IMPLEMENTATION OF CASE-BASED REASONING IN HELP DESK SYSTEM

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Bachelor of Computer Science
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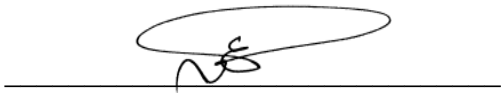
SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis/report is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Science (Software Engineering).



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ABSTRAK

Dengan perkembangan zaman, perkhidmatan *help desk* telah menjadi penting dalam sebuah syarikat atau organisasi disebabkan *help desk* wujud untuk memberikan maklumat dan sokongan mengenai produk dan perkhidmatan sendiri kepada pelanggan. Pada umumnya, pelanggan akan menghubungi *help desk* mengenai isu berkaitan apabila mereka memerlukan bantuan untuk mendapat penyelesaian atau meklumat tentang masalah mereka. Ini membawa kepada kewujudan *Help Desk System* untuk membantu kakitangan *help desk* bertindak balas terhadap isu-isu atau soalan-solan pelanggan dengan lebih cekap kerana tradisional *help desk* memerlukan masa yang lebih banyak dalam menyelesaikan masalah pelanggan. Selain daripada masalah masa, kakitangan juga menghadapi masalah pengetahuan dan kesukaran dalam akses data tanpa system yang sistematik. Tujuan kajian ini adalah untuk merekabentuk dan membangunkan sebuah *Help Desk System* dengan menggunakan algoritma *Case Based Reasoning (CBR).* Untuk mencapai tujuan ini, *CBR* telah dikaji dan dilaksanakan dalam *Help Desk System* untuk membantu ejen pelancongan memberikan cadangan kepada pelanggan mengenai pemilihan hotel berdasarkan keperluan pelanggan. *NetBeans* dan data-data mengenai pelancongan yang diambil dari "Open Source Development Network" telah digunakan untuk merekabentuk dan membanguankan prototaip *Help Desk System*. Tambahan lagi, prototaip ini juga dikaji melalui beberapa eksperimen untuk menilai prestasi. Juruteknik menggunakan teknik *CBR* untuk menyelesaikan masalah yang dihadapi dengan merujuk kepada kes-kes serupa terdahulu yang disimpan dalam repositori kes. Dalam system saya, ia mempunyai langkah berikut iaitu perwakilan kes dan penyimpanan kes, dan pemadanan kes dan pengambilan semula. Kajian ini akan memberi tumpuan kepada fasa kesesuaian dan fasa pengambilan semula, Metodologi yang difunakan adalah ukuran keserupaan. Hasil ujian adalah kes nombor, hotel. harga, dan kesamaannya yang dihitung. Kesimpulannya, *CBR* adalah satu pendekatan yang berkesan bagi penyelesaian masalah dan pembelajaran dalam kalangan pelbagai bidang Ini disebabkan *CBR* membantu dalam mengurangkan usaha dan masa yang diperlukan untuk perolehan pengetahuan dan perwakilan dengan ketara.

ABSTRACT

With evolving of the days, help desk service has become important in a company or an organization as it exists to provide customers or end users with information and support regarding to a company's or organization's products and service. Generally, customers will contact the help desk of related issues when they require assistance on providing solution or information to their problem. This leads to existing of help desk system in order to help the help desk personnel respond to customers' issues or questions more efficiently because of the time consuming when solving the customers' problem using traditional help desk. Besides of time consuming when solving customers' problem, the personnel also faced inherently knowledge problem during help desk operation and difficulty in assessing abundant case data without a systematic system. The aim of this research is to design and develop a Help Desk System used by tourism sector by applying Case-based Reasoning (CBR) algorithm. To achieve this aim, CBR algorithm will be studied and implemented in the help desk system to assist the travel agent provide recommendation to customers on selecting the hotel to stay based on customers' requirements. NetBeans and dataset about travelling retrieved from Open Source Development Network is used for designing and developing the model of the Help Desk System. Moreover, the system model will be tested by several experiments to evaluate its performance. Technicians apply CBR technique to solve a given problem by retrieving the precedent similar cases that are stored into the case library. In my system, it consists of the following steps which are case representation and storage, case matching and retrieval. This research will focus on the case matching and retrieval phase of CBR technique. The methodology being used is the similarity measurement. The result of the testing will be case ID, hotel, price and its calculated similarity. In conclusion, Case-based reasoning is an effective approach to problem solving and learning among the various domains. This is because CBR assists in reducing the effort and time required for knowledge acquisition and representation significantly.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ANN	Artificial Neural Network
CBR	Case-Based Reasoning
FL	Fuzzy Logic
RBR	Rule-Based Reasoning

