

DESIGNING AND IMPLEMENTATION OF AN EXPERT SYSTEM TO BE USED TO DETERMINE THE BODY SIZE

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Abstract:In globalizing world, for available sectors finding themselves a place is getting harder economically and commercially. This situation leads them to follow the latest technology to go ahead in common market. One of the latest technologies in textile field is trying on clothes for people in virtual environment. Here the biggest problem is to measuring and determining the size of the body. The aim of this study is to develop decision support system software to determine the most suitable body size. With this study, it is enabled to give easier and quicker result for the expert system.

Key words: Measuring of the body, determining the body size, Expert system.

Introduction

The rapid development in technology in globalizing world leads a competition environment among to available sectors. In order to be more successful in the commercial environment, they need to search new methods and apply them in their real environment.

When the market conditions changing so rapidly are taken into the consideration, in order to survive for the current sectors, it is necessary for them to offer their products or service to their customers more rapidly and desiring way. Within this period, the modern day business managers follow the strategy of taking the advantage of technology, special the information technology as a reaction to new development in competition, market, internal and exogenous environmental factors (Yıldız, 2005).

For the garment industry, which is an important sector in international economy,using the information technology methods gains favor for the sektor by making differences among their opponent and provide benefit. With the help of the development of information technology in garment industry, many applications are begun to made in otomatic systems. One of successful application in garment industry is to make the virtual fitting room for a person to try on the clothes he/she wants in the virtual environment. In virtual fitting rooms, people can try on the textile product they want by the simulation software in the virtual environment. The most important background of the virtual wearing system is the developing measuring and determining of the body size. It is needed to determine the body size and to use the right body size for people to try on the appropriate clothes .By the help of the body measuring system it is provided to determine the people's body size.

Body measuring process is one of the most important process of determing and producing of the clothes. The determining of the body size is made generally by hand. This has many disadvantages. These disadvantages are :

- Taking too much time,
- Being too tiring,
- The correctness of the process,
- The anti-hygienic of the measurement.

Today, body measuring and determining systems decrease or prevent most of these disadvantages. With the low budget, enabling personality trait on many clothes emphasizes the necessity of the rapid and automatic measuring

system (Guerlain, 2006). With this developing systems, the high resolution body images gotten at the end of the body scanning are analyzing correctly and completely and presenting the body sizes in standart data (Öndoğan, 2005). So more precise measurements are taken and for the target group it is provided mmeasurement standart.

In today's world, the information technology is used everywhere, it is needed to use this technology also to solve the problems in textile industry. So for the study of the deterring the body size, it is used expert system which is one the techniques of artificial intelligence. In this study, it is provided designing and developing of an expert system determining the body using the body size.

This study is prepared in four parts. In the first part, there is an general introduction about the topic and in the secon part there is definitions about the expert system. In the third part, there is an application done in this study (the structure and proceeding) and in the forth part there are results of the study.

Expert System

Expert system is a kind of computer programme which was developed by experts of artificial intelligence in 1970s and was started to practice commercially in 1980s. There has been many definitions for the expert system in literature.

- ES is a kind of software system which is modeling the reasoning and determining processes can be done by a person or many people expert in a field (Nabiyev, 2005).
- ES reaches a conclusion by making inference from the knowledge it has (Önder, 2003).
- ES is a consultant computer programme aiming to imitating the knowledge of the experts and ratiocination process in solving a special team problem (Turban, 1990).
- An ES program works as a system which is not standing for an algorithm, in its own knowledge base, making a search for the data know before and enabling the activation of the appropriate knowledge according to these data and going on searching by getting new data as a result of this activation (Allahverdi, 2002).

Expert Systems enable the defination of the real world problem not using the analtycal methods by intuitional methods and solving them. In figure 1. An expert system structure is shown (Llata vd., 2001).

