Rule-based Decision Support System for Internally Displaced Person in Natural Disaster

acadamyatm@gmail.com
Aye Thet Mar, Hnin Min Oo
Computer University, Maubin

Abstract

This paper describes the development of decision support system based on expert system, programmed on Internally Displaced Person (IDP) in Natural Disaster for supporting care and relocation and executed by the rule-based reasoning: backward and forward chaining method). In this system, the rules manipulate a set of IDPs information for separating three categories by using backward chaining method. Separation of category definition for IDPs from rules that operates the infer conditions (partial or full housing) based on decision making process by using forward chaining method. In this system, expertise organized IDP's person information and have built case database which are classified for three categories and then produce results.

Keywords: Internally Displaced Person, backward chaining, forward chaining, decision making process.

1. Introduction

International organizations are reeling from the strain of coping with natural disasters and with violent conflicts that have exploded or re-emerged in several countries. The world is also experiencing an increasing volume of diffuse conflict, seen as one of the main causes of forced migration. The growing number of displaced persons and enforced migrants is now perceived as a significant threat to global security. In Myanmar, Deadly Cyclone Nargis destroyed many villages of hard hit areas including Yangon and the Ayeyarwaddy Delta during 2008. Other communities suffered significant damage.

This system represents the final stage of a collaborative evaluation on the theme of donor support to Internally Displaced Persons (IDP). The profiling of Internally Displaced Persons signifies:(i) to know how many people were internally displaced, (ii) to know where they were displaced; (iii) to know why they were displaced; (iv) to better understand their assistance they need and protection needs; (v) to better understand displacement trends, so as to assist the government to develop a comprehensive and integrated national strategy; (vi) to assist the humanitarian community to respond more effectively to assistance and protection needs. In the immediate aftermath of the disaster, efforts have focused, as might be expected, on search and rescue, bringing clean water, food, clothing, medical care and shelter to survivors, and identifying and relocate to the number of internally displaced people.

In this paper, we examine the decision support system for Internally Displaced People in natural disaster, which explores the application of rule-based approaches to forced migration. A set of rules encompass any and all actions that are taken within the scope of a problem, but nothing irrelevant. The number of rules in the system can affect its performance. This system can be interrogated to give an analysis of the characteristics of displaced persons, and solutions for rectifying these persons. The significant of the rule based decision support system is:

(i)to enable the expertise to organize the knowledge base for internal displaced person's information on the basis of a given set of characteristics;

(ii)to build case database which are classified for three categories;

(iii)to solve displacement system by adapting the solutions of similar previous cases stored in a case memory;

(iv)to retrieve internal displaced persons relevant with category required by organization.

The design of the system is based on a rule based reasoning approach coupled with case database. On the other hand, the case base join in itself the rules concerning a particular subsystem of complex object, and also contain the information on each parameter which is used for the description of cases. It can be included in the structure of rule base of RBR or as a separate component of the system. The internal displaced person's information gives the exact match with case history stored the database. The case history is stored in SQL database. This simply means that any changes of displaced person's information made to any one of these categories but do not necessarily mean that no consists of displaced person's information have not to be made to these categories, as they are only loosely rule-based reasoning with case database coupled.

2. Rule-based Decision Support System

An IDP decision support system supports the definition, storage, retrieval and classification of IDP information through the IDP decision making process and thus, is an essential component in almost all natural disaster. In such settings, the decision making environment encompasses a broad range of activities and players including internal displaced persons, findings and classifying among three categories of persons who have left their homes.

A typical IDP decision making process consists of internal displaced persons gathering information, three cases of IDP categories and exploring potential case for various internal displaced persons and post care activities. The decision marking part of such systems are typically rule based which serves to mimic reasoning process experts (in the case the organization) use to solve problems and which could be put to use by a non-expert(supporting donor) to aid in an environment devoid of having very few experts. Such system effects decision making based on the assumption that organization activity can be analyzed using many simple rules and that the decision process of the managers can be modeled by sets of such rules. Essentially this system is used to propagate scarce knowledge resources for improved and consistent results.

Several rule-based reasoning is typically distinguished on their mode of acquiring knowledge. A particular type of reasoning uses "if-then-else" rule statements. Rules are simply patterns and an inference engine searches for patterns in the rules that match pattern in the data. The 'if" means "when the condition is true, the "then" means "take action A" and the "else" means "when the condition is not true take action B". As it is rule based reasoning supports case database connection to SQL. Internally displaced persons' information and three categories of IDP information are stored in database file. This system executes the data in its frame database and control knowledge in its production rules. It allows the knowledge engineer to use data-driven, forward and backward chaining.[3]

Forward chaining involves checking the condition part of a rule to determine whether it is true or false. If the condition is true, then the action part of the rule is also true. This procedure continues until a solution is found or a dead end is reached. Forward chaining is commonly referred to as data-driven reasoning. Backward changing is used to backtrack from a goal to the paths that lead to the goal. When all outcomes are known and the number of possible outcomes is not large. In this case, a goal is specified and this system tries to determine what conditions are needed to arrive at the specified goal.[2]

3. System Architecture

The person who moved within his/her country or boundary due to man-made disaster or natural disaster is called internally displaced person. In this system, expertise organized internal displaced person's information and have built case database which are classified for three categories and then produce results as shown in Figure 1. We define a case to be a description of the system at a particular point in appropriate rule-based reasoning approach. It is common to assume that the case captures all relevant information to the system's decision making process.

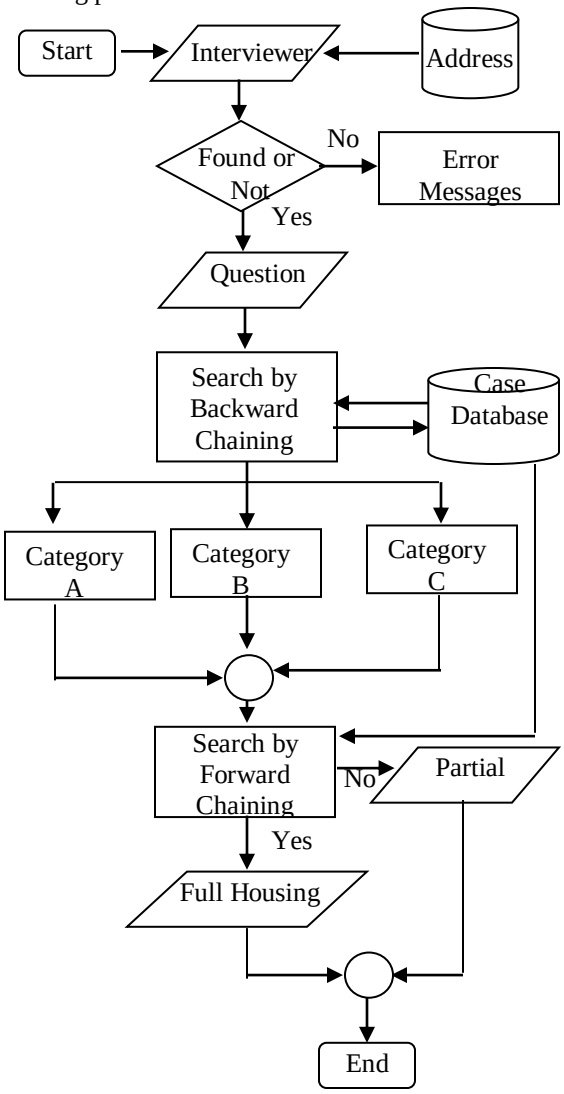

Figure1. System Architecture of Supporting System for Internally Displaced Person

The system starts that the interviewer asks the internally displaced person for his/her data (name, nrc no, town, village tract and village) completely. After that the system checks these data to the address database. If these data are found from address database, the system asks the questions and then search by rule base reasoning for case data from case database. We assume that the system evolves in three cases, where the occurrence of an event marks and checks transaction from these three cases. These three cases are Category A for "Still-Displaced Person", Category B for "Returnee" and Category C for Stranded Person". Since events define changes in Internally Displaced Person's information. These events are analyzed on the rule-based reasoning by using backward chaining method and the system executes that these events equate the case in three categories with IDP information. Of course, it is possible for an event to occur one of three categories and then the system evaluates the decision making process by using the forward chaining method for partial or full housing.

4. Components of System Architecture

The proposed system architecture identifies components for the rule-based reasoning (backward and forward chaining method). In the rule-based reasoning, the backward chaining method is made up of both facts and rules. A rule consists of several premises and a conclusion. If all premises are true, the conclusion is considered true[1].

4.1 Backward Chaining Method

A rule is composed of an IF portion and a THEN portion. The IF portion of the rule is the condition or premise, which tests the truth-value of a set of facts at three categories of the reasoning process. Figure 2 shows the variables (IF part) and the criteria (THEN part) considered for the creation of the rules in three categories. We start from accessible information as it becomes available or from a basis idea, and then we try to draw conclusions. For example,

IF
{
Question1: What is the name of the Place where you were living/working when Nargis hit Myanmar?
Answer 1 : (Aung Chan Thar)
AND
Question2:"Before Nargis, did you have an NRC card?"
Answer2 : (Yes)
AND
Question3: "Before Nargis, what is the name of place did you stay?"
Answer 3 : (Aung Chan Thar)
AND
Question4 : "What is the name and sex household leader of your Family?"
Answer 4 : (U Aye Htwe)
AND
Question 5: "After Nargis, what is the name of Place did you stay?"
Answer 5 : (Kyein Chaung)
AND
Question 6 : "What is the name of Place, where you were still in current?"
Answer 6 : (Kyein Chaung)
}
THEN
Your Category is A and Still-Displaced Person.

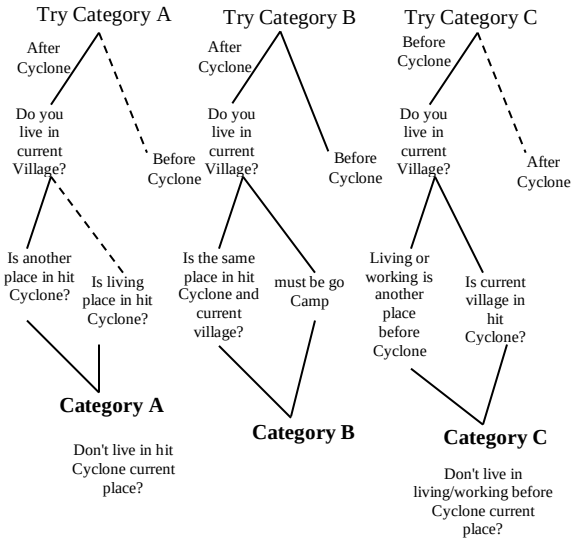

Figure 2. Creation of the Rules for Three Categories by Using Backward Chaining

4.2 Forward Chaining Method

In forward chaining, if the premise clause matches the situation, then the process attempts to assert the conclusion. Forward reasoning is as well as a more favorable approach for applications involving partial or full housing. However, our result is with forward chaining method. This is because the identification of requirements for the IDP care involves decision making process by checking different discerning external features of these categories. This forward chaining method provides mechanism, called the inference engine, which automatically matches facts against patterns and determines which rules are applicable. The actions of applicable rules are executed when the interference engine is instructed to begin execution.

The inference engine selects a rule and then the actions of the selected rule are executed. Then, the interference engine then selects another rule and executes its actions. This process continues until no applicable rules remain as shown in Figure 3.

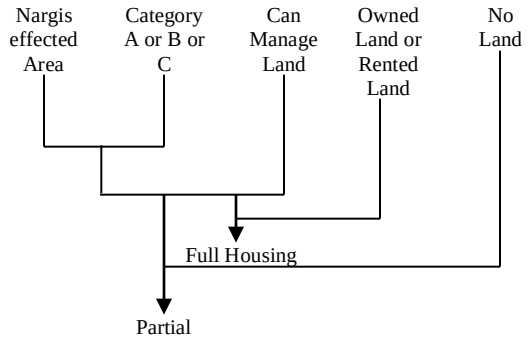

Figure 3. Forward Chaining to the Decision Making Process

In this process, the interviewer includes category A or B or C. This system decides the full housing based on the rules: can manage land or owned land or rented land, other, the partial based on no land in working or living area.

4.3 Result with User Interface

The rule-based decision support system presented in this paper designed for forward and backward operations using the Internally Displaced Persons. In order to demonstrate how the system can assist the administer and users in selecting the most suitable categories and in deciding the expected care for the IDPs on hand, a sample run is demonstrated in this section.

Upon the execution of the system, the system gives the decision maker for the users: the option of checking the classify categories(Category A) by using IDP information and then the result is the suitability care (full housing) of using IDPs by matching case database as shown in Figure 5.

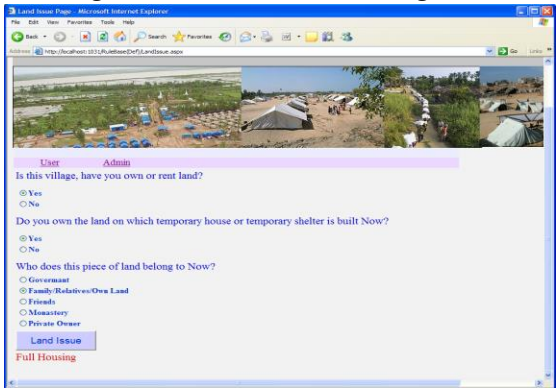

Figure 5. Suitable Care Shows for IDP Information

This system also provide for administrator: entering and adding the external IDPs data in the system to execute the decision making process as shown in Figure 5. The administrator uses insert, delete and update operation for the IDPs data.

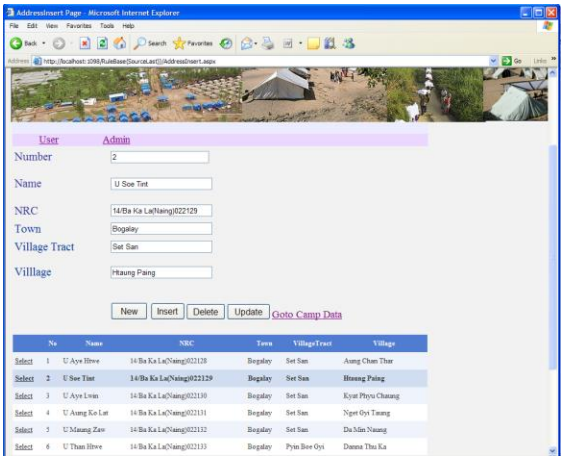

Figure 5. Entering and Adding the External IDPs Data

5. Conclusion

In this paper, a rule-based decision support system that marries forward and backward chaining methods is applied to Internally Displaced Persons analysis. This system supports separation of three categories from rules by using backward chaining that manipulate them in the decision making process by using forward chaining. This system will help the international organization conduct and support the Internally Displaced Persons.

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