A Method Based on Interactive Evolutionary Computation for Increasing the Effectiveness of Advertisement Texts

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ABSTRACT

Interactive Evolutionary Computation (IEC) is used in this work in order to perform the optimization of several advertisement blocks of text. The advertisement texts follow a format similar to the one used in a technique called Article Spinning. This format allows an IEC algorithm to evolve the text, using words and phrases as variable parts which change according to the subjective evaluation of people interacting with the algorithm. After several generations, the IEC algorithm provides a version of the advertisement text that, in theory, should exhibit an increased performance, according to the subjective evaluation function it was evolved with. In order to demonstrate the efficiency of the texts, these are compared against a version determined by an expert in a field related to marketing. For this comparison, three tests are performed: recall, recognition, and persuasion tests. The results obtained show that IEC could effectively be used to increase the impact of an advertisement text.

Categories and Subject Descriptors

H.1 [**Models and Principles**]: User/Machine SystemsSoftware Psychology; J.1 [**Administrative Data Processing**]: [Marketing]

Keywords

Interactive Evolutionary Computation, Textual Advertising

1. INTRODUCTION

Textual communication can greatly impact an individual in terms of persuasion [8]. This is important to be noted, as text still plays a major role in advertisiment texts in many communication channels, such as the Web. One can still see many text-based ads while navigating most websites, and this should imply that a great effort is put into creating these advertisiment texts. As stated in [7], accurate wording is essential in verbal communication, and this fact can be extended to textual communication [2]. Having this idea in mind, we can assume it's paramount for an advertising campaign to have a correct combination of words for a textual advertisement, so it can cause the desired impact. This is the reason behind the proposed method in this work. The goal of the method is to find a suitable combination of words, in an a semi-automated way, that when read by an individual, it has a better probability of transitioning into a desired state. Having such a tool could help a marketing expert in the process of creating an advertising campaign, as well as lower its overall cost by decreasing the necessary expertise of the human resources.

The process of changing some words of a block of text, while retaining its original meaning is called valence shifting. Another definition, as can be found in the work by Demir [2], states that "valence shifting is the task of rewriting a text towards more/less positively or negatively slanted versions." The method proposed would use a kind of valence shifting to rewrite advertisement texts in order to obtain versions that have a more positive connotation, based in terms of persuasiveness towards buying the product being advertised. Several techniques can be found in the literature that have been used to produce valence shifting in sentences, as the one proposed in [9]. In this work, we propose an innovative approach based on Interactive Evolutionary Computation (IEC) to determine a better combination of words in a block of text. The use of IEC is justified by two reasons: 1) human beings can help determine what combination of words is more appropriate to affect themselves, and 2) individuals interested on performing this search for a better combination can restrict the search space as they see fit. The latter reason shall be discussed in greater detail in Section 3.

As a justification of the importance of having well written text ads, one can see the works from Hsieh, and Chen [11], and Lewis, Whitler and Hoeg [12], who study how the type of content (i.e., videos, text, images, or a mix of these types)

GECCO '15, July 11 - 15, 2015, Madrid, Spain

DOI: http://dx.doi.org/10.1145/2739482.2768486

of a website affects the users' attention towards website advertisements, and determined that text does have an effect on the reader.

In order to perform valence shifting to increase the persuasiveness of a text using IEC, the proposed method relies on a technique called "article spinning," which is mainly used in commercial applications hasn't been widely used for research purposes. The structure proposed in article spinning enables the representation of a text as a chromosome in a genetic algorithm. This technique [14] is used as an automated web content authoring method, and is described in greater detail in Section 3. By using article spinning, this work relates to those in the field of Natural Language Processing (NLP) [17] and, being more specific, to those in the field of template-based Natural Language Generation (NLG) [15]. Some authors have made a distinction between two different approaches in NLG: real (or traditional) and template-based NLG [19]. It can be noted that the proposed method could be classified as a template-based NLG technique.

To test the presented method, an experiment based on the work by Hsieh and Chen [11] was performed, and is explained in the Section 4, and is an extension to a previous work by the authors of this paper, and it can be found in [13]. In Section 2, an overview of related work is presented. In Section 3, the method and its implementation are discussed. The conducted experiment and its results are discussed in Section 4. Finally, a conclusion is given in Section 5.

