HOUSE DECISION MAKING SYSTEM BY USING SOFT SET THOERY

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HOUSE DECISION MAKING SYSTEM BY USING SOFT SET THEORY

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A thesis submitted in fulfillment of the
requirement for the award of the degree of
Bachelor of Computer Science

Faculty of Computer Systems & Software Engineering
Universiti Malaysia Pahang

JUNE 2012

ABSTRACT

Now-a-days, there are too many characteristics of houses that people like to. Most of the people would find difficulties in find house based on certain circumstances because of too many characteristics that should be complete in continuous living. In addition, not all house would satisfied all side. It is because they have their own expectation for their own houses. The problem is, they do not know how to choose the best choice with the good characteristics for their own houses. By that, this system provides the solution with the objectives, which are to make people easier in making decision and to apply the soft set technique into a real life cases. The parameter for the house such as, the price, the place and many more will be judging by people before they buy it. So, the decision making using soft sets theory would be the solution for the problem. The concept that proposed by Maji et al. is employed to solve the problem of house decision making. By the application of the system, people would be easy to choose the houses according to the satisfactions of characteristics like they want. This report will discuss on the preparation and analysis that been collected throughout the development cycle of this system.

ABSTRAK

Kini, terlalu banyak ciri-ciri rumah yang diminati ramai. Kebanyakan dari mereka mendapati kesulitan dalam mencari rumah mengikuti keadaan tertentu kerana terlalu banyak ciri-ciri yang melengkapi kehidupan berterusan. Tambahan pula, tidak semua rumah mengikuti kehendak masing-masing. Ini kerana mereka mempunyai cara tersendiri untuk rumah masing-masing. Permasalahannya ialah, mereka tidak tahu bagaimana untuk memilih pilihan yang terbaik dengan ciri-ciri yang bagus untuk rumah mereka. Dengan itu, system ini menyediakan penyelesaian dengan objektif, iaitu untuk memudahkan orang ramai dalam membuat keputusan dan untuk mengaplikasikan teknik *soft set* dalam keadaan sebenar. Parameter rumah seperti harga, lokasi dan berbagai lagi akan dinilai oleh mereka sebelum membeli. Jadi, penentu pembuatan mengunakan teori *soft set* akan menjadi penyelesaian kepada masalah yang ada. Konsep yang diperkenalkan oleh Maji et al. ialah untuk menyelesaikan masalah dalam memilih rumah. Dengan mengaplikasikan system, ia akan memudahkan orang ramai untuk memilih rumah mengikuti ciri-ciri yang bertepatan dengan khendak mereka. Laporan ini akan membincangkan persediaan dan analisa yang telah dikumpulkan melalui proses pembangunan kitaran sistem.

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LIST OF ABBREVIATIONS

SST	Soft Set Theory
DSS	Decision Supporting System
CDSS	Clinical Decision Support Systems
Semi-D	Semi Detached
MIER	Malaysia Institute of Economic Research
VB	Visual Basic
FSKKP	Fakulti Sistem Komputer and Kejuruteraan Perisian

CHAPTER I

INTRODUCTION

This chapter briefly discuss on the overview of this research. It contains five parts. The first part is background of the research; following by the problem statement. Next are the objectives where the project's goals are determined. After that the scopes of the system and lastly is the thesis organization which briefly describes the structure of this thesis.

1. Background

The modern people always have to face some complicated problems in different fields that are in the fields of economics, engineering, medical sciences, etc. involving imprecise data in nature. Most of the people would also find difficulties in selecting a good house based on certain circumstances because of too many characteristics that should be complete in continuous living. In addition, not all houses would be satisfied all requirement. It is because they have their own expectation for their own houses.

Theories that been proposed for dealing with such housing selection problems in an efficient way (Behzadian, 2010). However, all the theories that associated with limitation of inherent which possibly due the inadequacy

of the parameterization associated tools with them (Maji, 2002). The concept of soft set as new mathematical tool for dealing with the uncertainties which is free from the above difficulties (Molodtsov, 1999).

As a practical problem is faced for a particular property, whether all the parameters in the parameters set is always necessary to preserve this property (Maji, 2002). By using the entire parameters set for describing the property which is consuming the time and the constructed rules may be finding difficult to understand, apply or verify.

To deal with this problem, reduction of attribute required. Reduction objectives are to reduce the number of attributes, and at the same time, preserve the property of the information. Mapping from parameter to crisp subset of universe is the soft set (Herawan, 2010). Data analysis and decision support systems we may see it structured of a soft set.

In the last few years, our each big city real estate trading market unprecedented prosperity has led the second-hand house market development. But as result of our country, second-hand house market itself complexity as well as the policy advancement time temporary.