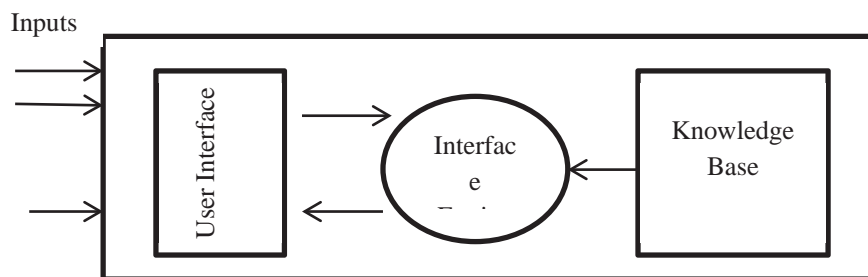


Figure 1. Expert System Shema

Expert systems help the experts in these points (Uysal, 2003);

- Understanding of the problem,
- Solving of the problem,
- Explanation of the solution,
- Evaluating the solution,
- Expanding the knowledge,
- Evaluating the abilities,
- Construction of the knowledge.

Expert System Applications: Its Structure and Working

The developed expert system makes body sizing according to the measures defined by the European Standards (CEN; 2015). The textile products are separated as upper and down parts. In this study, the body sizing of the upper clothes like t-shirt, sweater, shirt, jacket, dress, coat for men and women. It is available the measures of the upper parts (height, bust, waist, hip) of men and women. Apart from these measures, It is also important to involve the measures of sizes of shoulder, arm, neck, wrist and etc which are known as side measures in the programme and evaluate them with those measures. Because a structure with an expert system gives the right answer to the needs, it is the base of this project. In this study, according to available rule base, the body size of a person is defined and which size or sizes will be appropriate is evaluated. The general structure of the developed expert system is shown in figure 2.

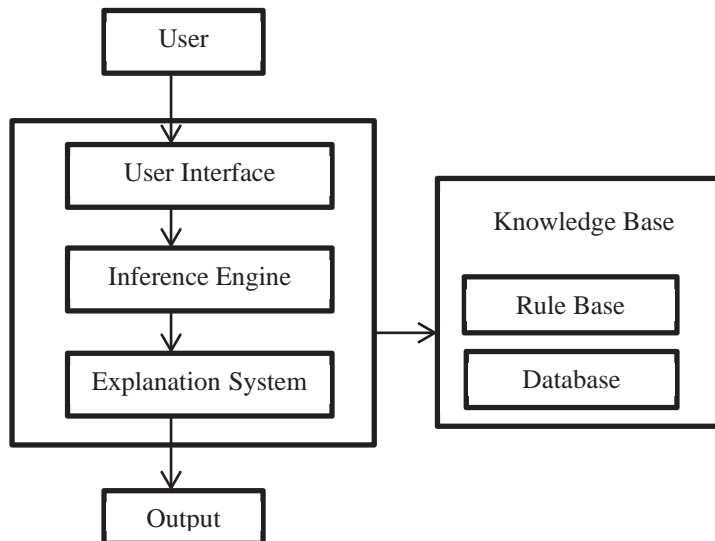


Figure 2. The general structure of the developed expert system

The user; In the use part of the expert system, there are the system manager and users.

User Interface; it enables the communication between the user and the programme. With the help of the user interface, the controlling of the data base of the system, adding or taking out the rules can be done. In this developed system, while system manager can reach the parts "The New Kind Definition" and "Rule Base" in its own authority, the user can pass the field where the evaluation is done after the definition of the body size measuring. Before the part of the body size measuring, it must be selected to the users' woman or man. For men, it is enough to wear just height and waist sizes, for women, it is necessary to use the sizes of bust waist and hip (Figure 3). The men and women's sizes are evaluated in different rule bases.

After all the fields are filled, in the background the body size of the person is measured. The developed expert system can make evaluation about the body size of a person using the data entered in the background.

In the developed software, also it can be added the kind of the measure in the expert system with the help of the user interface and by using this measure kind, a measure kind group can be composed. This measure kind group enables the rebuilt of the rule base. It can be added choices for making those measure kinds.

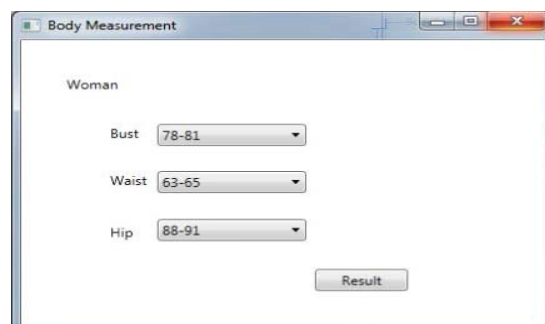


Figure 3. The form of the Application (Body Measurement)

Data Base; it composes the base data, rules and intuitive knowledge. The base of the expert system is related to the keeping the knowledge right and processing it. If the resolution of the data in the data base is strong, the developing system will be also that much strong.

