eContact Concept Paper

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After working on eye tracking during StudioNext I felt that I hadn't fully dug into the potential eye tracking presents to interact with people's emotions, so I formed that as a goal for myself this semester. Our eyes have evolved to communicate our emotions and read those of other people with amazing range and precision. In the fall Slavko encouraged us to investigate the eyes as a powerful human stimulus. While investigating a few directions for this project I learned about MIT's attention meter kit[1], which is meant for graphic interface developers. Although I liked the idea of enhancing human-computer or human-human interactions in digital medium, I didn't have a clear direction or focus. As I did more research I learned that although there are a multitude of variables in how we communicate with our eyes, the simple act of making eye contact is one that eye tracking could easily track and be used to enhance many interactions in electronic communication.

In depth research in the effect of eye contact only really took off in the 1960's. At this time several researchers started doing precise observations on the pace and length of eye contact in interactions. From them we know definitively that all people use eye contact in a conversation to let the other person know you are hearing what's been said. Without eye contact people feel that they are not fully in communication, and typically there is more eye contact when the subject is listening than when he is speaking. Eye contact can have a variety of subjective meanings - such as friendship, sexual attraction, hate and a struggle for dominance.[2] Eye contact is used with different frequencies and durations in different cultures, but it is always used to underline conversations.

The major inspiration I had for the direction of with this project was when a classmate, Jes, skyped into our class to participate. We set a computer up on a chair so we

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[1] Lee, Wetzel, Jang, Shen, Chen, Selker. "Attention Meter: A Vision-based Input Toolkit for Interaction Designers." CHI 2006, April 22–27, 2006, Montréal, Québec, Canada.

[2] Argyle, Dean: "Eye-Contact, Distance and Affiliation." Sociometry, Volume 28, Issue 3 (Sep 1965), 289-290.

could all see her face. I tried to wave at Jes but I had no idea if she saw me or was looking in my direction – it was impossible to tell by following her eyes on the screen. I then decided to address this problem because without knowing what the other person is looking at, video chat will always fall short of face-to-face interactions. Because of the placement of the camera and the placement of the video chat window, your eyes can never meet those of the other person, and this problem occurs on all computers, with all chat programs.

Knowing how simple it would be to track the frequency and duration of eye contact, and that overcoming the challenges of the camera angle would be difficult in the time allotted, I came up with a software- based solution I call eContact. This solution lets you know when other person is looking at your face in video chat. It provides a layer of feedback based on the location of each chat partner's gaze. If the other person is not looking at your face, their window appears darker on your screen. A white outline indicates that you are transmitting your eye to face contact to your partner. I tried to think of the simplest way to indicate eye to face contact. Using the programming language Processing[3] I was able to get the basic building blocks of this program working, but wasn't able to put them together. All elements of this program are viable in this language, except that the eye tracking program currently relies on an external eye tracking device[4]. In moving forward with the project I decided to assume it would only be a matter of time before it was able to use regular webcams, which would help my program be widely available to anyone with a webcam and computer. The program works by using an algorithm to detect faces in the video chat window, and eye tracking to detect

[3] www.processing.org
[4] German Research Center for Artificial Intelligence. http://www.dfki.de/web.

the user's gaze and their proximity to the face region[5]. With these elements in place, there are infinite options for the type of visual feedback that could be given to the user, which I will discuss in a later section.

I envision this program being most used and appreciated by people talking to others that they are already intimately connected with, including families, close friends, and couples. Video chat provides a level of intimacy that casual users don't always want because they often multitask while chatting and don't feel the need to see the other person's face[6]. Families however like video chat because you can see the other person's environment, the conditions they are in, and their face and expressions, which are already familiar. In addition, families using chat are often from two different generations, one who may be comfortable multitasking, and one who may not. EContact would be helpful in these cases to indicate to the non-multitasking user that the other is a little distracted, to help them understand that video chat is not the same as a real conversation. Another user group that could benefit is the 70-75 year old age range, which has had the largest percentage increase in internet use since 2005[7]. Many people in this age range use the internet to connect to their families and other seniors via social media, and this group is also unlikely to understand that other people multitask while chatting.

In thinking through how this program would work I tried to incorporate several design principles including affordances, scaffolding, and basic interactivity. The affordance in this program that indicates what's happening to the user is the white outline around the window when they are making eye to face contact. This allows the user to

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[5] Wilson, Fernandez. "Facial feature detection using Haar classifiers." Journal of Computing Sciences in Colleges. Volume 21, Issue 4 (April 2006) 127 – 133.
[6] Swift, Mike. "Video Chat gets an upgrade." *San Jose Mercury News*. Web. 8 October 2009.
[7] Taub, Eric. "Helping Grandpa Get His Tech On." *New York Times*. Web. 28 October 2009.

understand what is being transmitted to the chat partner. In terms of interactivity, my program enhances a normal conversation, which already is interactive. In normal conversation we respond to many signals in voice, expression, scent and gaze of our partner, but these are lost in video chat. With eContact, in addition to hearing the normal give and take of a conversation, you can see that give and take as well. If there isn't a good rhythm to it, you know your partner may be distracted and you can end the conversation politely, another principle we call graceful degradation.