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Help Desk is essential and vital part for a company or organization to provide good service and production. Definitely, Help Desk is a tactical solution for daily issues that is reported by customers. In traditional way, the provided help desk service involves channels like instant messaging, email and phone call support. From this, customers always fed up with long waiting period, dropped calls, and help desk personnel who do not comprehend or don't care about their issue("The Problem with Traditional Customer Service," n.d.). Although the help desk service provided is vary in forms, all of them have a same goal which is to provide customer with help (Ho Kang, Yoshida, Motoda, & Compton, 1997). Workloads at the help desk are dynamic (Andrews, Beaver, & Lucente, 2016). It is necessary to figure out an efficient resolution to shorten employee wait time for help desk personnel to start to handle and resolve the issues(Andrews et al., 2016). With the arise of internet technology, it is currently possible to offer efficacious and efficient help desk service over the global internet to fulfil customers' needs and satisfaction (Foo, Hui, & Leong, 2002). The existing of help desk system aims to help the customers to get help in troubleshooting, provide guidance or solve problems using software. Within the Help Desk System, a team of dedicated technicians always ready to give respond to customer or assist the customers to solve problems. In an organization, a Help Desk System allows the employees to track the problem status from customers request or analyse problems by using related software. Therefore, to provide effective and high-quality help desk service, the availability of expert technicians is crucial. However, the number of such high-level expert is limited, hence there exist various artificial intelligence techniques to be implemented into the system in order to create an intelligent help desk service environment.

In this research, a Case-Based Help Desk System has been designed and developed in order to support the customer service of a large organization in the tourism industry. Therefore, this research mainly discusses the implementation of case-based reasoning for in help desk system. Case-Based Reasoning (CBR) technique is achieving important consideration under area of Artificial Intelligence. It is suitable to be applied for problem solving and decision making due to its cognition-based model. CBR technique focus on problem solving and handle the new circumstances by considering preceding cases similar to new case. Case-Based System is a computerized method that helps to maintain all experience in the form of cases. It is more alike to real human resolution procedures, and its knowledge acquisition process is more liable compared to rule-based system (Delic & Hoellmer, 2000). This is because Case-based System no need to extract rules from the existing cases. The intuition of Case-based System is important part of human understanding and problem solving involves rolling back whole previous case, rather than just a rule (Bryant, 2009) . By using Case-based System, we can easily add new knowledge just by adding the new case as they are independent to each other. We can also conquer the inconsistent problem by organizing different type of knowledge into a single coherent structure. In CBR approach, there are four core steps which are:

Retrieve:	Discover similar case by computing the similarity measurement.
Reuse:	Suggest solution from selected case.
Revise:	Adapt and Improve the suggested solution from case base.
Retain:	Store the new case into case base for future need.

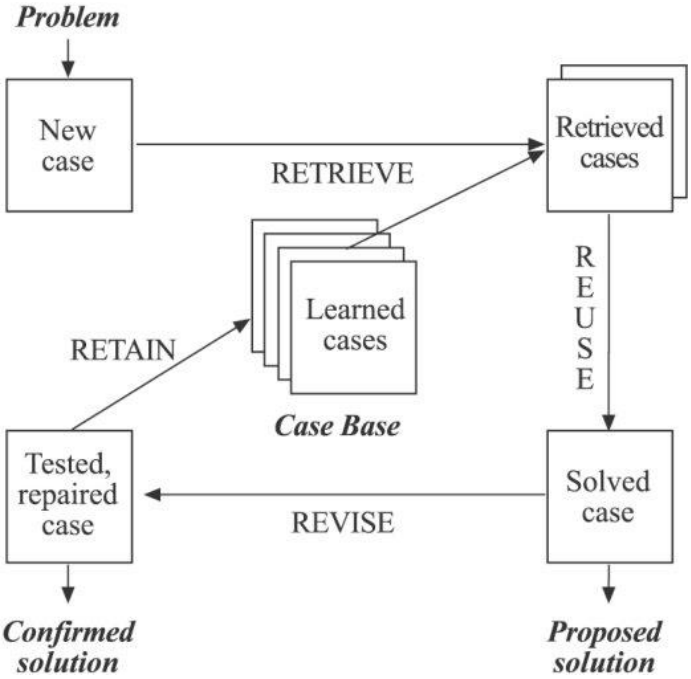

Figure 1.1 The Cycle of Case-Based Reasoning
Source: Vasileios Efthymioua, Maria Koutrakib (2013)

1.2 Problem Statement

In this era with advanced technology, there exist numerous issues or problems that need to be solve. Within an organization or company, the employees encounter some problems include:

i. Time consuming when tracking users' request problem without system. There is complexity of customers' records or report which has the similar problems when the customers ask for help. Therefore, the employees need to analyse the problems. When the employees want to track the problems, it will take too much of time.

ii. Inherently knowledge problem during help desk operation (González, Giachetti, & Ramirez, 2005). Without training, a newbie employee would not be able to access the information in notebooks and databases manually. When answering phone calls from customers, technicians unable to integrate their knowledge into addressing customer problem (Bryant, 2009).

iii. Adversity in assessing abundant data. When the volume of information/data growing and complexity of engineering, social, and service systems, it bring

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