Mediating Video and Sensor Data to Foster Empathy.

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ABSTRACT

My research looks at how to use biosensor data to enable the use of video as a more empathetic and more scalable input for designers. Prior work has shown there are mediations of biosensor data that positively impact empathy in communications. My research starts by applying these mediations to user research, followed by exploring how to use these mediations to increase the scale of video in design. Finally, I test these findings in an iterative redesign process. This work will provide information on the benefits, challenges, and applicability of these mediations which will enable their use in user research in general and other "one way" communications.

KEYWORDS

empathy, user research, video, biodata

1 INTRODUCTION

Empathy is seen as one of the key elements which designers use to understand their users [11, 19, 23]. And one of the largest differentiators between user research methods which aim to help a designer form empathy is the media and material shared with the designers [20, 21]. My work focuses on video data, which has a rich history of being used in design, with specific methods such as video diaries [3, 18], cued recall [1, 2], and naturalistic studies [6, 7, 17]. The aim of this research is to understand how video ban be enhanced and improved as input for designer's work.

One source of inspiration for increasing the empathy between two people can be found in affective Computer Mediated Communications [16].One specific branch of these affective communication methods is "expressive biosignals", where biosensor data from one person is expressed to another in order to increase empathetic connection [13, 15, 22]. Similar biosignals (heart rate and skin conductance) have been tested in order to give designers information of users' emotional state in different areas [8], my research aims to explore how these biosignals can support similar insight along with the rich temporal information of video.

This fusion of video and biosensor data can be done in multiple ways: from visual overlays to adding audible heartbeats. I refer to these variations as "mediations", since they mediate the viewing experience of the observer. In order to properly explore these mediations I will conduct a series of studies using video data of real users.

2 FUTURE WORK

My exploration of these mediations will focus on three questions: 1) Do existing mediations "work" with video? 2) Can biosignal mediations be used to help scale video research? 3) How can these mediations best support the design process?

In order to address questions 1 and 2 I will conduct two lab studies that focus on using video and biosensor data of cyclists. This will be followed by an iterative Research through Design process in which I will create guidelines around selecting and using mediations, give these guidelines and mediated video data to designers, and observer and reflect on their use of the guidelines and mediations.

2.1 Study 1: Verifying CMC mediations for video

A widely used biosignal used to foster empathy is the other person's heartbeat [10, 12–14, 22]. Presenting an audible heartbeat while looking at a static image of another person has been shown to increase empathy and a feeling of connection [22]. I want to test if this phenomenon still applies when applied to video data.

In order to accomplish this, I will conduct a simple study using the heart rate data of a cyclist, along with video of their ride. This will be converted to audible heartbeats using the same procedure used by [22]. Then, I will conduct a simple between subjects study, where half of the "observers" are shown the original video and half are shown the video with the heartbeat audio added to it. In order to measure the impact on empathy, I will use a similar method to [22] by first measuring global empathy (an observer's overall capacity for empathy), then presenting the stimuli, then measuring state empathy (an observer's empathy for another in that specific moment). Unlike [22], I plan on using the State Empathy Questionnaire [16] which measures state empathy in three dimensions: cognitive, affective, and compassionate.

2.2 Study 2: Scaling video with biodata

Building off of the results of the first study, I want to explore how mediations can help one of the largest issues with video data: the scale. Video is noted to be "...organizationally and analytically complex" [4], a large part of this is the fact that video needs to be watched in real time, and often multiple times. There have been efforts to select "key moments" of video to review based on sensor data [6], however these key moments being selected in order to gauge the safety of bike rides, not prioritizing the empathy generation of the observer.

In my second study I aim to create a similar process of scaling video by using biosensor data to highlight moments of "valence change", moments when the emotions of the rider change. First, I will gather video and biosensor data from ten bicycle rides. Using this data, I will conduct a "gen-rank-verify" study similar to the one

used by Do et al. [5]. Using the dataset, I will first apply a series of pre-existing mediations focused on enabling the "observation" of these ten bike rides rapidly. Using this initial set of mediations, I will "rank" them using a small group of participants in order to get the three "most promising" mediations (mediations will be compared using a combination of the state empathy questionnaire as well as the NASA-TLX [9] to gauge the "challenge" of each mediation). Finally, these three mediations will be used in a between subjects "verify" phase similar to study 1, where the impact on empathy and cognitive load will be measured and analyzed.

2.3 Case Study: Using biosignals in a redesign process

The impact of the mediations covered in the first two studies can benefit any "video like" setting (that is, a real time, audio-visual, one-way communication setting), however I want to specifically focus on how these mediations can benefit the design process beyond the impact on observer empathy. In order to create this enhance the benefit for the design process, I will first wrap up the successful mediations as well as observations around their use, impact, and cognitive load into a set of "design guidelines" that help designers select and use the mediations based on their current goal.

These guidelines are naturally based on assumptions and observations from a short term study setting, which might not generalize to an iterative design process. Thus, I will recruit a team of designers to go through such a process while using my design guidelines. In order to enable a team of designers to quickly iterate a product that involves rich, dynamic user experiences, I will have these designers design a meal kit service (where the user gets a collection of ingredients and instructions in order to make meals). This will enable inexpensive and rapid iterations while keeping a rich and temporal data-set consisting of video of users cooking along with their heart rate data.

Based on the first week's data, designers will be given an initial version of the guidelines as well as access to the videos of a group of participants using an initial meal kit, processed by the mediations developed in the previous studies. By observing their design process and behavior, I will gain insight into which guidelines and mediations are beneficial for the design process and how they are used. This information is then used to create a new iteration of guidelines, while the results of the design process (a new set of ingredients and instructions) are sent to participants who then capture their experience which are used to create a new set of mediated videos. This process will then be repeated four times, resulting in five iterations of the guidelines, five sets of mediated videos, and four iterations of the meal kit.

By applying the mediations and guidelines around them to a functional design process with multiple iterations, I will be able to gain insight not only into how these mediations are used, but also how designers use these mediations to communicate their insight with each other and how they reflect on previous iterations, both essential to the design process.

3 EXPECTED CONTRIBUTIONS

Given the increasing ubiquity of inexpensive video cameras and biosensors, my work on exploring and validating how these data sources can be mediated together will enable increased empathy for those consuming video. By then integrating the results and challenges of the studies into a design tool I also contribute actionable knowledge to the design field. Finally, I expect that these mediations, and the methods around implementing them, will enable empathy generation in many types of communication and media.

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