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Designing Fashion Using Interactive Genetic Algorithm

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Abstract

Nowadays offering various models to users to choose from is of paramount importance and is considered as an important element in industry after quality. In this study for designing garment we used interactive genetic algorithm which requires skill, taste and creativity. Recently the interactive genetic algorithm has been widely used in different artistic fields such as music and architecture. In this application fitness function couldn't mathematically be used and the fitness value of each pattern is assessed by user. In the present study IGA is developed to generate patterns of the Iranian women's formal dress are taken as chromosomes and their elements as genes. The generated patterns are presented to the users for evaluation and the new population is formed intelligently on the basis of the observer's evaluation. The results showed that acceptable patterns can be obtained after a limited number of generations.

Keywords: Designing fashion, Interactive genetic algorithm, Garment patterns

1. Introduction

The word "design" is developed from designare in Latin language that means to symbolize some plan. The meaning of design has changed age by age. And now it doesn't mean planning rather it refers to the result of the plans [1].It's better to say that it refers to choosing among various style of cloths. Recently certain software has been widely used for designing in all aspect. Among them is Auto CAD from Auto desk [1]. Such software can receive fabric pictures and color from initiation pattern to make the desirable changes with the help of menus which we can choose among. Some design-aid systems have used Evolutionary Computations (EC). But they couldn't transfer the feeling of human beings correctly. So they should be changed or helped. One of the design-aid systems that can communicate with human beings is genetic algorithm. In 2000 Kim et al. proposed the system of designing fashion which used the native style of clothes based on a new way of encoding. They suggested a dress has three parts including body, neck and sleeve. They took some bits as parts and some other as their colors [1]. Another study by Gong, Hao , Zhou and Sun was a multi-population adaptive hierarchy and their application in fashion design in 2006. It was a model of multi-population with the structure of hierarchy. It searches in subspace and has adaptive operators. That means its crossover is based on hamming distance where two chromosomes which have a maximum distance are selected and mutation probability is related to fitness of the candidate [2]. There are some other researches in textile industry such as optimization of pattern layout considering multi set

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pattern &pieces rotation in 2005. The main purpose in this study , is Minimizing scrap losses without overlapping of pieces by GA [3]. And also designing of weaving fabric by genetic algorithm in 2008 [4] They are done by P.Payvandy.There is an application of IGA for generating of carpet pattern in 2009 that is done by F.Zamani et al [5].
In this research, IGA is employed to generate design pattern for Iranian women's dress. Fashion designing is time consuming and costly. This system can save time and money in addition it can use preference of human.

2. Methodology

Genetic algorithms are search algorithms based on the principles of natural selection and survival of the fittest .GA's were first introduced by John Holland [6] .A GA attempts to develop a solution using a population of potential solutions. Each solution has a fitness value associated with it. Interactive Genetic Algorithm (IGA) is the same as GA has a fitness function. In IGA user gives fitness to each individual instead of fitness function. In this way IGA can 'interact' with user, and also can percept user's emotion or preference in the course of evolution. For this reason IGA can be used to solve problems that cannot be easily solved by GA, such as design and art. The structure of program is illustrated in Figure 2.