In Malaysia, there is a lot of problem of housing and property in Malaysia. From general, there is a problem in each characteristic such as the ownership, the price of the house, location, quality, completion time, the size of the house and many more. That's problem cause difficulties to the people in finding houses.

In Malaysia, people now would find difficult in finding house. Most of them would like to find the comfortable houses to continuous in living. In general, many people would find difficult in choosing the best house. The characteristics of the houses will make people did not know how to choose the best option in selecting the best house. Malaysian people also find difficulties in decide the best house, because there is too many option for them to find the good house with the strategic place and sometimes the characteristics of the house.

2. Problem Statement

Many people would find difficult in choosing their house with good characteristics. The parameter for the house such as, the price, the place and many more will be judging by people before the buy it. So, the decision making using soft sets theory would be the solution for the problem. In this work, the decision making concept proposed by Maji *et al*. (2002) is employed to solve the problem of house decision making.

In this method, Classical method cannot be used because various types of uncertainties present in this problems. Therefore, the soft set theories will be used. The reason is soft set theory has a rich potential for applications in several directions. Soft sets also called as systems of neighborhoods and are a special case of context dependent fuzzy sets.

3. Objectives

There are a few objectives of this research are as follow.

i. To develop the first theory of soft set-based decision making proposed by Maji **(2002)**.
ii. To make people easier in house making decision.
iii. To develop a system using for soft set-based decision making.
iv. To apply the soft set technique into a real life cases.

4. Scopes

The scopes of this research are described as follow.

i. The theory used is based on soft sets proposed by Molodtsov **(1999)**.
ii. The soft set-based decision making technique used is based on theory proposed by Maji **(2002)**.

iii. The develop soft-set based decision making system is based on Visual Basic

iv. Apply in decision making problem for housing selection only.

5. Thesis Organization

The rest of this thesis is organized as follows. Section 2 describes the literature review on decision making, decision support system, soft set theory and their relation to fuzzy and rough set. Section 3 describe the method which containing the notion of information system (databases), fundamental concept of soft set theory and a technique proposed by Maji *et al* **(2002)**. Section 4 describes the datasets, modeling process, interface of the system and results on soft set-based decision making using Maji's technique for house decision making following by discussion.

CHAPTER II

LITERATURE REVIEW

This chapter briefly discusses about the literature review of decision making, housing and lastly Soft Set Theory (SST). The first section is decision making. Then, next section describes housing review. After that, the soft set theory will be discussed.

2.1. Decision making

This section firstly presents a description of decision support system. Further, decision making and its applications are presented.

2.1.1. Decision support system

Decision support system is a computer based information system that supports business or organizational decision making activities. It is also serve the management, operations, and planning levels of an organization and help to make decisions that not easily satisfied in advance (http://en.wikipedia.org/wiki/Decision_support_system).

It is included knowledge-based systems. Decision Support System intended to help decision makers compile useful information from a combination of raw data, documents, personal knowledge, or business models to identify and solve problems and do decisions (http://en.wikipedia.org/wiki/Decision_support_system).

Abbreviated from Decision Support System (DSS), it can be refer to an interactive computerized system that gathers and presents data from a wide range of sources, typically for business purposes. Decision Support Systems use to help people make decisions based on data that is culled form a wide range of sources. It is not single information resources, such as a database or a program that graphically represents sales figures, but integrated resources working together (http://www.webopedia.com/TERM/D/decision_support_system.html,).

Decision support system has widely use now-a-days, for example of decision support systems are in securities, scheduling, power system and agricultures. Decision support systems in securities investment, a knowledge-system-based security is an interconnected, coordinated, computer-aided system that incorporates monitoring of trading data risks, special information service and conventional investment management. The important component when build the decision support system according to (Ding, 2010) are selection of the system software which involve the operating system server, development language and development tools. We also should consider in the selection of the hardware. So that, the system can has high performance.

Another example of Decision Support System (DSS) is Clinical Decision Support Systems (CDSS) which is a significant part of the field of clinic knowledge management technologies through their capacity to support the clinical process and use of knowledge, from diagnosis and investigation through treatment and long-term care. One of the examples of the system is MYCIN. MYCIN is a system that used rule-based expert system designed to diagnose and treatment for certain blood inflections which is antimicrobial selection for patients with bacteremia or meningitis. It was later extended to

handle other infectious disease. It is probably an expert system which describe by Mark Musen as being the first who convincing demonstration of the power of rule-based approach in the development of robust decision-support system (http://www.openclinical.org/dss.html).

