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Measuring Semantic Complexity of Images: An Explanation of Image Taboo

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Research Motivation

Through this project, we seek to better define the semantic space of images.

Our results may impact the accuracy of image search results and the semantic web as a whole.

Image Semantic Complexity

(Figure 1)

(Figure 1) has a low image semantic complexity.

(Figure 2)

(Figure 2) has a high image semantic complexity.

Prior Results

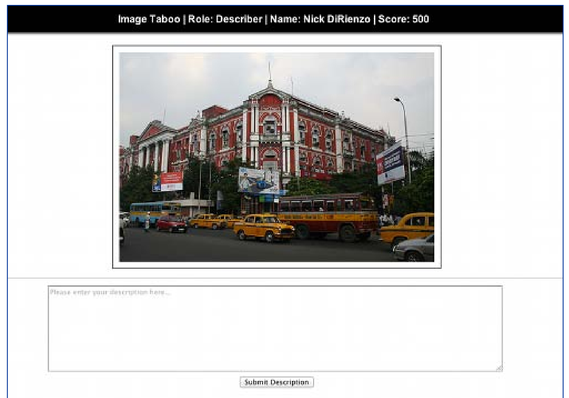
In the Fall 2011 semester, a passive version of Image Taboo was created. Through internal testing, we collected 271 descriptions and 412 games were played. Through a more real-time game, we hope to receive far more data.

Real-time Image Taboo

We propose a fun way to use human participants as data collection tools. We developed an online game where two strangers connect over the Internet to cooperatively score points. Each player is either a Describer or a Guesser, and their individual score is determined by their role. To make it addictive, we have a global leaderboard where players can see how they rank amongst the rest of the world as either a Describer or a Guesser.

The Role of the Describer

The Describer views a single image, known as the Key Image, which is then described in a text box (Figured 3). As the description is being written by the Describer, our system streams this description to the Guesser's screen. To achieve a high score, the Describer must try to use the least amount of words as possible, but can only score those points if the Guesser guesses correctly, so the Describer must make each of the words quite descriptive. The Describer, however, cannot remove characters once they are written in the text box.



(Figure 3)

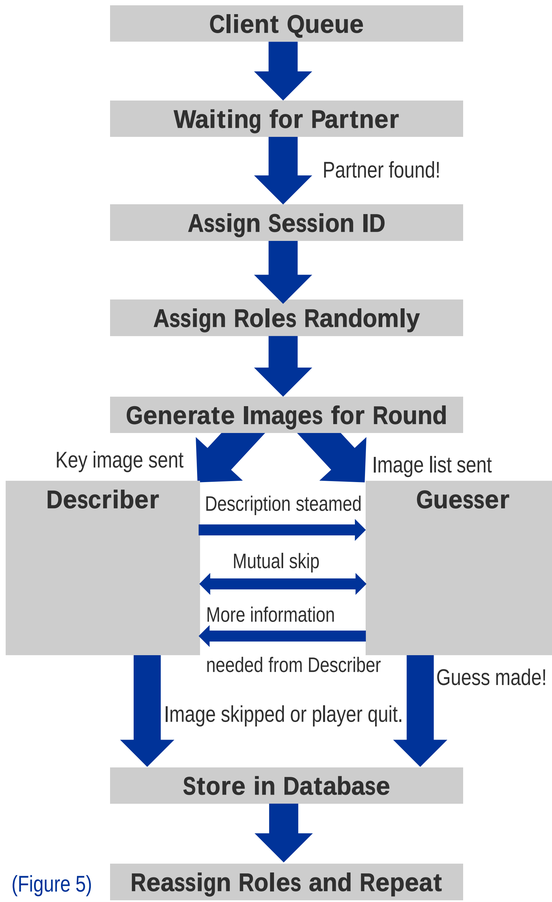
The Role of the Guesser

The Guesser views the Describer's streaming description and the grid of images (Figure 4). This grid of images can range be a 2X2, 3X3, or 4X4 grid. In this grid of images exists the Key Image, which the Guesser is trying to determine from the Describer's live description. The Guesser only has one opportunity to guess for a Key Image, and can only score points if correct.

(Figure 4)

Real-Time Control Flow

(Figure 5) describes the control flow of Image Taboo.



(Figure 5)

Communication Between Players and Server

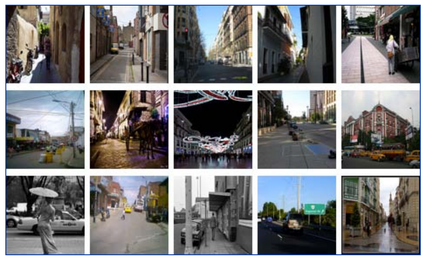
We utilize new web technologies to provide users with a real-time experience. Image Taboo uses scoket.IO for communication over a persistent socket between server and client. Our system passes along almost all necessary data in JSON (JavaScript Object Notation) to the client, the client primarily communicates that way between other clients, and the server is there as a relay. At times, the client must request data from the server (i.e. the list of images), and that is through a normal GET request. To log data into our MySQL database, a client makes a normal POST request as well.

Authentication

To keep track of users, we opted to authenticate using Google Accounts. By doing so, we ease our development by not having to create our own authentication system because we can utilize the OAuth technology to authenticate users using their Google Account. By authenticating users, we can be confident that each user is playing another unique user.

Dataset

For the initial release of Image Taboo, we will be using the "street" synset from image-net.org. (Figure 6) is a sample of the synset.



(Figure 6)

Technology Stack

Image Taboo is built in Python using the Tornado web server, and to provide real-time communications the Tornadio2 module is utilized, which allows socket.IO to be used with Tornado. To store data, Image Taboo uses MySQL.

Future Work

Image Taboo is under active development. Image Taboo will not only be a browser based application. Our next development phase will consist of creating an iOS implementation to interact with other iOS and browser users.

References

[1] L. von Ahn, "Games with a purpose," IEEE Computer Magazine, pp. 96 – 98, 2006