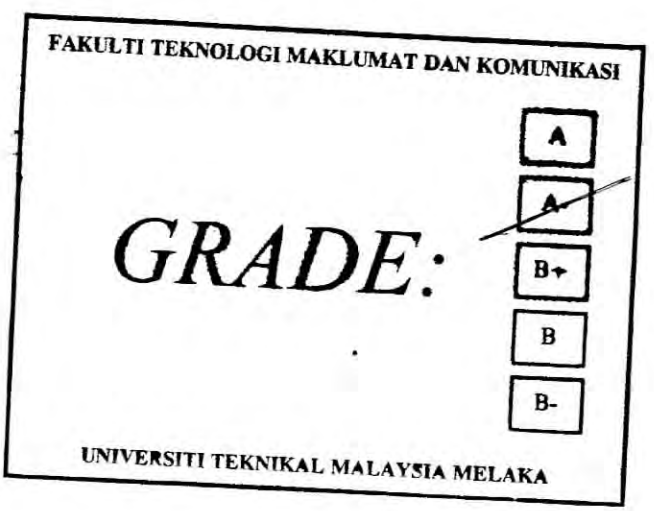
DISASTER ALERT INTELLIGENT SYSTEM

AMNI BINTI MOHAMED ZAIN



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SESI PENGAJIAN: 2009/2010

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CATATAN: * Tesis dimaksudkan sebagai Laporan Projek Sarjana Muda (PSM)
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DISASTER ALERT INTELLIGENT SYSTEM (DAIS)

AMNI BINTI MOHAMED ZAIN

This report is submitted in partial fulfilment of the requirements for the
Bachelor of Computer Science (Artificial Intelligence)

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2010

DECLARATION

I hereby declare that this project report entitled

DISASTER ALERT INTELLIGENT SYSTEM

is written by me and is my own effort and that no part been plagiarized without citations.

STUDENT : _____ Date: 25 June 2010

(AMNI BT. MOHAMED ZAIN)

SUPERVISOR : _____ Date: 25 June 2010

(DR. ABD SAMAD HASAN BASARI)

DEDICATION

To my adorable parent for their endless support and understandings have been profound throughout the difficult times of this course.

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First of all, my warmest thanks to God for giving me strength throughout my journey until the end.

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ABSTRACT

Disaster Alert Intelligent System (DAIS) is an expert system in helping geologist to predict disaster occurrence and level of disaster based on the given rules. The disaster includes flood, earthquake, hurricane, drought and tsunami. If disaster is predicted, an alert based on possible disaster area are sent via Short Messaging System (SMS) to the residents in the selected area. The system is a hybrid method of Artificial Intelligence (AI) which is Rule-Based, Decision Tree Analysis and Guided Rules Reduction System. DAIS is developed on the hope that, it may save many lives in the possible area. The case study is conducted in the area of Melaka Tengah, Melaka. It tested there and obviously could be implemented in any places which coverage of telecommunication is available. Thus, in order to send an alert via SMS, DAIS has the ability to save many residents information in the database. Then, once disaster is predicted according to the given level of disaster, SMS can be sending through the resident's mobile number which already saved in the database. To develop this system, the chosen AI techniques were embedded to Microsoft Visual Studio .Net software development environment with MySQL database. Finally, to send SMS the need of Global System Mobile (GSM) is essential and connected to the DAIS.

ABSTRAK

Disaster Alert Intelligent System (DAIS) adalah sistem pakar dalam membantu untuk meramal kejadian bencana alam dan tahap bencana alam tersebut berdasarkan peraturan yang diberikan. Bencana alam ini termasuklah banjir, gempa bumi, ribut taufan, kemarau dan tsunami. Kemudian, jika bencana alam diramalkan akan berlaku, mesej amaran akan dihantar melalui *Short Messaging System* (SMS) kepada penduduk di kawasan mengikut daerah yang berkemungkinan berlaku bencana alam. Sistem ini merupakan gabungan teknik kepintaran buatan terdiri daripada *Rule-Based, Decision Tree Analysis* dan *Guided Rules Reduction System.* DAIS dibangunkan dengan harapan dapat menyelamatkan banyak nyawa di daerah yang berkemungkinan berlaku bencana alam. Daerah Melaka Tengah, Melaka telah dipilih sebagai kajian kes. DAIS diuji di sana dan boleh dilaksanakan dimana sahaja asalkan mempunyai jaringan telekomunikasi yang baik. Oleh yang demikian, untuk menghantar amaran melalui SMS, DAIS telah menyimpan maklumat penduduk di dalam sistem pengkalan data. Kemudian, setelah bencana dijangka berlaka pada peringkat tertentu, SMS boleh dihantar melalui nombor telefon penduduk yang disimpan di dalam sistem pengkalan data. Untuk membangunkan sistem ini, teknik-teknik AI yang dipilih telah diintegrasikan ke dalam persekitaran pembangunan perisian *Microsoft Visual Studio .Net* dan pengkalan data *MySQL*. Akhirnya, untuk menghantar SMS, rangkaian *Global System Mobile* (GSM) adalah penting dan akan disambungkan ke sistem.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

1.1 Project Background

Disaster Alert Intelligent System (DAIS) is a system based on artificial intelligence technology that will be developed in Projek Sarjana Muda (PSM). This is intended to inform an early alert to local residents of potential disaster areas in Melaka Tengah and the surrounding. The aim of this system is to help people in Melaka Tengah and surrounding areas to have an adequate time to take appropriate actions in saving their lives and properties if disaster occurs.

