

استخدام الوكيل الذكي لبناء قاعدة

المعرفة في الانظمة الخبيرة المستندة

على القواعد

**Using Intelligent Agent to build
Knowledge base In Rule-based
Expert System**

المدرس المساعد

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استخدام الوكيل الذكي لبناء قاعدة المعرفة في الانظمة الخبيرة المستندة على القواعد Using Intelligent Agent to build Knowledge base In Rule-based Expert System

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الخلاصة:

تعتبر مرحلة استخلاص المعرفة من خبراء المجال وتحويل تلك المعرفة الى احدى طرق تمثيل المعرفة كقاعدة معرفة في النظام الخبير من اصعب المراحل الي يمر بها بناء الانظمة الخبيرة.

في هذا البحث تم استخدام طريقة الية لبناء قاعدة المعرفة في الانظمة الخبيرة المستندة على القواعد لذلك نهدف الى بناء وكيل ذكي قادر على استخلاص معارف حل المشكلة من الخبراء البشر في ذلك المجال ومن ثم تحويلها الى حقائق وقواعد في قاعدة المعرفة لنظام خبير مستند على القواعد. وقد تم استخدام لغة برولوج في بناء الوكيل الذكي المقترح.

Abstract:

The complex stage in building expert system is extracting knowledge from domain experts and translating it to representation method in knowledge base of expert system.

In this research, automatic way is used to build knowledge base in rule-based expert system ,therefore ; this paper aims to construct Intelligent agent which is able to extract the problem solving knowledge from human experts then translate it to facts and rules in knowledge base of rule-based expert system .The proposed intelligent agent is implemented and execute by using Prolog programming language.

Keywords: Agents, intelligent agent, rule-based expert system, automatic knowledge acquisition

Introduction:

Computer system has become a part of our everyday lives, Artificial Intelligence (AI) is sometimes refer to machine intelligence which is concerned with devising computer programs to make computer more intelligent, expert system is one of the most common application of artificial intelligence that consists of user interface, inference engine and knowledge base. In this research we focus on construct of knowledge base by using intelligent agent. Knowledge acquisition is bottleneck in the construct of expert system, because the extraction of knowledge in problem domain is an important step in the building of knowledge base[1]. In the traditional method of knowledge acquisition the knowledge engineer interviews with domain expert to extract knowledge then translates it to representation method in knowledge base of rule-based expert system.

In this research we find automatic way by using intelligent agent to translate expert knowledge to facts and rules in knowledge base. The term agent is used to represent two orthogonal concepts, the first is the agent's ability for autonomous execution, the second is the agent's ability to perform domain oriented reasoning [2].

Knowledge acquisition:

After the stage of problem domain selection the knowledge acquisition stage is started to transfer the expert of problem solving knowledge which its resources are human expert, books, scientific research or data base to programs [1].

The primary people involved in building expert system are the knowledge engineer, the domain expert and the end user ,the

main task of knowledge engineer select the software and hardware tools for the project, help the domain expert to focus on necessary knowledge and implement that knowledge in correct and efficient knowledge base [5]. Figure (1) illustrates a simplified model of the knowledge acquisition process that will serve as a useful for understanding the problem involved in acquiring and formalizing human expert performance, knowledge engineer interviews with domain expert to extract expert knowledge which is then translated to facts and rules. We will search more automatic way to construct knowledge base. There are many programs that interact with domain experts to extract expert's knowledge these programs provide support for the following activities:

- Entering knowledge
- Maintaining knowledge base consistency
- Ensuring knowledge base completeness