2.1.2. Decision Making

A mental process resulting in the selection of a course of action among several alternatives scenario can be regarded as the decision making. Every decision making process produces a final choice. The output can be an action or an opinion of choice (http://en.wikipedia.org/wiki/Decision_making).
Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Making decision shows that there is an alternative choice that being considered as well identifies as possible with the highest probability.
Decision making is the process of sufficient reducing uncertainty and doubt about alternative to allow a reasonable choice to be made from among them. This definition focuses on the information-gathering function of decision making. It should be noted here that uncertainty is reduced rather than eliminated. Very few decisions are made with absolute certainty because complete knowledge about all the alternatives is seldom possible. Thus, each decision involves an amount of risk. If there is no uncertainty, then there is no decision. You have an algorithm, a set of steps or a recipe that is followed to bring about a fixed result.

2.1.3. Decision making in Computer Science Fields

The phenomenon of decision making discovered from the viewpoint of computer science and information technology. The basic questions from this viewpoint is what can the computer offer to decision makers and how it can support their work? Therefore, the main issue is to provide support to people

who make complex decisions (Bohanec, 2009). Now-a-days, computers are everywhere. The implemented of the computer are widely used by the industry for machinery, communication and many more. When dealing with those problems and tasks, the question is therefore how can computers and information technology support people who are faced with difficult decisions, so that they can decide better, faster and more effectively. This is addressed in the area of decision support programs, systems, methods and techniques (Bohanec, 2009).

When we talk about decision maker, a computer scientist usually starts with the questions who or what is making decisions, the man or the computer? In decision support, we wish to help people to do decisions. Therefore, we are primarily interested in human decision making. However, in computer science and related disciplines, such as artificial intelligence, the aim is also to make intelligent system for example computer programs and machines, which are able to make autonomous decisions by themselves. That is, the focus there is on a machine decision making.

Obviously, the problem solving, decision making process provides a framework for systematic analysis of problems. The quality of the decision will be in direct relation to the amount and quality of substantive information that is use while going through this process.

2.2 House

The following table describes a Boolean data set of houses to be selected. There are ten houses with their five teen related attribute describe their condition.

Table 2.1: Houses with Parameters

House/ Parameter	A	b	c	d	e	f	g	h	i	j	k	l	m	n	o
T1	1	0	0	1	0	1	0	1	1	1	0	0	1	1	1
T2	0	1	1	0	0	0	0	1	1	1	1	0	0	1	1
D1	0	0	0	1	0	0	0	1	0	1	1	1	0	1	1
D2	1	1	0	1	0	1	0	0	1	1	0	0	1	1	1
B1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1
B2	1	0	1	0	0	1	1	1	1	1	1	0	0	1	1
A1	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0
A2	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0
C1	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0
C2	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0

The details of house are as follow

a. Terraced house (T)
b. Semi-detached house (D)
c. Bungalow (B)
d. Apartment (A)
e. Condominium (C)

Meanwhile, the details of parameters

a. Location, where city = 1 and non-city = 0
b. Level, where have stories = 1 and do not have stories = 0
c. Security, where have security = 1 and do not have security = 0
d. Price, where RM 0 – RM 100k = 1 and RM 100k – RM 500k = 0
e. Size, where small size less than 1000 square feet = 0 and big size more than 1000 square feet = 1
f. Gate, where yes = 1 and no = 0
g. Solar system, where yes = 1 and no = 0
h. Garden, where yes = 1 and no = 0
i. Backyard, where yes = 1 and no = 0

j. Garage, where yes = 1 and no = 0
k. Store, where yes = 1 and no = 0
l. Include furniture, where yes = 1 and no = 0
m. Good school district, where yes = 1 and no = 0
n. Good structure, where yes = 1 and no = 0
o. Easy to improve internal aesthetics, where yes = 1 and no =0

2.2.1 Housing

Building or structure that has the ability to be occupied for dwelling by human beings or other creatures is called house. The term house includes much kind of dwellings ranging from rudimentary huts of nomadic tribes to free standing individual structures. In some contexts, house may mean the same as dwelling, residence, home, adobe, accommodation or housing, among other meanings (http://en.wikipedia.org/wiki/House).

2.2.2 Type of house

Houses can be built in a large variety of configurations. A basic division is between free-standing or detached dwellings and various types of attached or multi-user dwellings. Both sorts may vary greatly in scale and amount of accommodation provided. Although there appear to be many different types, many of the variations listed are purely matter of style rather than spatial arrangement or scale (http://en.wikipedia.org/wiki/List_of_house_types).
The types of houses offer in Malaysia ranging from apartments to condominiums, terraced houses to semi-detached houses, bungalows to resort houses, situated in the town city Centre, near beach, near jungle and recreation places. As we ever know, there is too much type of houses in

Malaysia that we ever known such as terraced, semi-detached, bungalow, apartment, and condominium and orchard house.

