

GameSense *

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ABSTRACT

This paper presents a novel game-like advertising system called GameSense, which is driven by the compelling contents of online images. Given a Web page which typically contains images, GameSense is able to select suitable images to create online in-image games for advertising. The contextually relevant ads (i.e., product logos) are embedded at appropriate positions within the online games. The ads are selected based on not only textual relevance but also visual content similarity. The game is able to provide viewers rich experience and thus promote the embedded ads to provide more effective advertising.

Categories and Subject Descriptors

H.3.5 [Information Storage and Retrieval]: Online Information Services—*Web-based services*

General Terms

Algorithms, Experimentation, Human Factors.

Keywords

Image advertising, online game.

1. INTRODUCTION

The proliferation of digital capture devices and the explosive growth of online images have led to countless image collections on the Internet. These images naturally would become a region of interest in a Web page. Associating related ads with image content is an effective way for advertising [2]. Compared with other advertising media such as text, image, and video, games are more attractive and can deliver much more enjoyable experience to users. Using game as an advertising carrier, users can get more involved with image contents so that ad impression can be significantly promoted at the same time. If the ads related to image content can be embedded during the game, it would be a new perspective for advertising. Gamers' competitiveness to rack up high scores will make them spend more time in the game which can increase the effect of the advertising campaign.

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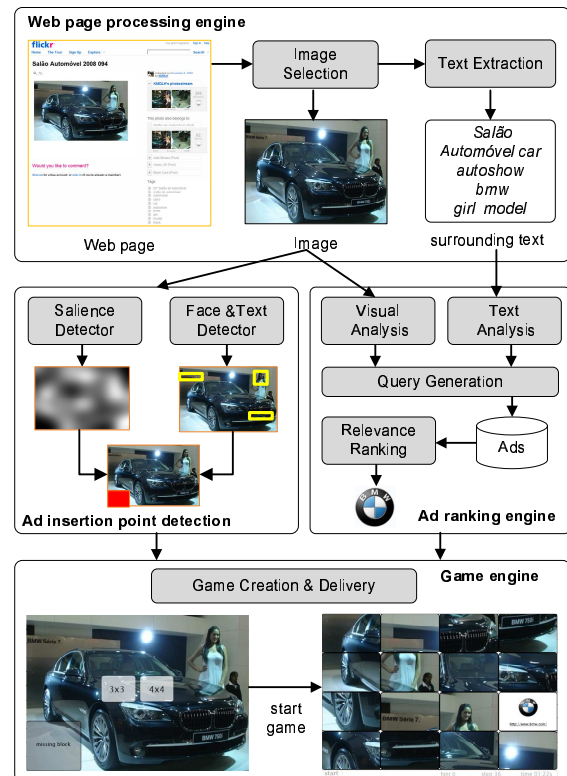


Figure 1: System framework of GameSense.

Motivated by the above observations, we present a new online advertising model dedicated to image on the basis of gaming form, called GameSense, which supports creating a game from an online image and associates relevant ads within the game. Different from existing in-game advertising systems that use digital devices and video games as a medium for advertising, GameSense leverages the pervasive and compelling image contents as advertising carriers and creates a game for each individual image. It is convenient to apply GameSense as a real online service based on existing Web client-side technologies such as JavaScript, Flash, and Silverlight. We use “sliding puzzle” game as a demonstration in GameSense.

2. SYSTEM

The system consists of four major components: Web page processing engine, ad ranking engine, ad insertion point de-

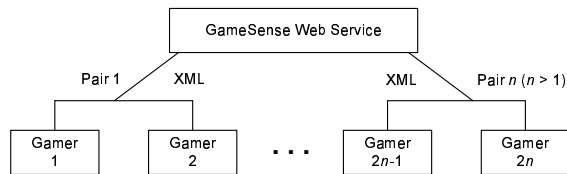


Figure 2: GameSense two-player mode.

tection, and game engine. Figure 1 illustrates the system framework of GameSense. Web page processing engine selects suitable images and extracts surrounding text by Web page layout analysis. Ad insertion point detection component detects the most non-salient area for ad insertion through visual salience analysis, face, and caption detection. The ranking engine ranks the ads according to textual and visual relevance between the ads and the images. The game engine creates a Flash or Silverlight game and delivers it to client browser.