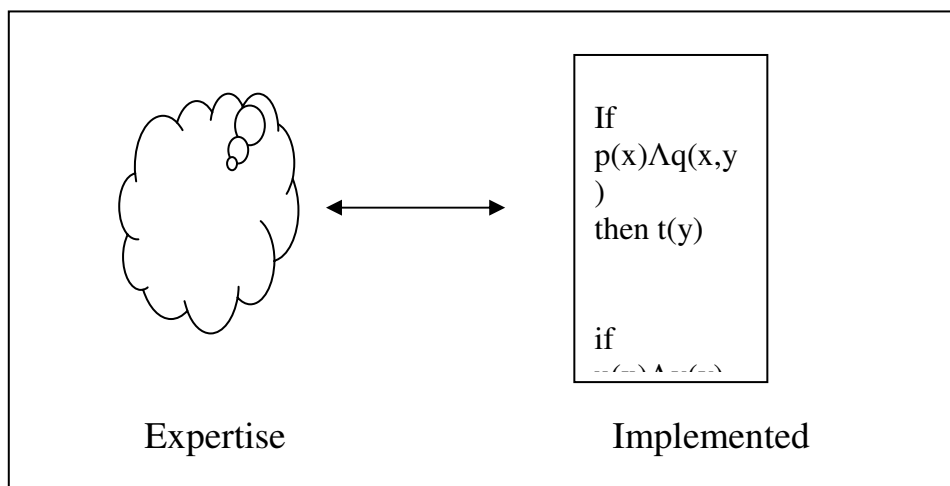


Figure (1) the standard view of building expert system

The most useful knowledge acquisition programs are that restricted to particular problem solving domain such as diagnosis, design, prediction... etc.[5].

Intelligent Agent:

The concept of an agent has become important in both artificial intelligence and mainstream of computer science [6]. Researchers from the artificial intelligence scholarly community had developed several major areas of research during the 1980's, one of which was expert systems, this body of research has evolved into intelligent systems during the past decade. Within the area of intelligent systems research, expert system, knowledge management, machine learning, neural networks, data mining and intelligent agents have further development, researchers have define intelligent agent as consisting of very little Artificial Intelligent and primarily computer science[4].

A rule-based, agent control architecture provides several desirable properties such an agent could have an embedded expert system with a human expert's knowledge encoding in to rules to aid in high level decision making and control [3], this definition of agent is a good starting point but can be expanded in certain areas. First, an agent executes; it acquires input and produces output .Agent processing is domain-oriented: An agent "knows" about certain concepts, data structures, rules, and interfaces but is not necessarily capable of interpreting information outside its field. An agent also "reasons" by encapsulating rules that allow it to transform conditions into decision. And it operates autonomously by virtue of being persistent and capable of operating in a changing environment [2]. In our research will introduce software agent technology and concentrate specifically on ways that agent add value to data-base related processing such as knowledge discovery and other forms of data to knowledge base.

Proposed Intelligent Agent:

The Intelligent agent which is used to knowledge acquisition more efficient when we are restricted to a particular problem solving domain. In proposed intelligent agent we are restricted to a diagnosis domain using production system to represent knowledge in knowledge base, that mean the output of proposed intelligent agent is a knowledge base in rule-based expert system in diagnosis domain. In general intelligent agent have input and output. Figure (2) below illustrated the input and output of proposed agent:

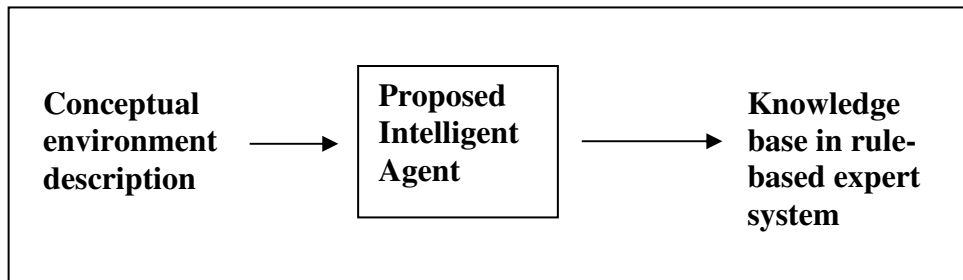


Figure (2) Input and output of proposed agent

Embedded Knowledge base:

When the construct of knowledge base is the bottleneck of construct of rule-based expert system, therefore; the proposed agent focuses on construct of knowledge base. In other word, the main task of proposed agent is to build the knowledge base in rule-based expert system. The other components of rule-based expert system such as user interface and inference engine are the task of knowledge engineer. Knowledge engineer will proposed search strategy and a way of user interface built to capture a complete rule-based expert system which can be provided an

advice in diagnosis domain. Figure (3) illustrated the place of proposed agent in the components of rule-based expert system:

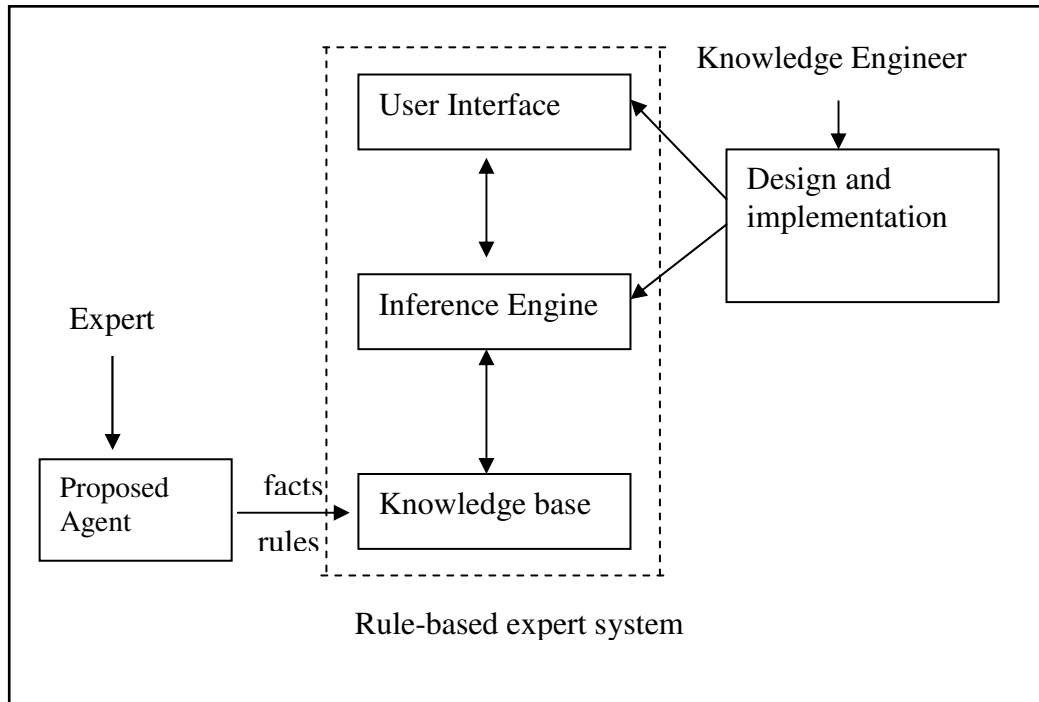


Figure (3) Proposed agent and rule-based expert system

Model of Proposed Agent:

Software agents are computer programs different from non-agents programs in their ability to run autonomously sensing and acting on changing environment condition because they run autonomously[6]. The proposed agent can be interacted with expert by interface, the interface of proposed agent must be friendly of expert and more comfortable and must be hide the complexity of other components of agent. Figure (4) illustrate main components of proposed agent. The interface also permits for expert to be update of knowledge in knowledge base. That

means the ability of interact combination between adding knowledge and previous contains of knowledge base. The output of interface is knowledge description from the input conceptual description. After knowledge description, the second phase has been started which involves extracting facts and rules from knowledge description. After that, knowledge (facts and rules) will be written in knowledge base, before knowledge (facts and rules) have been written in knowledge base the proposed agent must be check that facts and rules consistency with other contains of knowledge base, finally we capture complete knowledge base which used production system to represent that knowledge, then knowledge engineer take that knowledge base and complete rule-based expert system by adding inference engine and user interface.