One of the types of house in Malaysia is terraced house. It is a row of identical or mirror-image houses share side walls. The first and last of these houses is called an end of terrace, or end house or corner house, usually larger than those house in middle. Terraced house normally have open spaces at the front and back. Each row may consist of 10 to 12 units depending on the width of the house, as it have to comply with regulations of the Fire Services Department that each row shall not exceed 130 feet (http://www.mymm2h.com/property/type-of-houses.html).

Next is semi-detached house. Semi-detached house or often called as "Semi-D" consist of pairs of house built side by side as units sharing a party wall. Each house's layout is normally a mirror image of the other one. Semi-D house have front, rear and any one side open spaces (http://www.mymm2h.com/property/type-of-houses.html).

Another type of houses in Malaysia is bungalow. A bungalow is a type of standalone building. It is also known as detached house. These detached houses have open spaces on all sides. Besides, there is also apartment as the accommodation in Malaysia. An apartment is a self-contained housing unit that occupied only part of a building or a section in the building. The occupied share a common area like lobby, car park, lifts and so on. An apartment normally consist basic facilities like swimming pool and guarded.

Not only that, condominium also one of the accommodation in Malaysia. It is usually bought by wealth person. A condominium, or more commonly named "Condo", is a form of house unit in a multi-unit dwelling building where each unit is individually owned and the common areas such as walkways, recreational facilities are jointly owned by the unit's owners. The owners and occupiers of condominiums are subject to rules and regulations of the condominiums. In condominium, usually full facilities are provided like swimming pool, gym equipment, club horse, CCTV, inter-com, guards

which distinguished it from apartment type of living (http://www.mymm2h.com/property/type-of-houses.html).

Some of residents in Malaysia also like to build their own house. They convert the building as they like to fulfill their satisfied. There is also orchard house, which is normally comes with a land plot size of not less than an acre. Orchard house is an exciting lifestyle development offering you with fruit orchard together with a village style house (http://www.mymm2h.com/property/type-of-houses.html).

2.2.3 Price

The Malaysian government under its 5 year National Plan has introduced the low, medium and high cost housing categories. Since the independent day, the provision of low cost housing has become a priority of the government in the Five Years National Plans. Government agencies were directly establishment of the State Economic Development Corporations and various urban development agencies. A ceiling price for low cost housing was fixed at RM 25,000 per unit for people with house hold income of less than RM750 per month since 1982.

Research shows that the house price movements are influenced by economic fundamentals; real growth – affects household's purchasing power and borrowing capacity, interest rate – affect cost of capital and payback capacity, stock prices – affects household's wealth and investment alternatives, supply – affects availability and choice, population growth-proxy for growth rate of household, economic activity – affect consumption and sub sectors related to housing market such as furniture and household accessories (Hashim, 2010).

Rising house prices and low interest rates have fueled the surge in mortgage borrowing and enable consumers to spend at high rates supported by increase in their income. However, when and where housing prices have fallen,

borrowing and growth slowed, with plausible effects of a slowdown in housing prices on household spending, economic growth and sectorial balance. Sustainability in house price embark on the factor of demand, where affordability will be the determining issue and supply, where availability complement market demand. With the current income level, cost of fund and leverage offered by financial institutions, households have the opportunity to own and perform their monthly mortgage payment without much sacrifice (Hashim, 2010).

Housing price, like any other goods and services in a market economy, are determined by the interactions of demand and supply. People's demand for owner occupied housing is primarily determined by price of housing, population growth and household formation rate and income growth. If a new 2,000 square foot house on a one acre lot sells for RM150,000, then an identical house on the same size lot in the same locality that is three years old will sell for slightly less than RM150,000, even if the initial selling price of the house was much less, say around RM125,000. If the new house sells for RM130,000, then the three year old house will sell for slightly less than RM130,000 (Hashim, 2010).

Malaysia releases a quarterly house price index. The real Estate and Housing Developers Association (REDHA) is the best source of papers, press clippings and stories about the housing market. The National Property Information Center (NAPIC) publishes Property Market Status Report which focuses on property sales. Bank Negara Malaysia has useful monetary, financial and economic data (http://www.globalpropertyguide.com/Asia/Malaysia/price-change-1-year,).

According to statistic in Kuala Lumpur, the house price index surged by 11.4% year over year in 2011, with a rise of 7.1% during the latest quarter. House prices also increased in Selangor by 9.6%, Perak 6% and Negeri Sembilam by 5% over the same period. On the other hand, in the year to end 2011, Pulau Pinang and Johor experienced price falls of 1.2% and 1%,