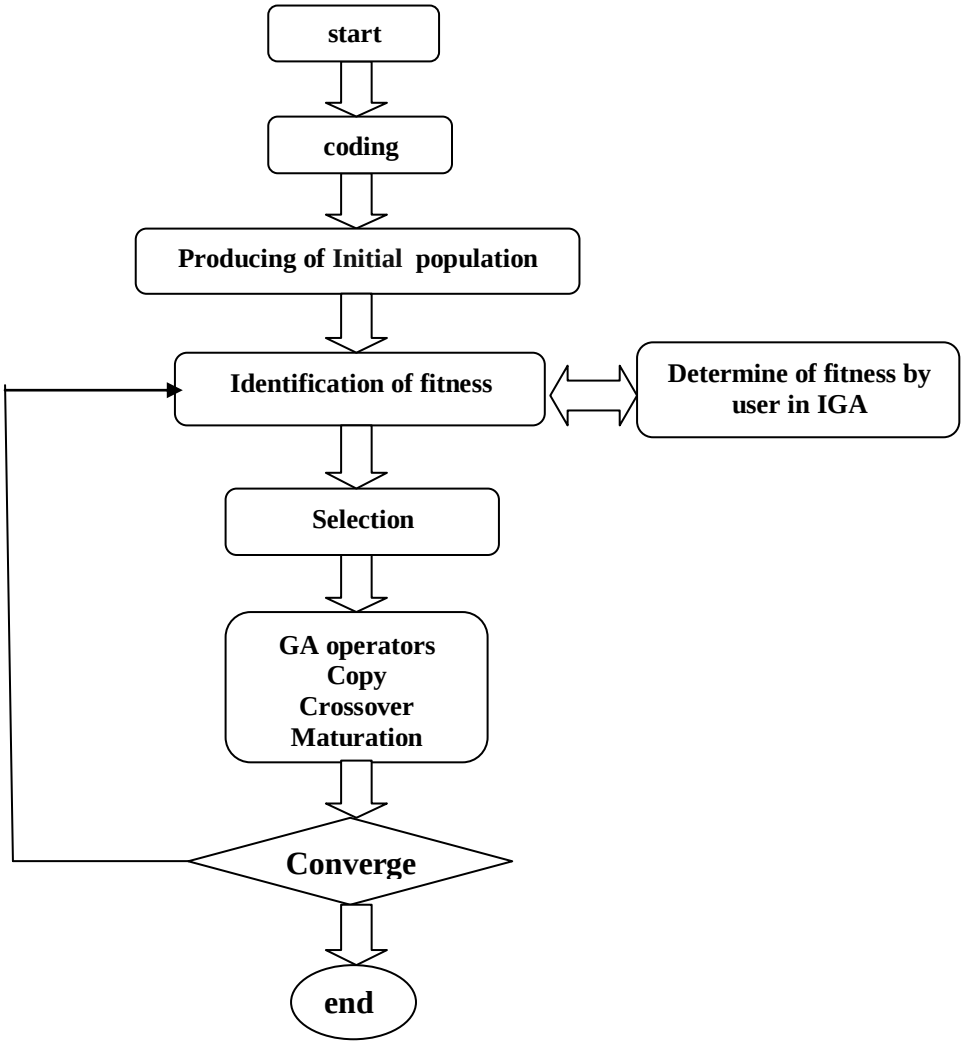

Figure2. The structure IGA

2.1Chromosome, genes and coding

In this study 50 pattern of women's dress is produced and then its elements are separated in to 6 parts including collar, sleeve, skirt, pocket, belt and button. Using this procedure the database is prepared and encoded in the form of real number. A sample of Encoding collar are shown in Figure 4

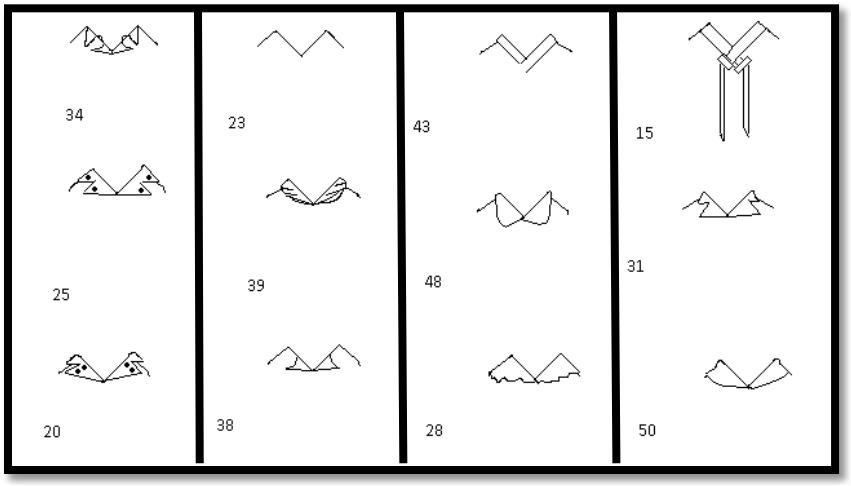

Figure4. sample of Encoding collar

Each pattern is displayed by a Chromosome, which includes 6 parts (collar, sleeve, skirt, pocket, belt and button) as genes. Some pattern may not conation all the parts. For example maybe a pattern doesn't have pocket or something else. Sample of the chromosome and their genes is shown in Figure 5. As it is shown in Figure 5 When every pattern is drawn as a chromosome, their elements are separated as its genes. By this way the Initial population is produce which is seen in Figure 6.

