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A Review on Expert System and its Applications in Civil Engineering

Muhammad Akram[1]*, Jamal Abdul Rahman[1], Irfana Memon[2]
Faculty of Civil and Environmental Engineering, University Tun Hussein Onn Malaysia, Malaysia
Quaid-e-Awam University of Engineering, Sciences and Technology, Nawabshah, Sindh, Pakistan
*Corresponding Author:akhund42@yahoo.com

Abstract

Aim of Study

This study provides in depth review of expert system and potential benefits achieved with its application in the field of the Civil Engineering.

Need of Study

Currently, construction projects are facing various chronic problems. One of the reason contributing to these problems is delay in decision making. This leads to need of mechanisms which can enable practitioners in making prompt decision. Hence, expert systems are investigated for seeking opportunities and studying applicability in construction projects to use as a tool for aiding in decision making process.

Research Approach

This study is carried out through reviewing previous studies conducting in addressing the importance and issues of the expert system. It also includes various research works demonstrating the applications of an expert system in different research areas of civil engineering.

Research Findings

This study highlighted that expert system is very useful approach for benefiting the practitioner in making quick decision. It will be helpful in avoiding waiting times. It can be successfully applied in the areas of civil engineering specifically construction management.

Limitations

This paper presents a review on expert system with its application. It has focused on four established methods which are Rule based system (RBS), Case based system (CBS), Fuzzy expert system (FS), Neural network (NN).

Importance and Contribution

This review paper contributes in the field of Civil Engineering in highlighting the usage and advantages of an expert system.

Keywords: Expert system, Expert system applications, Type of Expert system, Expert Systems in Civil Engineering

I. INTRODUCTION

Expert System is an efficient computer program which provides the solution of problems based on task specific knowledge and inference techniques at the level of a human expert [1]. Expert systems are developed from the study of artificial intelligence (AI), which is a field of computer science and aims of to transfer human brain power into the machines [2]. An expert system is used to extract the information of a human expert within a specific domain and makes this knowledge available to less experienced users through a computer coded program [3].

Expert system also known as knowledge based expert system is a computer program that information and experience in a specific area for decision making. The computer program system contains a database which stores a collection of information and rules which describes all the data about the problem domain. Expert system provides high quality experience, domain specific information; apply heuristics, forward or backward reasoning, uncertainty and explanation capability. For information representation techniques, forward and backward chaining rules are used. Expert system is developed to imitate the human experts decision making ability in a particular domain such as construction management or any other field of knowledge where there is a shortage of comprehension engineer or experts and can also give advices and explanations [4]. The knowledge base elected from the expert by a qualified information engineer using various methods can include systematic interviews. Normally, the expert data field is "fuzzy" in nature and contains a great deal of procedural facts; so the knowledge engineer must be an expert in the process of information elicitation. Expert system represents a way of capturing, coding and reusing of information. Fundamentally, an expert system comprises of some representation of expertise, or a problem to be solved, and some mechanisms to apply the expertise to a problem in the form of rules[5].

II. CHARACTERISTICS OF EXPERT SYSTEM

The most significant element in an expert system is the knowledge. The power of an expert system exists in the particular, high-quality knowledge about the task in a specific domain. In expert system knowledge is estranged from its processing for example. The knowledge base and the inference engine are split up. An established program is a combination of knowledge and the control structure to process this knowledge [5]. Expert system consists of a database to apply the data to any particular situation

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