2. RELATED WORK

The proposed method performs valence shifting by applying IEC techniques. The method is inspired on several works, like the one by Trujillo, Garcia-Valdez, Fernandez-de-Vega, and Merelo [18], where they use IEC to evolve animations. The platforms these authors use is the same used in the experiments of this work, namely Evospace [3] and Evospace-Interactive [4], both developed by Garcia-Valdez. Other works that use IEC to evolve products that are likable by the people who help in the evolution process are: Picbreeder [16], an online service that allows users to collaboratively evolve images; EndlessForms.com [1] is a website that allows its users to collectively explore the space of CPPN-encoded objects via interactive evolution by selecting the objects they are interested in, which serve as parents for the next generation. In general, one can see that IEC can be used to find solutions to problems where the fitness function of the evolutionary algorithm is the subjective opinion of a human being.

This work mentions the concept of persuasiveness of a text, and that is what is measured in the conducted experiment (see Section 4). Guerini, Strapparava, and Stock [10] present a work that measures this persuasiveness of a textual message based on how many clicks it receives by using Google AdWords. As mentioned before, this persuasiveness is achieved by performing valence shifting on the advertisement texts. Two of many experiments that prove that valence shifting is achievable can be found in the work by Gardiner and Dras [5], and the work by Gatti, et al. [6]. There are several works that propose methods for performing this kind of process, such as the one presented by Demir [2], and the work by Guerini, Strapparava and Stock [7].

3. PROPOSED METHOD

The central piece of this method lies in the template the advertisement texts follow in order to be optimized (defined by the article spinning technique). The template allows the recombination of parts of a block of text, and these parts can be individual words, phrases, sentences or whole paragraphs. For example, consider the generalized text shown in Figure 1. In this text, we can see some "words" in curly braces, separated by bars, and other pieces of text labelled just as "text" in bold. To clarify, consider the following example: the template **{Hello | Good morning | Greetings}, stranger! {How are you? | How's the weather?}** could produce some of the following combinations: 1) Hello, stranger! How are you?, 2) Good morning, stranger! How's the weather?, 3) Greetings, stranger! How are you?

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{A1 | A2 | A3 | A4 | A5 | A6} text {B1 | B2 | B3}
{C1 | C2 | C3}, text {D1 | D2 | D3 | D4 | D5}
text, text {E1 | E2 | E3 | E4 | E5}.
Text {F1 | F2 | F3 | F4 | F5} text, text, text.
{G1 | G2 | G3}.
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Figure 1: Text block format

This template can easily be represented as a vector or a chromosome in a genetic algorithm. For example, a vector <3, 2> would mean that, in a given template, that chromose refers to the third text in the first "curly braces group," and the second text in the second group. Applying this vector to the example mentioned in the last paragraph, this would produce the following text: **Hello, stranger! How's the weather?**. The search space would then be restricted to those combinations that can be generated by this template, which can be represented as a chromosome. IEC can now be applied to look for a sub-optimal solution in the search space that is generated by the template's options, and this solution would be found by using the subjective evaluation of the human beings who choose what combinations are better. It is important to be noted that a solution found by IEC would only be a good solution in that particular search space, and would be almost impossible to achieve "the best" advertisement text. Also, to clarify, a search space would be determined by the number of options in the template. For example, a template with 7 text groups, with 5 options each would create a search space of $5^7 = 78,125$ possible solutions. A generalized example of this relationship between the template and a chromosome is shown in Figure 2

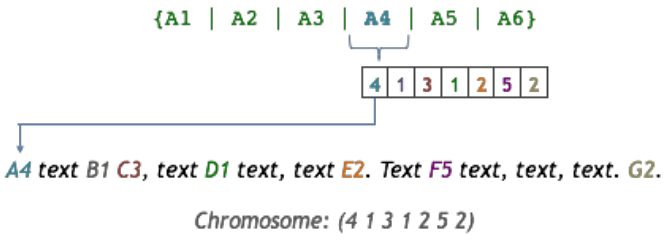

Figure 2: Chromosome representing a template

Incorporating IEC into the proposed method was achieved by using two technologies: Evospace [3] and Evospace-Interactive [4].

The evolution of the texts was aided by a website with a graphical interface following the structure presented in Figure 3. This website does not perform the evolution process, but only allows users to interact with the textual representations of the chromosomes stored in Evospace. Whenever a user enters the website, the web application in the backend selects two individuals from the population contained in Evospace, and the interface transforms these individuals into their textual representation. After this transformation, the user is capable of choosing one out of the two texts that are being presented. The selection must be done according to a question that is presented to the user, in this case, "Which of these text ads would you convince you more to buy this hamburguer?" This way, users begin to choose what words they think "sound better", and what order of words should the ad follow.

Figure 3: Graphical user interface

After a certain number of generations (number of users choosing what texts are better), a sub-optimal solution should be generated.