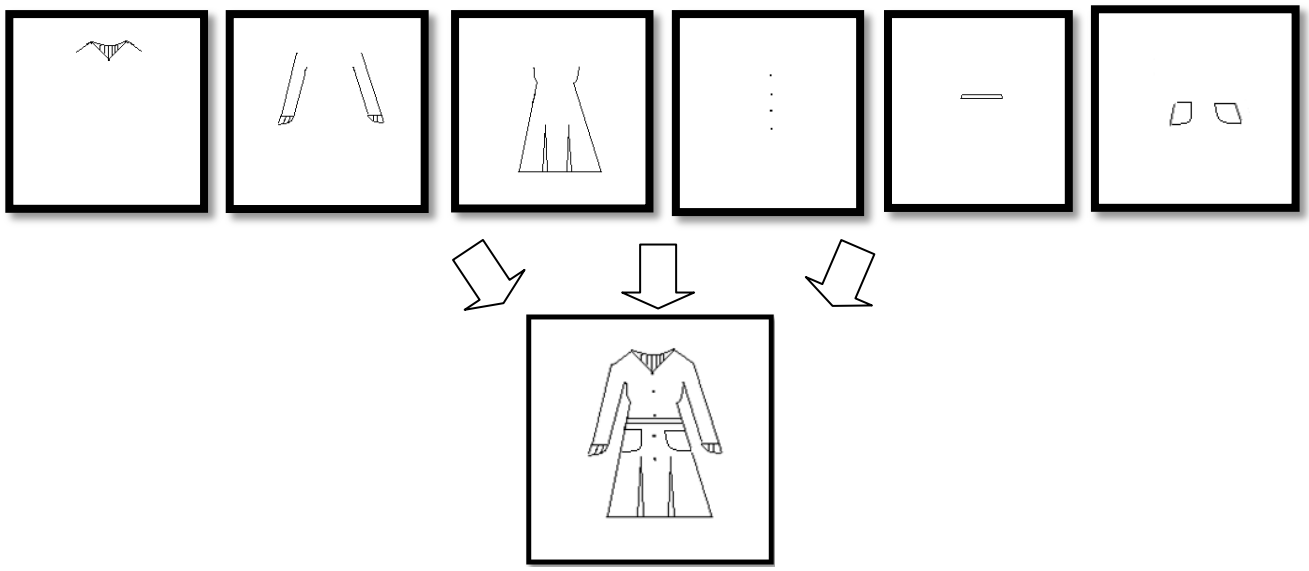

Figure5. Sample of the pattern and elements

2.2 Initial population

Initial population is produced by arranging genes in chromosomes randomly. This process is shown in Figure 6.

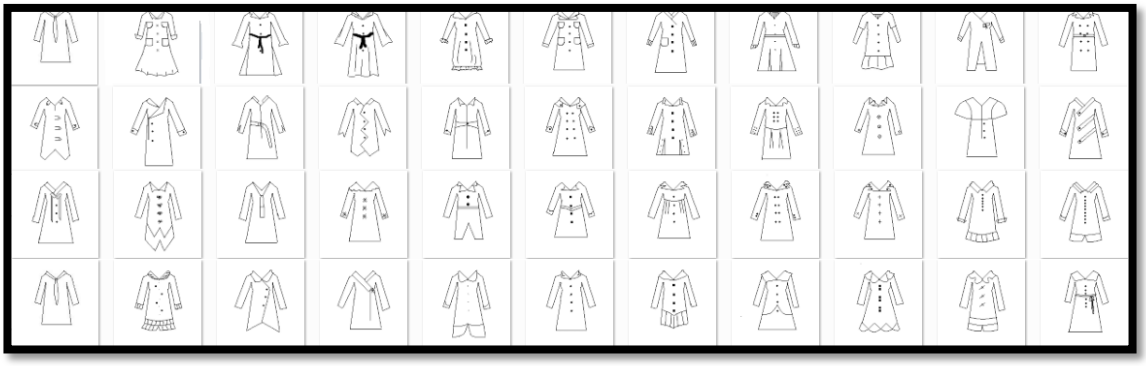

Figure 6. Initial population

2.3 Identification of fitness

In this step patterns in each population are presented to user .As it was shown in Figure 7 the user can be expressed his/her prefer which is index of fitness.

