CITS 4201 – Project Proposal

Using Genetic Algorithms to automate the optimisation of a web application interface

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Thursday, 12th March 2009
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1. Overview

One major problem in the design of the human computer interface of a web application is deciding on a layout that will maximise ease of use, maximise the usage of the available functions and be the most aesthetically pleasing. A good design in the interface will be able to maximise the number of return visitors and to maximise the usage of the system. For these reasons when designing a web interface layout one would try to optimise the interface to maximise the positive aspects of the interface.

This project proposal proposes a system where by the interface is automatically evolved through the use of genetic algorithms. Upon each evolution of the interface, it will be closer to the optimal interface. Such systems already exist for automatically optimising advertisements, facial recognition and things similar to these.

The system that will have this experiment conducted on is a proposed health monitor system, the “Virtual Health Monitor™” . This health monitor system is a comprehensive health management web application that allows a particular user to manage all aspect of their own health. A variety of different factors affect the particular health determiners that a person would want to track, such as age, gender, physical location, body type and more. For this reason we will need to separate each person into a specific group and have a particular generated interface for each of these groups.

This web application’s success in determined by the usage it generates and the return visitors to the web site. Return visitors are essential in ensuring that we maximise advertising revenue and increase the profitability of the website. The launch of this system is proposed to be on the www.virtualmedicalcentre.com™ website.
2. Background Material

The use of genetic algorithms to optimise web objects for interaction with users is not a new concept. One such example is [1] which provides the service of optimising online advertising so that the most successful combination of ad elements is used in order to increase the click through rate of any particular advertisement. However, this system is limited only to online advertising and works on a singular ad element, whereas the proposed system optimises a whole web application consisting of very many subsets of components to be optimised. However, the snapAds system does show an encouraging fundamental proof of concept for this proposed project.

This project would also have to cover the issue of determining the usability of a web application, in order to be able to determine which generation is the best fit. There is a number of automated web usability determining systems available, but none which are able to automatically update the interface to accommodate for inefficiencies in the design. The main inadequacies in the designs of these systems is the operations by which they determine the usability, such as the paper “The bloodhound project” [2] only conducts tests on sample of people by giving the user a predefined task to complete, rather than giving the user a system and seeing if they can create a task to complete themselves. Also, in “The Handbook of Latent Semantic Analysis” [3] uses a Cognitive Walkthrough of the Web (CWW) to identify usability problems, however this is aimed to help in the navigation of complex informational websites when there is a predetermined article or specific information the user is after. This proposed project is concerned with a web application, which is not necessarily a source of information (however you may obtain information from using it) it is a tool to help a user to achieve long term goals, such as weight loss, rather than short term goals, such as finding a single article.

Another paper that contains information on determining the Human Computer Interaction (HCI) effectiveness in a web application is “Using on-line surveys to measure three key constructs of the quality of human–computer interaction in web sites: psychometric properties and implications” [4] This paper covers an issue of using online surveys to determine the usability of a web site. This concept can be expanded upon to aid in creating the automated service and to determining the usability of the web application. Also the proposed system’s effectiveness will need to be tested, and we can use a variation on the online surveys and test it against a small sample group of users in order to determine the automated system’s effectiveness.
Once we are able to determine the usability of the web application we will need to be able to use the genetic algorithms to automate the optimisation of the web application. There are a number of papers and books published on genetic algorithms, but a few of particular interest for this project are, “Introduction to Genetic Algorithms” [5], “Practical Handbook of Genetic Algorithms” [6] and “Genetic Programming” [7]. The techniques and theories outlined in these books are the fundamental backbone of the system. The interface will need to be able to update itself as it identifies usability issues which are determined by the usability metrics.
3. Aims of the project

The main aim of the project is to have an automated system where the interface evolves for a user in order to make it more usable and aesthetically pleasing. Also, it is to create a benchmark of an optimised interface that would be displayed to new users of the system, based on the predetermined interface that they are part of.

The experiment will be conducted over a yet to be determined size of sample space, and the test application is proposed to be launched on Australia’s leading health information website, www.virtualmedicalcentre.com™. Using VMC’s average of over 2.5 million impressions per month, there will be a large enough traffic volume pushed towards the health monitoring system to ensure that we have the minimum desired sample space. Also, apart from using this as the only samples that we conduct, there will be small groups of users that will test the usability and complete an online survey in order to determine the effectiveness of the automated usability metric that is to be used.

The optimisation process will automatically categorise each user into a sub-group based upon their age, gender, geographical location and other determining factors. It will then determine which generation works best for each group of users in order to create the next evolution of the system for that particular set of users. It is necessary to have the system optimise separately for each sub-group of users as preferences will vary upon the user and their background.

The system will be discrete and transparent to the user, and will need to optimise and evolve the system without user intervention. However, an option not to have one’s interface optimised and to use a default interface will need to be built into the system, as the users may not want to participate in such an experiment but may still want to use the system. Also, a human selection process may also be used to decide upon the optimal theme that a user wants to use. If a group of users tend to create their own “optimal” theme, this will be taken into account and be highlighted as an option to all users of that particular group.

This system can be broken down into a number of sub-tasks that it needs to achieve for the system to be considered a success:

1. Attract users to the system
2. Measure the usability of the system for a particular set of users
3. Evolve the system to a more optimal state for this set of users
4. Repeat steps two and three till perfectly optimal
5. Have the users return and reuse the system on a regular basis
6. Independent surveys reflect the optimisation of the system.
4. Time plan
5. References


To whom it may concern

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