Database composes of the reals presenting the problem situation and values. In this study, SQL Server database programme is used in order to keep the data safe and process them quickly.

The rule base: the expert system must have the structure of a defined size or control mechanism and work in certain situations. The sizes are structure in which the solution of available problem can be expressed properly. In this study, it is benefited from the "European Size Measures" and there are four rule bases. The first and second rule base (The rule base-1 / the rule base-2) are composed for defining of the woman and man body size and the rule base 1 has 10 and the rule base-2 has 8 rules.

Table 1. Size defining rules for woman (Rule Base-1)

Rule No:	Rule	Inference
1	If; Bust:74-77, Waist:60-62, Hip:84-87	Size: 32
2	If; Bust:78-81, Waist:63-65, Hip:88-91	Size: 34
3	If; Bust:82-85, Waist:66-69, Hip:92-95	Size: 36
4	If; Bust:86-89, Waist:70-73, Hip:96-98	Size: 38
5	If; Bust:90-93, Waist:74-77, Hip:99-102	Size: 40
6	If; Bust:94-97, Waist:78-81, Hip:103-106	Size: 42
7	If; Bust:98-102, Waist:82-86, Hip:107-110	Size: 44
8	If; Bust:103-107, Waist:87-91, Hip:111-115	Size: 46
9	If; Bust:108-113, Waist:92-96, Hip:116-120	Size: 48
10	If; Bust:114-119, Waist:97-102, Hip:121-125	Size: 50

Table 2. Size defining rules for man (Rule Base-2)

Rule no	Rule	Inference
1	If; Height:166-170, Bust:86-89	Size: 44
2	If; Height:168-173, Bust:90-93	Size: 46
3	If; Height:171-176, Bust:94-97	Size: 48
4	If; Height:174-179, Bust:98-101	Size: 50
5	If; Height:177-182, Bust:102-105	Size: 52
6	If; Height:180-184, Bust:106-109	Size: 54
7	If; Height:182-186, Bust:110-113	Size: 56
8	If; Height:184-188, Bust:114-117	Size: 58

The third and fourth rule base (The rule Base 3 / The Rule Base-4) is composed for making comment about the size of woman and man according to the body measuring in the first and second rule base. The rule base 3 has 5 and the rule base 4 has 4 rules. (Table 4)

Table 3. The rules of defining body size of woman (Rule Base 3)

Rule No	Rule	Inference
1	If; Size: 32 - 34	XS
2	If; Size: 36 - 38	S
3	If; Size: 40 - 42	M
4	If; Size: 44 - 46	L
5	If; Size: 48 - 50	XL

Table 4. The rules of defining body size of man (Rule Base 4)

Rule No	Rule	Inference
1	If; Size: 44 - 46	S
2	If; Size: 48 - 50	M
3	If; Size: 52 - 54	L
4	If; Size: 56 - 58	XL

In the developed expert system, there are 27 rules totally and all the rules are kept safe in the database.

Inference Mechanism; it is the inference of the data in the database and controlling of them. It is place of making inference with the expression of sizes in the rule base. It transmits the inferences obtained using the data and rules in the data base. Two different searching methods are used while interpreting the rules: Forward Chaining Method and Backward Chaining Method (Üstkan, 2007). In this study, “Forward Chaining Method” which is based on estimating and defining the available conditions of the rule by starting with the known data is used. In table 1, 2, 3 and 4 the inferences obtained by the rules of the application using the inference mechanism.

Conclusion and Recommendations

In order to provide the success and continuity, the avible sectors must decrease the accession duration of the products and increase the quality . One of the most important steps of increasing the quality is following the current development in the technology. With these developments in the garment industry, virtual dressing rooms and the application of body scanning and sizing which is also background for virtual dressing room becomes really important.

So, in this study, an appropriate software was developed by taking into consederation of the European Size Stanstands and using expert systems. The main target of this software is to define the size of a person by using the body size of him/her and choosing the most appropriate and efficient way. It is seen that, in the example applications the needed results could be taken as a successful and desired way. But if the kind of the body sizing methods are increased, the more appropriate results can be taken.

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