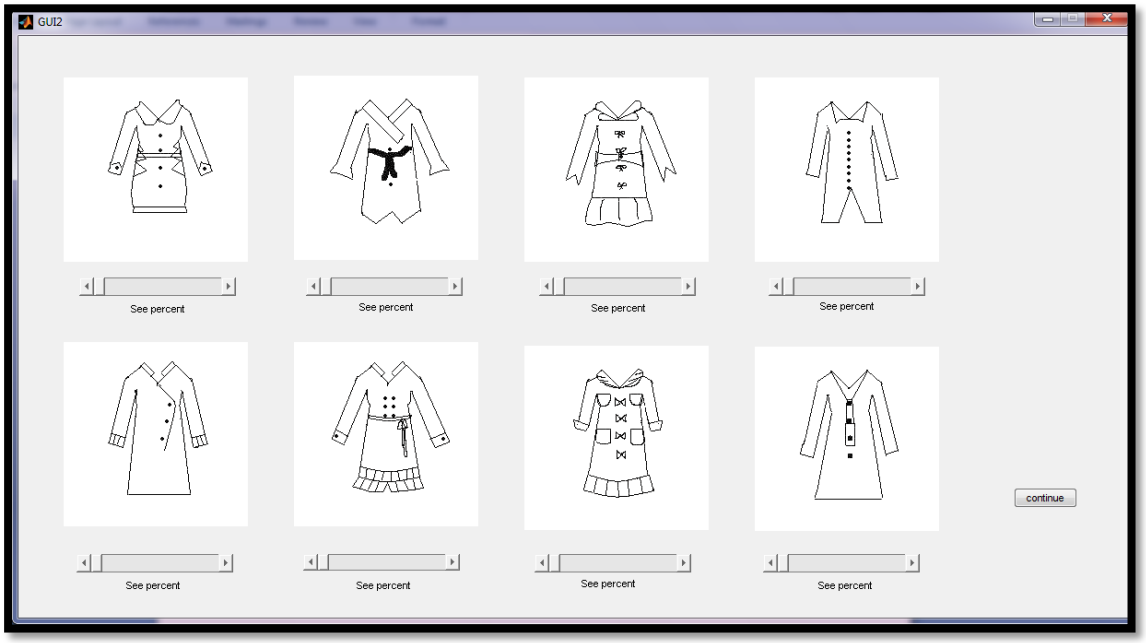

Figure 7. Identification of fitness

2.4 selection

The selection of the best chromosomes as parents for crossover operator is based on the chance of choosing highest finesses. This selection is carried out by the roulette wheel [5].

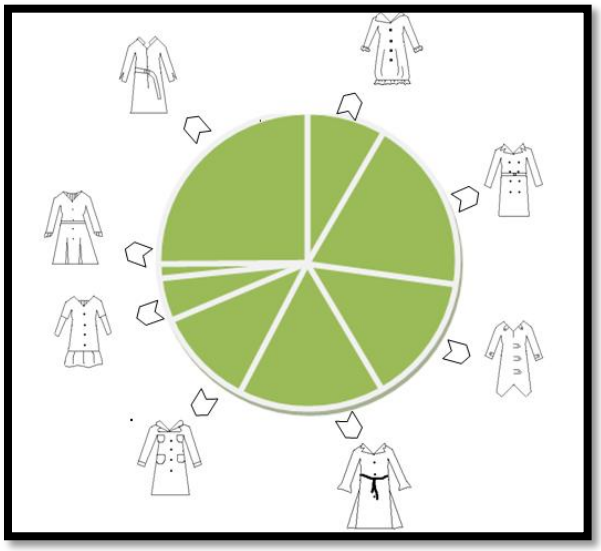

Figure 8. selection using roulette wheel

2.5 IGA operators

In this step, operators which consist of copy, crossover and mutation take action. The copy transfer the best Chromosome of the old population in to new population directly. This can improves the performance of system quickly and on the basis of the preference of the user. Also it prevents from losing the best that has been selected by user before. In crossover, there are the possibility of one, two, three, four and five point crossover simultaneously as it was shown in Figure 9. In fact in this operator some parts change between parents and produce new patterns as child.

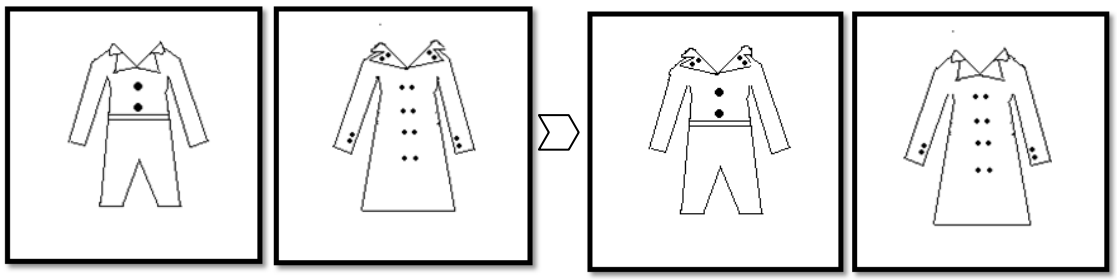

Figure9. Crossover in collar point (parents (left pictures), children (right pictures))

Also for mutation every part can be randomly replaced by a new one.

