Implementation of Paddy Production Information System

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Abstract

The rapid growth of technology has largely eased the access to information. At the same time, it is increasingly difficult for human people to collect, filter, evaluate and really use the vast amount of information. An information system has access to at least one and potentially many information sources. Today's organizations cannot be operated or managed effectively without information systems that are built using a range of information technologies. In Myanmar, the production information for paddy was stored in documents. This system is an implementation for a computerized paddy information system. This system uses Backward Chaining technique for inferencing. Backward chaining, more common in the expert systems currently developed, is best suited for applications in which the possible conclusions are limited in number.

Keywords: Information Systems, Rule-based Systems, Backward Chaining

1. Introduction

An information system is an organized set of components for collecting, transmitting, storing, and processing data in order to deliver information for action . In business firms and other organizations, this information is necessary for both operations and management. Most information systems in today's organizations are built around the information technologies of computers and telecommunications-they are computer-based information systems. Information systems in organizations include systems that support business operations of the firm, systems that support its management, and systems that assist general knowledge, that is, work with abstract information rather than with tangible materials.[8].

Information systems are agents or software programs which gather information form heterogeneous sources on behalf of human users to achieve the goals. One of their main tasks is to perform searches for relevant information non-local domain on behalf of their users or other agents. Information system should be capable of following tasks: locate information source, extracts information from the sources, filter the information using the user's interest profile, prepare and present the results in an appropriate form. This include retrieving, analyzing, manipulating and integrating information available form multiple autonomous sources.

A work system is a system in which humans and/or machines perform work using resources to produce specific products and/or services for customers. An information system is a work system whose activities are devoted to processing (capturing, transmitting, storing, retrieving, manipulating and displaying) information. This system aims to give paddy rate information to the farmers. The system process its aim based on the user's data (goal). Then it continues the processing with the rules in the domain by using Backward Chaining. This system is also a prototype for rule-based systems.

2. Related Work

A Canadian telecommunications company, AGT, had made marketing expertise available to the customer service representatives with an expert system called CSR advisor. The use of CSR advisor had replaced the conventional customer service process for retrieving information from external information sources like customer orders in response to one shot queries and requests for periodic information and monitoring external information sources for the occurrence of given information patterns, called information monitoring requests. It was the first expert system used in business organization and was also information monitoring system. The field of artificial intelligence extends a vibrant promise of a future machine with expert systems-vehicles for gathering, organizing and delivering knowledge in a specific limited domain[8].

Expert systems are computer programs that try to emulate the functioning of real human experts, in a particular field. They are also called knowledge-based systems because of the stress given on the domain specific knowledge base. This knowledge is handled in a much different fashion than in the conventional programs. Whereas in conventional programs, the knowledge is mingled with the algorithm in the program statements, in a typical expert system, domain specific knowledge and the algorithm are separate. This algorithm

which has the problem solving general knowledge is called the inference engine. Once the knowledge base is completed, it is ready to use. To do so, a computer program that will enable us to access the knowledge for the purpose of making inferences and decisions and for problem solving is needed. This program is an algorithm that controls some reasoning process and it is usually referred to as the inference engine or the control program. In rule-based systems, it is also referred to as the rule interpreter. The control program directs the search through the knowledge base. The process involves the application of inference rules in what is called pattern matching. The control program decides which rule to investigate, which alternative eliminate, and which attribute to match. The most popular control programs are also most of the inference methods that have been developed for rule-based expert systems can be grouped in two major categories as per their performance. The two inferencing with rules methods are: Forward Chaining and Backward Chaining [3].

3. Agent-based Information Systems

Agent based systems are one of the most vibrant and important areas of research and development to have emerged in information technology in the 1990s. Put it its simplest, an agents is a computer system that is capable of flexible autonomous action in dynamic, unpredictable, typically multi-agent domains. Many observers believe that agents represent the most important new paradigm for software development since object-orientation.

The concept of an agent has found currency in a diverse range of sub-disciplines of information technology, including computer networks, software engineering, object-oriented programming, artificial intelligence, human-computer interaction, distributed and concurrent systems, mobile system, telematics, computer-supported cooperative work, control systems, mining, decision support, information retrieval and management and electronic commerce. So, the basic idea of agent based information system is to support the user in problem solving, learning, planning and other daily functions effectively and efficiently [7].

4. Rule-based System

A rule-based system RBS is a computer system that uses rules to provide recommendations or diagnoses, or to determine a course of action in a particular situation or to solve a particular problem. The term ***rule*** in artificial intelligence, which is the most commonly used type of knowledge representation, can be defined as an IF-THEN structure that relates given information or facts in the IF part to some action in the THEN part. A rule provides some description of how to solve a problem. Rules are relatively easy to create and understand. Any rule consists of two parts:

- the IF part, called the antecedent (premise or condition) and
- the THEN part called the consequent (conclusion or action).