Scaffolding is a term that refers to using existing frameworks to help a user become familiar with your program or product, and then having it slowly fade away Scaffolding for eContact would involve mimicking the mouse-over function, which users are already familiar with, which highlights buttons when your mouse is over them. Users would grasp from the white outline on the chat window that their eyes were acting more like a mouse. The scaffolding for this program would also indicators in the buttons used on Skype or chat windows. There is also a similar program used in many type chat programs that notifies you when the other person is responding, giving you one more indicator of the other person's attention level to you. With eContact text reading "(Partner's name) is looking at your face" or "(Partner's name) is distracted."

Although I decided to come up with a software-based solution, there are other hardware solutions out there that allow you to transmit direct eye contact to your partner. Several companies and individuals make teleprompters to reflect the chat partner's image on glass over the camera, so you can look through their face into the lens[8]. There are also methods involving rear projection systems or suspending the camera in front of the screen. Apple also has a patent on small embedded cameras hidden among LCDs in a

[8] www.iris2iris.com, http://datenform.de/blog/here-is-looking-at-you-kid/, http://www.bodelin.com/se2e/

screen that can build an image and allow a user to look directly at the screen and at the camera, and a patent for embedding one or more cameras behind the screen and rotating the active and inactive parts of the screen to create an integrated image from all the sources[9].

The main problem with these solutions is that if the other person doesn't have the same apparatus, you may transmit eye contact to them, but you still won't see their eyes. In addition, it's likely that these solutions would be more expensive and it would take time before they could be integrated widely into all computers. While businesses and corporations may be able to afford this, my research has shown that these users prefer not to look at the other person's face in video conferencing, but instead share a screen to write notes and discuss work together[10]. Targeting users who want to speak to people they are already familiar with, eContact could animate emotions that consumers would appreciate, which I will discuss in the next section.

Of course eContact relies on the complicity of video chat programs, but it is much easier to implement than changes to hardware. This idea will be more likely to catch on because no matter what, video chat is different than a face to face conversation, and even if eye contact were possible, there are a lot of small details missing that we rely on to help us communicate. Adding the option for more emotional feedback in the form of software and graphics will help the medium of video chat become understood as a separate form of communication, and can help people figure out what video chat works best for.

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[9] Blass, Evan. "Apple patent embeds thousands of cameras among LCD pixels" *Endgadget.com*. Web. 26 April 2006.
[10] Swift, Mike. "Video Chat gets an upgrade". *San Jose Mercury News*. Web. 8 October 2009.

Future ideas for this program involve testing different types of feedback to add to the video window. After presenting my ideas to the class, Slavko suggested adding emoticons for extra eye contact, since that is something people have invented for themselves to add more emotion to electronic communication and clarify when they were joking or serious[11]. I also received the suggestion to design an experience for people using video chat, which seems to be an area with a lot of room to play in. Because video chat will never be like a face-to-face conversation, there is an opportunity to see how many things can be done with it. I think the idea of animating emotions, either with traditional emoticons, or drawings or objects users can upload themselves is the most promising and exciting.

There is also an opportunity for this program to enhance social media. Skype, a major provider of video chat, envisions their program as a way to make social networking more personal and emotional. Two weeks ago Skype's Chief Technology Strategist Jonathan Rosenberg talked about social networking as "broadcasting" information about yourself, but these "broadcasts" lack emotion and interaction[12]. Their company believes that to be truly social, these networking features in the future will be synchronous, or in real time, with emotion and interaction capabilities that don't yet exist. My concept fits right in with this vision.

I have enjoyed working on this project and feel it has allowed me to investigate many issues I am interested in and test my skills in design, programming, research, and teamwork. I am not sure how much farther I can take the project now, although the latest

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[11] Ludden, Jennifer. "Emoticon Inventor Marks Web's Birthday With A :-)" *NPR Interview*. Web. 5 Nov. 2009.

[12] Courtney, Jim. "Skype's Jonathan Rosenberg: The Rise of Real Time Social Sharing." *Voice on the Web*. Web. 22 Apr 2010.

feedback has pushed me in an interesting direction. I may try to program more over the summer to have something I am really proud of for my portfolio. I am a little disappointed that I didn't commit to a direction sooner to allow myself more time to try to make a program that actually works. In all I enjoyed the work I did on the project and the class time a great deal, and think that it was a great opportunity to learn how best to push myself to perform in the future.