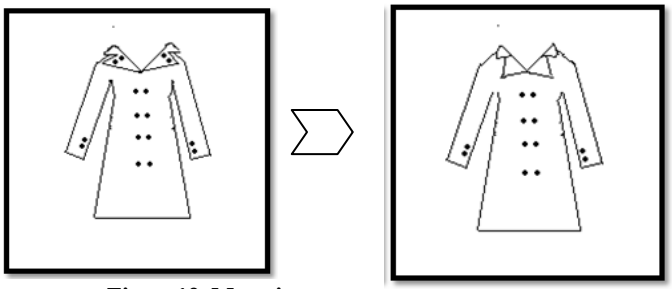

Figure10. Mutation operators

3. Experiments and result

To test how much the user is satisfied with this system, twenty observers were requested to use the system for finding their preference. All of the data is divided in to 5 groups and the average of satisfaction degree in 9 generations is obtained. The population number was 8 at each .Using more population numbers causes pictures unclear when presented to the user and also make users' tired to evaluate all population numbers . The percent of copy and crossover was optional but suggested to be 10%-60 respectively. The Figure 11show the average of fitness degree in generation number in simple IGA. Also the percentage of satisfaction which is shown in Figure 12 has maximum value in generation number 6

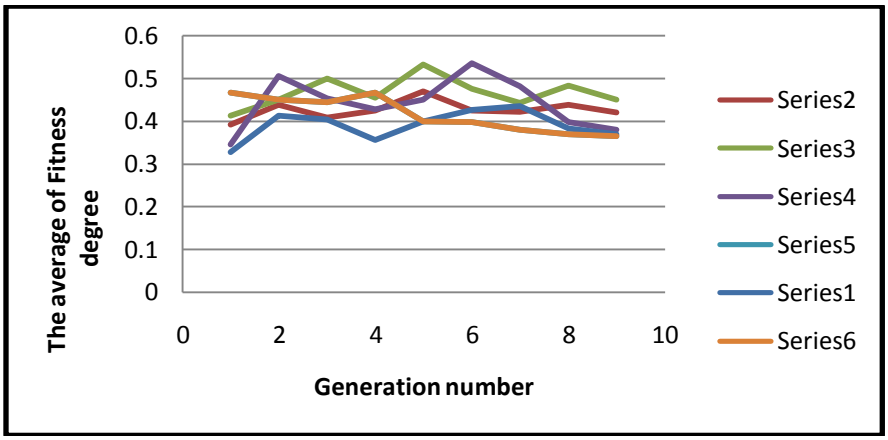

Figure11 .the average of fitness degree in simple IGA

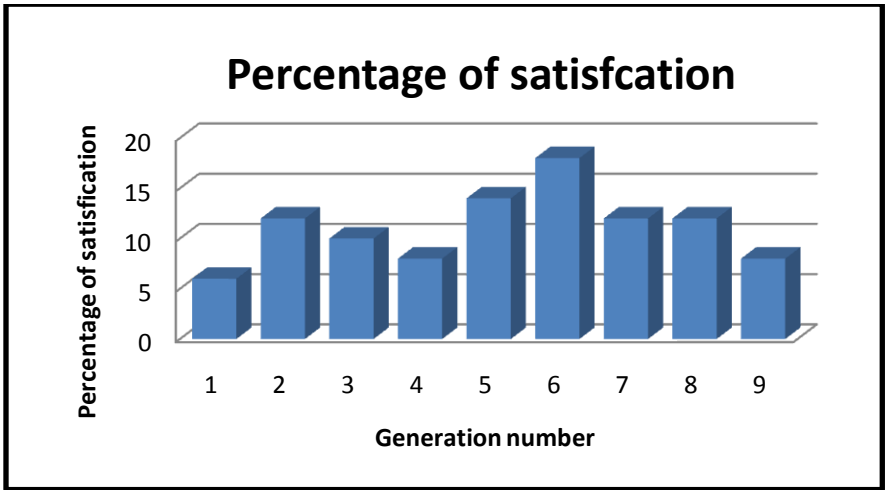

Figure12 .percentage of satisfaction

4. Conclusion

This article presented the generation of the Iranian women's formal dress according to IGA that is a based on a natural system. This evolutionary system is based on human preference and emotion. Because there are a lot of pictures that everyone must choose among them and it causes users' fatigue and needs a lot of time when only using fashion databases, this evolutionary system is so useful and helps user to get ultimate pattern but There is a limitation in searching data base because only 8 pattern evaluate by user in each generation. So the evolutionary algorithm doesn't search database efficiently. So it is suggested to use another subsidiary system that is presented in further studies.

5. References

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