COMP30290 NATURAL COMPUTING
PROJECT PROPOSAL 2012

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Project Title: To Evolve and Optimise Colour Sets for Website Templates Using Genetic Algorithms

Abstract:
In this proposal the problem of designing and optimising websites' colour template will be highlighted. A possible solution to the problem using Interactive Genetic Algorithms is proposed, and the process, methodology and observations are be stated. In addition, the issues with human interaction are detailed and mentioned, with possible solutions to the automation of this process offered.

I. THE PROBLEM

One of the most important aspect of a website are the look and feel, how the website is presented, what the design looks like, as it is one of the main factors that determine the usability of a website.

As it can be seen in most current websites, the styling relies on a set of colours which when chosen with care, can greatly uplift the quality of the overall look, however when chosen poorly it can repel users. A typical colour set would concentrate on one or two main colours, these being in most cases for background and foreground, such as text colour. The set would contain different shades of these main colours, usually chosen to fit the different roles they would take. As an example, most websites use plain white as their background, however a container within that site would have slight shade of grey as its background and have a dark colour, such as black, for fonts. The creation of an optimal colour set, one where the colours match nicely together, is sometimes a long and tedious process, as even a minor adjustment to one colour may offset the overall niceness, the measure of how much the colours fit well together in a human perspective, of the colour set.

The aim of this project is to see whether Genetic Algorithms (GAs) are an effective tool to develop and optimise colour sets for website templates, and to analyse how different combinations of GA methods can be applied to find an optimal algorithm to solve the problem.

II. THE SOLUTION

To develop and optimise colour sets, we are going to be using Genetic Algorithms. Colours are represented by a tuple of numbers, which can be easily represented in binary format. This format can be used as the genetic material for the GA. Evolutionary methods that have been used by Koza (1992) can be used on this

representation as well. However because the colour sets have to meet a human requirement, the evaluation has to be extended to involve some sort of human interaction where a person can choose between colour sets, and select the best X out of all, as GAs do not have the ability to simulate any of the human "intuition and emotion" (Sung-Bae Cho, 2002). This process of involving humans into the evaluation of GAs is a class of algorithms called Interactive Genetic Algorithms (IGAs).

The problem that might arise from using an IGA is that in order to achieve a solution, a larger population and a higher number of generations have to be used. And since the IGA uses a human to evaluate a specimen within iterations, it might take a long time before one run of the algorithm is completed. An option to simulate the human evaluation will need to be researched and implemented, in order for this process to be automated and sped up.

A possible solution to this problem would be the use of a neural network (NNs). It has been shown that NNs are a very powerful tool to classify difficult data (Jean-Charles Pomerol, 1996). However more research into the application of a NN to the fitness function of the GA has to be done. If a NN were to be used, it would have to be trained before the experiments. To achieve this, a large about of sample colour sets would need to be compiled ranging from very good to poor quality.

Another option to evaluate the fitness of specimens is to compile a set of good colour sets and look at the different attributes of the colours, and determine a relationship between them. Using the value of this relationship, the specimen could be classified and given a fitness value based on its closest neighbours. A possibility that might arise is the use of Fuzzy Logic, to evaluate fitness if a proper relationship could not be found (Jean-Charles Pomerol, 1996).

When an evaluation function has been found, the methods of GAs can be applied and observed on the data sets. It has been shown before that some methods, such as shuffling crossover are not beneficial to the evolution of the population (J. Byrne et al.). Throughout the experiments, the effects of the different methods will be examined.

At the end of the project, the question as to whether GA can be used to create and optimise colour sets should be answered. And if successful, a general algorithm highlighting the different GA methods used should be developed.

REFERENCES

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