4. EXPERIMENT AND RESULTS

The purpose of this experiment was to prove that the evolved texts could compete in performance to those generated by marketing experts, and thus supporting the hypothesis that IEC can be used to improve the quality of an advertisement text. Consequently, five experts in fields related to marketing were asked to create their own versions of "the fittest" combination from the template. A paper sheet (shown in Figure 4) containing all the group of words and their options was given to each of the five experts, and they were asked to choose the options they thought were best in order to effectively persuade an individual into buying the product being promoted.

For this experiment, the proposed method (as explained in Section 3) was followed and 100 participants were asked to choose one out of the two ads that were presented in the graphical user interface. After selecting one of the ads, they were asked to choose again, so each participant would perform an evaluation between the two ads twice. This process was performed two times, first for a textual advertisiment about a hamburguer, and the second time for an automobile advertisement. After this evolution process, the fittest individual from each population (the hamburguer and automobile populations) were chosen, and their textual representation was taken to be compared in terms of persuasiveness to the versions generated by the experts.

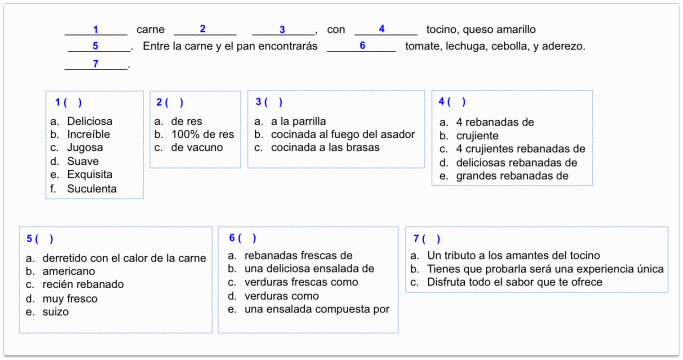

Figure 4: Template given to the experts

To determine how well the evolved advertisement texts performed against the experts' versions, three tests were conducted, based on the work by Hsieh and Chen [11]. In this experiment, the authors show the participants a website with multimedia content and some advertisements. The participants are then asked if they noticed an ad in the website while they were navigating. If they did recognize the ad, they are then asked if they recall what was the ad about. In this manner, the authors are capable of determining the performance of an ad in terms of recognition and recall.

For the experiment conducted in this paper, another test was added, and the participants (the participants were different than those who helped in the evolution process explained before) were also asked what advertisement text they thought would be more persuasive, by showing them the evolved version and the experts' versions of the ads. The participants had to interact for 30 seconds with a dummy website , where a movie's trailer is played to distract the participant's attention. After the 30 seconds of interaction, the participants were first asked if they recognized the ad. If they did, they were then asked if they could recall what was the ad about. Finally, they were asked to compare the evolved ad against one of the five experts' version. To complete the experiments, a total of 150 participants were needed for each of the ads (hamburguer and automobile).

The results of these tests are shown in Table 1 (hamburguer ad) and Table 2 (automobile ad). These tables present the average performance of each of the experts' versions against the evolved text. For example, a 46% of recognition means that 69 participants successfully recognized the ad, taking into consideration all the five experts' versions. In the case of the hamburguer ad (Table 1), the experts' versions scored a better performance in recognition, but failed in recall and persuasion against the evolved text. In the case of the automobile (Table 2), the evolved text scored a better performance in every test.

5. CONCLUSION AND FUTURE WORK

As a conclusion, this work serves as proof that IEC is a promising technique for performing valence shifting to a text, and that it has the possibility of matching the performance that an expert would achieve when choosing a combination of words from a template. The proposed method

Table 1: Results of the experiments with the hamburger advertisement text.

Type of Text	Evolved Text	Expert's Text
Recognition	40%	46%
Recall	27.3%	22%
Persuasion	56%	44%

Table 2: Results of the experiments with the automobile advertisement text.

Type of Text	Evolved Text	Expert's Text
Recognition	65.3%	54.6%
Recall	32.6%	24%
Persuasion	54%	46%

could prove to be a valuable tool for the creation process of a marketing campaign that involves advertisement texts.

The authors are working on implementing a similar technique as described in [8], where Google AdWords is used to perform experiments with greater numbers of participants. This approach gives the advantages of testing the advertisiment texts in a real-world situation, as well as giving the possibility of testing several advertisiment texts in a relatively short period of time. A fuzzy inference system would be part of the solution to control the bid's amount of each ad unit, and help in the process of determining what ad units should be removed or kept longer in the advertisiment campaign, and thus helping indirectly the evolutionary process.

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