3. IMPLEMENTATION

Image selection. We adopt document object model (DOM) tree-based method to analyze the page layout and select the images which are suitable for creating games with ads in the page. Intuitively, the images with poor visual qualities, or belonging to the advertisements or decorations (usually are too small), are filtered out [2].

Game creation. To create a sliding puzzle from an image, the image is partitioned into 3×3 or 4×4 pieces in a random order with one missing as the empty space. The objective of the game is to place the pieces in order by making sliding moves with the empty space. A relevant ad is embedded in this empty space when gamers slide the pieces to figure out the whole image. Inspired by Google Image Labeler [1], besides the single-player mode, the game can run in the two-player mode which allows gamers to form pairs randomly and compete to solve the same sliding puzzles. Client games interact with a Web Service on the GameSense server to update the playing status. Figure 2 illustrates multiplayer interactions.

Ad position detection. As the games are created by images, the detection of ad insertion position is based on image saliency analysis, as well as face and text detection. The advertisement area should be the most non-salient area within the original image, so that the informative content of the image will not be occluded and gamers will not feel intrusive to the advertisement [2].

Ad ranking. Conventional contextual advertising primarily matches ads to Web pages based on webpage understanding. Besides the global relevance between the ad and ad landing page, the ad should be relevant with the local information (such as surrounding text and image content) associated with the image. Note that the position of ad is fixed to a image grid during the game. Thus, given an ad insertion point, the ads are selected from the ad inventory and ranked according to the textual and content relevance. Given an image I in the Web page P , we seek an ad x to maximize the following relevance function.

$$\arg \max_x \{w_g R_g(P, x) + w_\ell R_\ell(I, x) + w_c R_c(I, x)\} \quad (1)$$

where $R_g(P, x)$ is global page relevance, while $R_\ell(I, x)$ and $R_c(I, x)$ are local textual relevance and image content rele-



Figure 3: An example of applying GameSense.

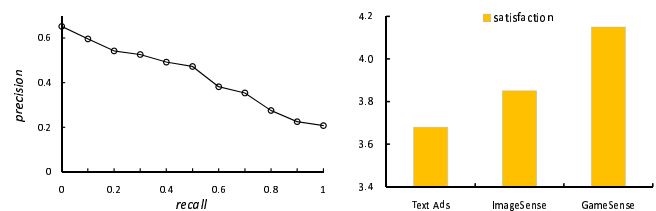


Figure 4: Evaluation on ad relevance and user experience.

vance, respectively.

Apply GameSense as an online service. There are three main roles in the ecosystem of game advertising, i.e., publishers, advertisers, and game service providers. Figure 3 illustrates how publisher subscribe GameSense service. Publishers only need to insert a piece of codes into their own Web pages. Then a Flash or Silverlight game embedded with an ad will be delivered to the browser from GameSense Server.

4. EVALUATION

We have collected 7,300 advertising logos, 6,400,000 photo pages from Flickr.com. The representative top 100 queries from a commercial image search engine were used to search the Flickr collection and the top 10 pages were returned for each query. One image was selected for advertising in each triggering page. For each image, we returned the top 10 ads. 15 subjects were invited to judge the ad relevance. For each page, three different kinds of advertising including conventional text advertising, ImageSense [2], and GameSense were provided to the subjects to give the overall satisfaction scores (1-5). The higher score indicates the higher satisfaction. Figure 4 shows the 11-point average precision curve and the evaluation result of user experience. It is observed that GameSense has provided acceptable relevant performance, and achieved better user experience than conventional advertising.

5. REFERENCES

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- [2] T. Mei, X.-S. Hua, and S. Li. Contextual in-image advertising. In *Proceedings of ACM Multimedia*, pages 439–448, 2008.