A rule can have multiple antecedents joined by the keywords AND (conjunction), OR (disjunction) or a combination of both.

4.1 Components of Rule-based Systems

Rule-based systems or production systems are computer systems that use rules to provide recommendations or diagnoses, or to determine a course of action in a particular situation or to solve a particular problem. A rule-based system consists of a number of components:

- Database of rules, knowledge base, consists of a set of rules that represent the knowledge that the system.
- Database of facts represents inputs to the system that are used to derive conclusions, or to cause actions.
- Interpreter or inference engine is the main part of the system that controls the process of deriving conclusions. It uses the rules and facts and combines them together to draw a solution. [3].

4.2 Rule Engine

A rule engine is a computer program that relies on knowledge represented as rules, or productions, to make decisions based on information about a particular problem, which is provided by the user to the rule engine. A production rule system is turning complete, with a focus on knowledge representation to express propositional and first order logic in a concise, non-ambiguous and declarative manner. The brain of a production rules system is an inference engine that is able to scale to a large number of rules and facts. The inference engine matches facts and data against production rules - also called productions or just rules - to infer conclusions which result in actions.

The process of matching the new or existing facts against production rules is called Pattern Matching, which is performed by the inference engine. The Rules are stored in the production memory and the facts that the inference engine matches against are kept in the working memory. Facts are asserted into the working memory where they may then be modified or retracted. A system with a large number of rules and facts may result in many rules being true for the same fact assertion; these rules are said to be in conflict. The agenda manages the execution order of these conflicting rules using a conflict resolution strategy.

There are two methods of execution for a rule system: forward chaining and backward chaining; systems that implement both are called hybrid rule systems.

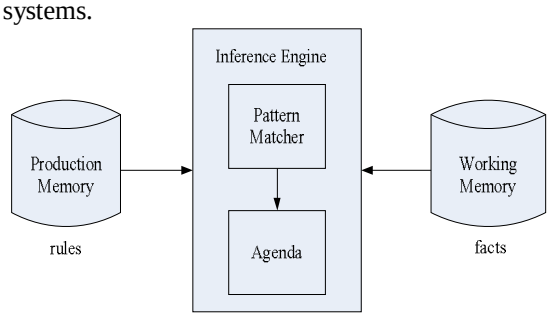

Figure 1. Structure of a Rule Engine

5. Backward Chaining Inferencing

Backward chaining is a goal-driven approach. Inference works towards a final state or goal, and by looking at the working memory to see if goal already there. Inference process can be started without giving any initial information. If only the final goal is given, the system tries to fire the rule whose THEN portion contains the desired goal. This rule can be fired only if the IF portion is satisfied. So the system makes these conditions sub-goals and pursues them. This is called backward chaining strategy. The following is a naive implementation of backward chaining as conclusion to assertions.

```
Backward-Chaining (H)
begin
    if H matches an assertion in working memory then
            return true
      end if
    if there is no rule with a consequent that matches H then
            ask user or assume false
       end if
    for every rule R with a consequent that matches H do
            if for all antecedents A of rule R, we have Backward-Chaining (A) = true then
                        return true
            end if
            end for
return false
end
```

6. Architecture of the System

This system is to implement of paddy information system, based on forward chaining inferencing. Myanmar is an agricultural country and most of citizens are farmers. Moreover, the main business of the country is rice and paddy tradition. So the computerized-paddy information system is intended for the farmers. They can use the paddy information and decide what type of paddy to be grown. As this system is based on the process of backward chaining, the user must gives what he wants to know. It is a goal. Then the system searches the rule which match the goal in the rules base. The rule can fire if when it's THEN parts are fired. To the THEN parts be fired, they are checked whether they are in the assertion bases. The assertion based stores the facts which are the parts of goals. The system continues backward chaining process until the user's goal matches with the fired rule. To implement the paddy information system, the information from the Myanmar Agricultural Office, Pyay Branch, the West of Bago Division, Ministry of Agricultural, are used in the system. This system is developed by the C#.net 2008.

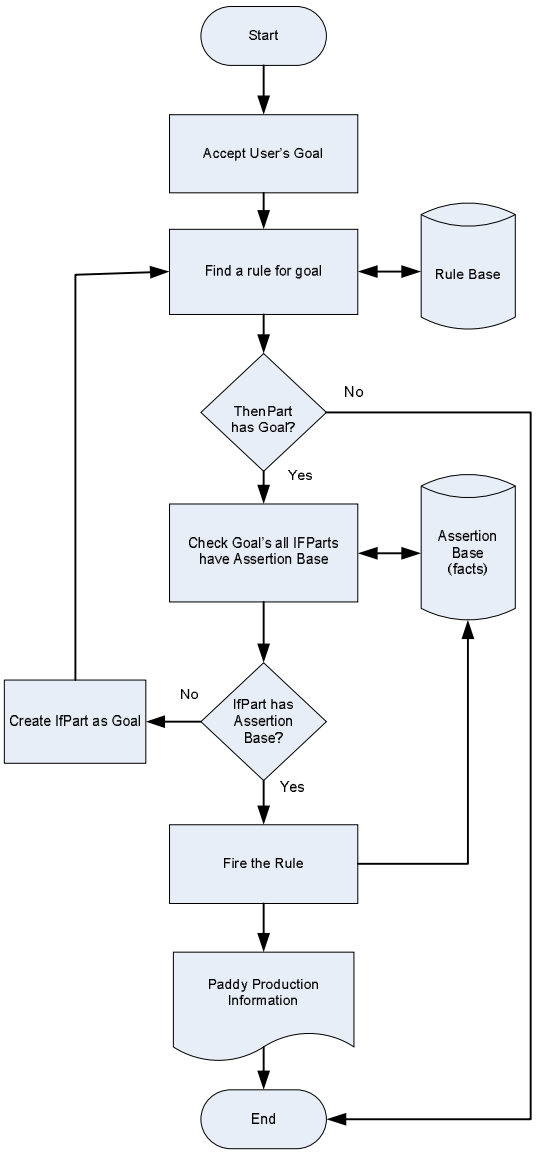

Figure 2. Process Flow of the System

7. Results of the System

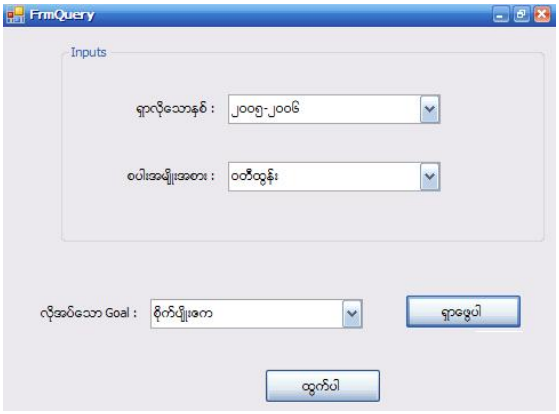

Figure 3. User inputs the goal

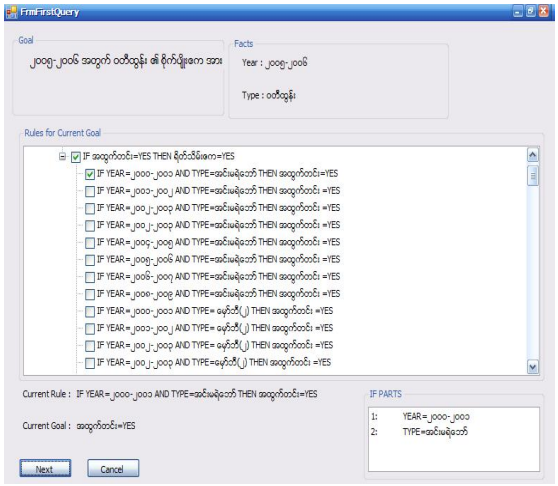

Figure 4. Process of Backward Chaining

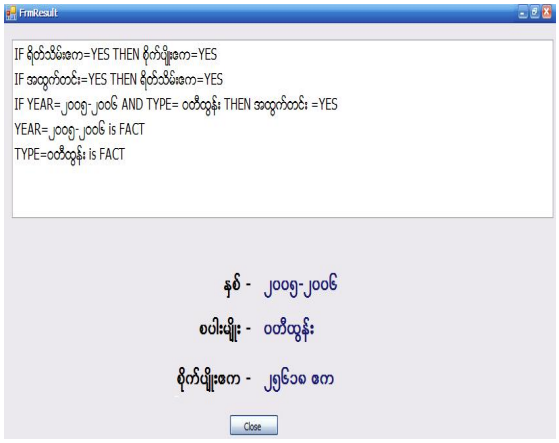

Figure 56. Outputs of Paddy Information

8. Conclusion

This system is user-friendly, especially for the farmers. To provide easily access and can give accurate information accurately and timely, to select suitable paddy items to grow for agriculture worker and to be understandable and usable of rule-based problem solving , this system intended and developed. Backward chaining gives a more efficient way of reaching the desired conclusion than forward chaining. The advantage of backward chaining is that search is directed and the disadvantage is that goal has to be known. This system to be more robust and efficient will be extended as future work. This work is to be further extended with detailed study of security issues.

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