

Software Engineering Institute

Executive Summary

Community Partner

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Student Development Team

Asawari Kanitkar

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Background

A few years ago, researchers at CSAIL, MIT published a seminal paper on Eulerian Video Magnification, a process by which it is possible to visualize the human pulse from video. This was accomplished through the use of computer vision techniques to track the user's face and signal processing to extract heart rate estimates accurate within five beats per minute. The Software Engineering Institute (SEI), a federally funded research and development center headquartered on Carnegie Mellon's campus, has iterated on MIT's research to produce a prototype that extracts a heart rate from the frequency of light reflected off of a user's face.

Project Description

Project Opportunity

The SEI seeks to extend their prototype for demo purposes and solicit feedback from users. The technology currently exists locally and requires the client's machine in order to be demonstrated. Consequently, use of the technology is restricted to in-person meetings with the client. Our client's mission is to demonstrate and make this technology accessible to a larger audience.

Project Vision

Our project is the first step towards deploying the prototype by providing heart rate analysis through a live demonstration of our client's technology. The objective of our application is to allow anyone with a computer webcam to obtain their own heart rate by recording a video to be processed by our client's technology. This technology challenges the existing market for wearable health monitors by eliminating the need for costly devices and focusing on the sole use of video input through a non-invasive technique. With increased accessibility and development, the potential applications of this technology are numerous, ranging from aiding security screening measures to medical use in developing countries.

Project Outcomes

We created an interactive website that captures a user's heartbeat and maps it to their corresponding physiological status. Our interface coordinates with the client's algorithms to enable users to determine their heart rate in a few clicks, view rich visualizations of the resulting estimates, and provide feedback to further the technology's development and outreach.

Project Deliverables

Source code for our website is included in a GitHub repository shared with the client, along with extensive documentation of installation and execution. We also handed over documents detailing process work, design and technology decisions, current issues, and future plans.

Recommendations

Our client organization is highly technical by nature. However, any future developers on this project should have an understanding of WebSocket technologies, the facial recognition and tracking technologies employed, and JavaScript libraries used to graph the resulting heart rates.

It is also important for future developers to understand the project's long term goals, one of which is to be able to stream video and receive heart rate estimates in real time and another being the ability to process multiple requests to the client's server at once. We opted for WebSockets to scaffold this functionality but further development on the front-end and back-end is required.

Student Development Team

Asawari Kanitkar served as the Assistant Lead in Development. She is a third-year student majoring in Information Systems and minoring in Business Administration. This summer she will be working at Bank of America.

Divya Mohan served as Back-End Development Lead for the team. She is a third-year student double majoring in Information Systems and Human-Computer Interaction. This summer she will be working as a front-end engineer at Slack.

Katie Williams served as Design and Front-End Development Lead for the team. She is a third-year student double majoring in Information Systems and Human-Computer Interaction. This summer she will be working in front-end design and development at Apple.