DAIS is designed by referring to the analysis of seismic data provided by Malaysia Meteorology Department based on the relationship between intensity of rainfall and river water level response. Three categories of disaster warning to local residents will be notified are "alert", "warning" and "hazard".

Under the alert category, local resident will notify people of early warning information of potential disaster area. On the category of warnings, the local residents will be notified that they asked to prepare an incoming disaster. For hazard category, the local residents who notified are advised to move and take appropriate action to save their lives and property.

To develop this system, a case study of the Melaka Tengah district survey weather data is used and analyzed.

The AI method that will apply in developing this system is rule-based that provides knowledge based to the system, decision tree analysis and also might use guided rules reduction system.

The alert that will be produced is sent via SMS. Thus this particular system involves mobile technology and also involves technology of Global System Mobile or GSM. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signaling and speech channels are digital, and thus is considered a second generation (2G) mobile phone system.

1.2 Problem Statements

Before the system being developed, the existing system is manually operated. Undoubtfully that a manual system is not very effective in conveying information and warnings to local residents when disaster occurs. Problems with the manual system will also cause previous occurrence of data loss occurs when natural disasters or theft can do without a full backup. In addition, the manual system is not really adapted to the current circulation technology. Thus, the message will not be able to deliver in systematic way when warning supposed to be delivered to the residents. Society today is expects technology can help them eases the burden of their daily lives. Manual system also faced time constraints in delivering information to local residents if the facility did not follow the existing technology. Besides that, it also difficult to forecast with a supervised system manually.

1.3 Objectives

a. To study rule based system, decision tree analysis and guided rules reduction system in order to develop expert system
b. To develop an alert system in monitoring local residents safety
c. To develop disaster forecasting intelligent systems appropriate to local resident

1.4 Scope

Every scope involved in this particular system is described as shown below:

a. Login module

   This module is designed to verify the user before they use the system. It is important to make sure only the authorized personnel can access into the system.

b. Registration Module

   This module will bring features that allow user to register the residents and the user of the system. The residents also can register their account via SMS.

c. Prediction Module

   This scope will predict the disaster based on the rules given.

d. SMS system module

   This is the most important features of the system which is the system will send an alert about the disaster warning to the registered residents via SMS.

1.5 Project Significance

Since this system will be developed due to current problem statement analysis, it can bring a lot benefits to users and local residents especially. This system will help them to make an early preparation when disaster will occur. The project is important because the existing system currently being used is manually operated and not very effective and not really user friendly. Hence, by using this system, it will provide direct benefits to many parties in an effort to save lives and property when disaster is predicted to occur.

This particular system will communicate with the SMS provider to send alerts to the residents. SMS is used as a medium of communication between application and the residents. Obviously, SMS is easy to use and more effective way compared to email services or mass media announcements.

In the other words, this system will help the community to have a better preparation to face disaster.

1.6 Expected Output

The expected output from the system is forecast the output based on rules given and alerts residents via SMS. The alerts have three level of disaster warning to deliver when disaster is predicted will happen which is Alert, Warning and Hazard.

Thus, by developing this system it may help residents to have better preparations to face disaster and the authorities will get ready with an emergency situation and the medical helps. In the other hands, it may save many lives.

1.7 Conclusion

After completing this system, it can contribute significantly to local residents and lightens their burden if disaster happens. In other words, this system can provide an early step to face the disaster. This system also can be supervised and monitored 24 hours a day. Besides that, it will provide an alert system in monitoring local residents' safety. Furthermore, development of disaster forecasting expert systems appropriate to local residents will need the system developer to study the knowledge based, rule based and decision making techniques. Rule-based and decision tree analysis can be applied in this system in a way to develop an expert system.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter focuses on literature review and project methodology that describe and elaborate critical points and methods used in developing this project. Literature review is the process of analyze business processes, determine underlying patterns then conclude a conclusion that aims to review the critical points of current knowledge on a particular project. The purpose is to find and analyze the body of literature of the system.

Besides that, this chapter also covers the methodology used to describe methods of the system. Methodology is a set of guidelines, standards and processes that involved and followed explicitly in order to produce a system. Thus, the process of achieving result will be studied and verified.

The methodology that will be used to develop this system is Object Oriented Analysis Design (OOAD). The selection of an appropriate methodology is very important and a single development methodology is not necessarily suitable for every projects. By choosing the right method will helps to produce better quality product, in terms of documentation standard, acceptance maintainability and system consistence.

2.2 Facts and findings

This section will explain about the domain of this project, the existing system and suitable technique that relevant to be used in developing this system.

2.2.1 Domain

The domain of this system is security alert that can bring a lot of benefits to the residents and community who's living at the disaster risk area.

Apart from Projek Sarjana Muda, this application will be developed to fulfill the current demand. Therefore, the system may save many lifes, properties, businesses and reduce the damage cost caused by disaster.

The SMS will be used as a human-machine interaction because of its efficiency and common technology that widely used. The residents will receive an alert via SMS which is more practical than email. Generally, residents have their own mobile phone, so they will get updates from to time to time.

The SMS text messaging offers an accessible and cost effective facility for public to communicate with the council. The list of benefits to add the technology by sending and receiving SMS to public and especially for residents is endless.

2.2.2 Existing System

The examples of existing systems are Malaysia National Tsunami Early Warning System (MNTEWS), and Global Disaster Alert and Coordination System (GDACS). The details about the functions and features are as below: