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Knowledge Acquisition Based on Repertory Grid Analysis System

Be Nue[1], Sabai Win[2]

[1]Faculty of Information Science, [2]Faculty of Computer System and Technology
[1,2]University of Computer Studies, Myitkyina, Myanmar

ABSTRACT

This paper is to introduce an approach to the repertory grids are a well-known knowledge acquisition and representation techniques based on the personal construct theory. The repertory grid analysis is the most applied method of semi-automated interviews used in AI. Several software packages that use RGA improve the knowledge acquisition process. Repertory grid has the cognitive/psychological basis and generality needed to provide excellent elicitation and acquisition facilities. Repertory grids are used as knowledge acquisition tools in the development of expert system. The rating of knowledge acquisition is gaining insight into expert's mental model of the problem. This system gives knowledge using development of knowledge acquisition methods based on repertory grid analysis. This system helps user to recommend which products are most similar.

KEYWORDS: *Knowledge Acquisition Methods, Repertory Grid Analysis*

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1. INTRODUCTION

The purpose of this paper is to represent and describe the features of knowledge acquisition, and finally present some product in identifying issues and validating parts of that approach. Repertory grids are well-established as a general and powerful knowledge elicitation and acquisition technique to support classification.

Repertory grids have been applied to wide variety of domains, usually aimed at various kinds of heuristic classification or expert system formation. Their general applicability makes them very attractive in knowledge acquisition (KA) [2].

Focus must be placed on the personal constructs individuals use to make sense of themselves, other people, and their environment. Based on the model developed, each individual is able to anticipate and then act on the basis of these anticipations. In this paper, there are three main parts as sub section. These are methods of knowledge acquisition section, repertory grid technique section and how repertory grid analysis work section.

2. Methods of Knowledge Acquisition

Many methodologies have been devised to improve knowledge acquisition. They range from automation to programming aids in knowledge representation. The methods of knowledge acquisition can be divided into manual, semi-automated, and automated.

Manual methods are basically structured around some kind of interview. The knowledge engineer elicits knowledge from the expert and/or other sources and then codes it in the knowledge from the expert and/or sources and then codes it in the knowledge base. The three major manual methods are interviewing (structured, semi structured, unstructured), tracking the reasoning process, and observing.

Semiautomatic methods are divided into two categories: (1) those that are intended to support the experts by allowing them to build knowledge bases with little or no help from knowledge engineers, and (2) those that are intended to help the knowledge engineers by allowing them to execute the necessary tasks in a more efficient and/or effective manner (Sometimes with only minimal participation by an expert). The method described on this thesis is classified in manual and semiautomatic [1].

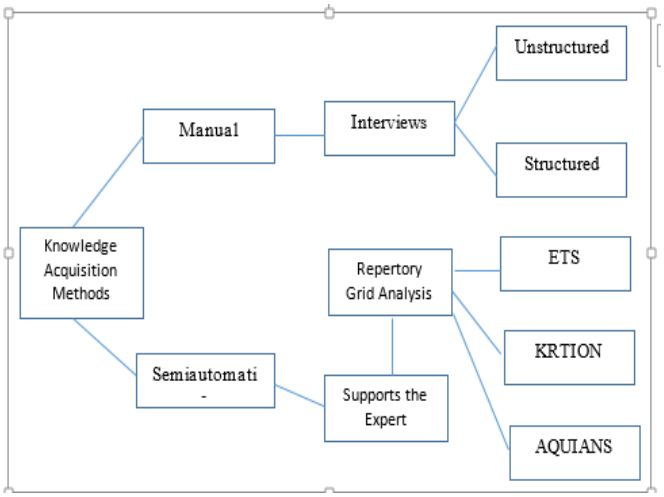

Figure: Methods of Knowledge Acquisitions

The knowledge acquisition methods are including two main parts in above figure. There are manual and semiautomatic methods. Manual method is interviewing system. Two basis types of interviews can be distinguished: unstructured (informal) and structured.

Semiautomatic method is intended to support the experts andthe knowledge acquisition tools have been developed based on the repertory grid analysis system. Three representative tools are ETS, KRTION, and AQUIANS [1].

3. Repertory Grid Technique

The repertory grid technique elicits these constructs accurately and reflects the changes in an individual's constructs system. The repertory grid technique distinguishes the objects of a problem domain (called elements) through their attributes (called constructs).

A typical repertory grid session consists of the following steps:

Step1 : Eliciting constructs. Each constructs consists of pole.

Setp2 : Indexing elements on these constructs.

Step3 : Quantification of these perceptions of end user through rating, ranking and/or sorting of elements.

Setp4 : Statistical analysis to find out about element distance, construct centrality.

4. Repertory Grid Analysis Works

Repertory grid analysis works according to several process. First, the expert identifies the important objects in the domain of expertise. Second, the expert identifies the important attributes that are considered in making decisions in the domain. Third, for each attribute the expert is asked to establish a bipolar scale with distinguishable characteristics (traits) and their opposite. Fourth, the interviewer picks the objects and asks. The answers are recoded in a grid. The numbers inside the grid designate the value assigned to each attribute for each object [1].

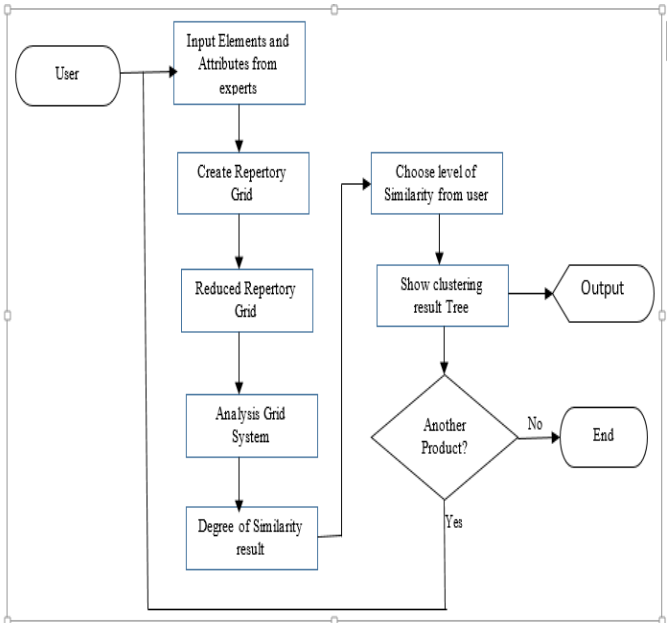

Figure: System Flow Diagram of RGA System

4.1. Refining to improve and analyzing repertory grids

This is the way that a repertory grid can be simple and analyzed to make clear the structure of the knowledge certain in it. It is illustrated with reference to a grid filled in with an expert's assessment of a number of productions. The grid in maximum and minimum ratings for each construct is 10 and 1.The grid contains assessments of productions are based on a set of constructs. Each construct ought to be assessing some quite different aspect of the production, and it is worth checking to see that they do.

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
	Casio Exilim EX-600	Samsung Digital I85	Nikon Coolpix S6	Sony Cyber-shot DSC-w11	Fujifilm finepix F3	Hp photo smarts R927	Niko n Cool pix P4	Canon power shot SD-700S	Olym plus stylus 720SW	Kodak Easy share V610
C1-Image quality	4	6	6	6	6	8	6	6	6	6
C2-Battery Life	10	8	6	10	10	2	6	8	2	2
C3-Overall design	6	6	8	4	6	7	6	8	6	6
C4-Magapixels	4	8	4	8	6	8	8	4	7	5
C5-Zoom	4	8	3	4	6	8	5	7	4	10
C6-Scene Modes	10	3	5	1	5	4	6	3	8	7
C7-Ounces	8	2	9	1	7	1	6	3	5	4

Figure: A filled – in repertory grid for Digital Cameras

This table is filled in repertory grid for Digital Cameras. Casio EX-600, Samsung I85, Nikon s6 and are digital cameras productions. This identification is done in an interview. Image quality, battery life, overall design and etc attributes are important in the case of selecting digital cameras. For each attributes the experts is asked to establish a bipolar scale. Rating in the grid is 1 to 10 and maximum rating is 1.

4.2. Different between the values sets of all the constructs

By comparing two rows of rows of the grid, and assessing of the different between two rows to add up all magnitudes of the differences between the corresponding values in each row.

Magnitude (6-5) = Magnitude (1) =1 and the magnitude of the magnitude of the difference between 5 and 6 is magnitude (5-6) = magnitude (-1) =1.

Examples the difference between the first two rows of the table is:
C1 – C2 = 6+2+0+4+4+6+0+2+4+4=32

Calculated in this way, the different between the values set of all rows of the table. The following table is given the differences between the values sets of the constructs.

Maximum different = (Elements *Attributes)

Percentage of different = (different between two rows) / maximum different * 100;

In this way, the member of constructs can be reduced, all of which differ by more than ten percent of the maximum possible difference. The smallest value of in this table, for the constructs can discarded. The resulting reduced grid is shown.

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
E1	100	60	78	62	81	54	71	67	71	60
E2		100	65	83	79	75	79	87	70	73
E3			100	60	79	68	79	73	71	63
E4				100	75	71	73	73	65	56
E5					100	62	79	79	75	71
E6						100	73	70	78	68
E7							100	75	86	76
E8								100	67	74
E9									100	84
E10										100

Table: Gives the percentage similarities of the elements

4.3. Degree of Similarity Methods

The reduced grid to bring the knowledge is contains into better focus. This is the measure the similarity between the value sets of the various elements of the grid. So as to be able to group together those are most similar.

The degree of similarity between two productions can be calculated in:

1. Calculate the difference between the two columns corresponding to the two productions by adding the magnitudes of the differences of corresponding extra as described above.

For example: (E1 – E2) = 2+2+0+4+4+7+6=25

2. Calculate the percentage similarity algorithms form **= 100 – 100 * (different of two columns) / (reduced constructs * (max: rating – min: rating))**

The degree of similarity between two productions can be calculated in:

4.4. Clustering in the Grid

1. Find the largest number in table that has not already been considered.
2. Read off the elements labeling the rows and the columns of the number, and take the appropriate action from the following:

   If neither element is in cluster, starts a cluster with the elements.

   If one of the elements is already in a cluster and the other is not, add the second element to that cluster.

   If the elements are in separate cluster, join the clusters.

   If both elements are in the same cluster, do nothing.

Repeat from beginning until all the elements are in cluster.

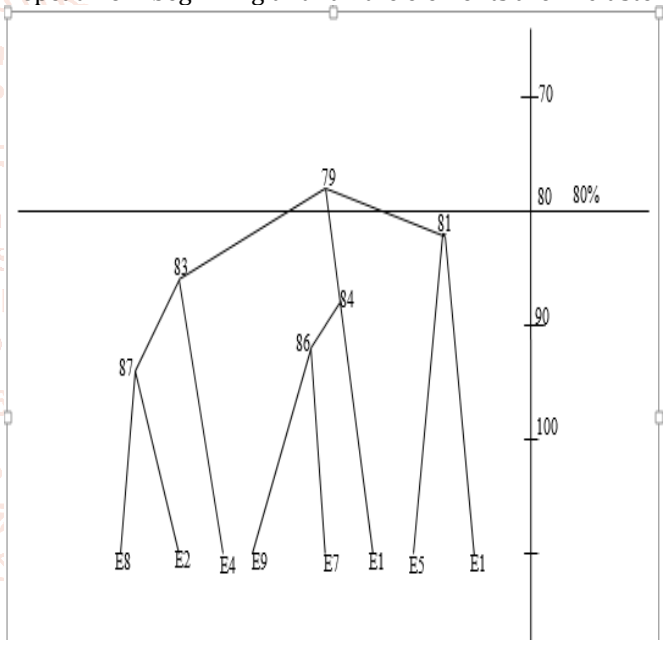

Figure: Cluster in the grid

80% similarity clusters {E2, E8, E4} {E7, E9, E10} {E1, E5}
After the initial analysis of the grid, experts can modify their ratings of elements and see the effects on clustering.

To summarize, methods have been presented to show that, given a filled-in repertory grid, it is possible to carry out two kinds of operations on it. The constructs can be examined to determine which are essential and which are not, so that any that is redundant may be removed. The elements can be compared and any that are similar can be replaced in cluster. By these means, the grid can be refused and analyzed to expose aspects of the knowledge if contains.

5. CONCLUSION

This system is a knowledge acquisition system based on the theory, Repertory Grid Analysis (RGA), which is one of the prominences in Artificial Intelligence. This system can be used afterward to make recommendations situations, where the importance of the productions.

This system has pointed out that only certain types of knowledge can be properly acquired using manual knowledge acquisition methods like interviews and observations. Therefore, the expert may change the rating inside the grid.

Finally, this system can produce the result wanted to the user. By using this system, it is good for those who are studying repertory grid analysis system because this system is actually based on Repertory Grid Analysis (or) Personal Constructs Theory.

6. LIMITATION

This system offers users friendly to be convenient. There will be some limitations when input ratings are "1 to 10". "1" is offers minimum rating and "10" is maximum rating. This system accepts the inputs, which are only digital number and not the characters. When the system will enter, the user must constructs or attributes.

Another limitation is, when the differences between the values sets of all the constructs, if the constructs is less than ten percent, the member of constructs can reduced, all of which differ by more than ten percent.

Finally, a limitation is when the analysis is calculated of the similarity, the user must be input a line down at a level of percentage. If this input is not found in similarity table, which will display error message. The users will have change to change new repertory grid analysis system.

7. FUTHER EXTENSION

Any interested and enthusiastic system developers who want to make the completion of this system. This system is emphasized only knowledge acquisition methods using repertory grid analysis but later it is hoped to do the vice versa of intended to use a web page for the application of productions in online.

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Jouke C. Verlinden

Faculty of Design, Engineering and Production Delft University of Technology

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