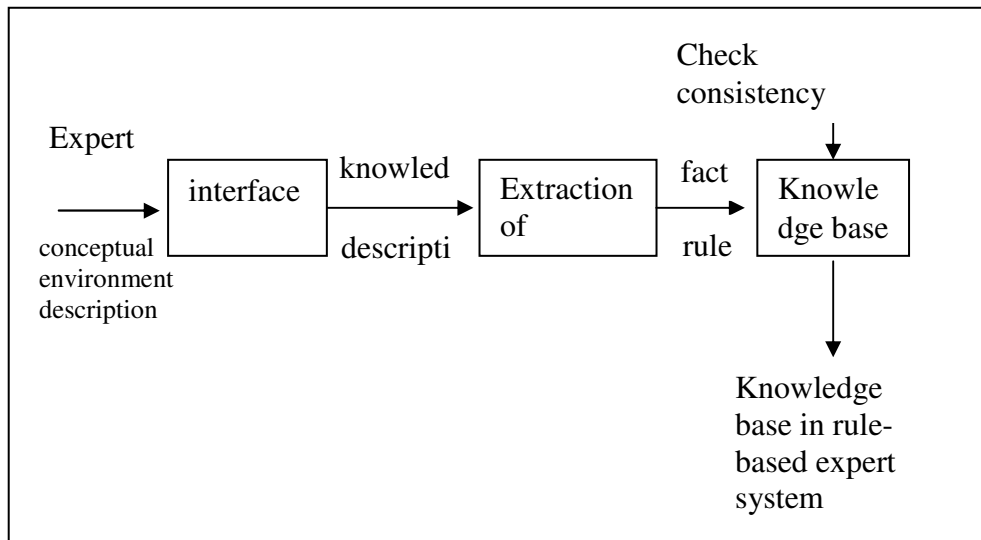


Figure (4) Modal of proposed Intelligent agent

Case study (experiment result):

When the proposed agent works in diagnosis domain; the diagnosis is one of general expert system problem categories

which means determining the cause of malfunction in complex situation based on observable symptoms [5]. We will select an example for diagnosis domain such as medicine diagnosis for eyes disease. The following steps illustrates how we can build knowledge base for Glaucoma disease and treatments for that disease:

Step one: interact between expert and interface:

Input the main situation which needs to diagnosis :

Primary Glaucoma

*/*interact with previous symptoms*/*

Determine by yes or no for the following pervious symptoms:

-Obstruction of the passage of Aqueous : No

-Obligation of the felnation angle : yes

Input the number of symptoms which need to add : 3

Input the first observable symptom :

No pain except ache

Input the second observable symptom :

Abnormal facility of aqueous outflow

Input the third observable symptom :

May be loss vision of one eye

Do you have treatment : *yes*

Input the treatment :

1-Medicine

a-Anticholneslenose drugs

b-Epinephnes drugs

c-Pilocarpein

2-Surgical operation

Step two: Knowledge description:

Primary Glaucoma if Obligation of the felnation angle and No pain except ache and Abnormal facility of aqueous outflow and May be loss vision of one eye

The treatment of Primary Glaucoma are Anticholneslenose drugs and Epinephnes drugs and Pilocarpein or Surgical operation

Step three: Extraction of knowledge to facts and rules:

*Name_ disease(Primary Glaucoma):-
cond5,cond10,cond11,cond12.*

Condition (cond5, "Obligation of the felnation angle").

Condition (cond10," No pain except ache ").

Condition (cond11,"Abnormal facility of aqueous outflow").

Condition (cond12" May be loss vision of one eye").

Diagnosis (Primary Glaucoma,[cond5,cond10,cond11,cond12]).

Treatment(Primary Glaucoma, [Anticholneslenose drugs, Epinephne drugs, Pilocarpein or Surgical operation]).

Conclusion:

In this paper we have discussed how we can build Intelligent agent to construct knowledge base in rule-based expert system, after running the proposed system we can conclude the following :

1. We can translate the conceptual expertise for expert to facts and rules in knowledge base using proposed intelligent agent.
2. In this research we produce a general model for construct intelligent agent in diagnosis domain.
3. The proposed intelligent agent can quick up construct of rule-based expert system, that means instead of using interview

with domain expert to extract knowledge we can use intelligent agent for that job.

4. We can use one application of artificial intelligent (intelligent agent) to construct another application (rule-based expert system)
5. We have seen an example in diagnosis domain for eyes disease, that means the proposed agent can be used in any diagnoses categorize.

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