
SOFTWARE REQUIREMENTS SPECIFICATION

for

Pulse : Heartbeat Detection
using Webcam

Version 1.0

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1 Introduction

1.1 Purpose

In Today's scenario, more and more people are having cardiovascular diseases as they work in a sitting environment and lack of exercise with poor eating habits all these factors lead to heart diseases and increase the number of deaths per year. So ,to live a proper healthy life we should be able to know about our body but many equipment that are used to measure heartbeat is expensive and not available at many places or even they are not available 24/7 so this software is going to use a webcam to take live video streaming of your face which will then calculate the variation in colours that your forehead undergoes it will determine the HB. heartbeat sensor is an electronic device that is to measure the heart rate i.e the speed of the heartbeat. It takes less time, which is advantageous in the case of sudden need of testing. Monitoring heart rate of body and blood pressure that are the basic things that we do in order to keep us healthy. The goal of this is to understand the effects of realistic conditions for the application of health monitoring which deals with health monitoring at public spaces (i.e. airports, subways, malls,etc).

1.2 Document Conventions

This Document was created based on the Software Engineering (SE) concepts for System Requirement Specification Documents.This SRS is for developers, project managers, users and testers. Further the discussion will provide all the internal, external, functional and also non-functional informations about "Pulse".

1.3 Intended Audience and Reading Suggestions

The document is intended for Monitoring heart rate which is very important for athletes, patients as it determines the condition of the heart (just heart rate) as well as it is available to any other individual or a user.

1.4 Project Scope

1. It's a non-contact method to measure someone's heartrate.
2. Works as a Digital Heart Rate monitor
3. Works as patient health monitoring system

2 Overall Description

2.1 Product Perspective

The capability listed in the section on product functions is offered by the standalone model "Pulse". The main objective of this project is to streamline the results delivery of this Heartbeat Detection system while minimising work and hardware requirements.

2.2 User Classes and Characteristics

User Classes -

- Users of the web application "Pulse" should be able to retrieve theirs or someone else's heart rate via video camera in real time. The web application will support two types of user classes, Ordinary, and Professional. As professionals such as healthcare practitioners, would need accuracy and reliability. As ordinary users i.e. the general population, would prefer a fast execution time, good responsiveness, and a small application footprint.

User's Characteristics -

- Every user should be able to work without any difficulty and have some medical understanding.
- He must also possess a fundamental understanding of English.

2.3 Product Functions

The intended structure needs to be strong and stable enough to handle real-time data without risking data loss.

Frame capture, face detection, region-of-interest (ROI) definition, trace extraction, frequency domain filtering, peak detection, analysis of repeating points of interest, heart rate display, and software implementation form the foundation of our solution. More specifically, the ROI definition increases the use of ROI data. Fig. 1 depicts the projected framework, which is described as follows:

The face detection process begins as soon as the camera is turned on, and the ROI of the forehead is then isolated to extract the R, G, and B traces.

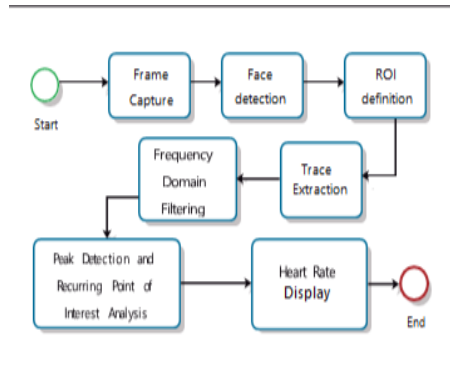


Figure 2.1: Data Flow Diagram

2.4 Constraints

1. The time allotted for this project will be limited to the end of this semester.
2. The language for the project will be Python and the development environment will be the embedded Python 3.11.2 environment.
3. All the HTML code for the user manual will conform to the HTML 4.0 standard.
4. Programming is done in Python, CSS, HTML.

2.5 User Documentation

1. The system will provide an online user manual in HTML that describes the functionality and options available to the user.
2. The system will provide a hard copy of the user manual, which is identical to the manual outlined above.

2.6 Assumptions and Dependencies

Assumptions -

- The web application mentioned within this Software Requirements Specification document is previously administered with the correct information needed for heart beat detection.
- For higher accuracy, since professionals do not usually tabulate tardiness, it is assumed that the user is of a particular skin color, standing still in a sufficiently bright lit room. The web application also assumes that the background of the user is clear.

Dependencies -

- Heart rate measurement used for setup and face recognition is dependent on the user and is administered outside of the capabilities of the heartbeat detection application.
- Statistics on heart rate measurement is dependent on a user's consistent utilization of the website for the time period.

3 System Features

"Pulse" is a Heartbeat Detection using Webcam model. The main art of this project is to display person's Heartbeat using live video stream from their webcam.

3.1 Functional Requirements

1. The "Pulse" website is being build using Python, HTML, CSS, Flask framework.

Back-End - Python

Front-End - HTML, CSS

Web Framework- Flask

2. The face detecting process begins automatically when the camera is started.

4 Other Nonfunctional Requirements

4.1 Software Quality Attributes

1. In the development phase testing is being continued. So that the quality of the software is being maintained and all the requirements are being fulfilled. Testing will be further continued while implementing next steps too.

2. The whole process runs real-time.

3. The application works well in normal lighting.

5 Diagrams

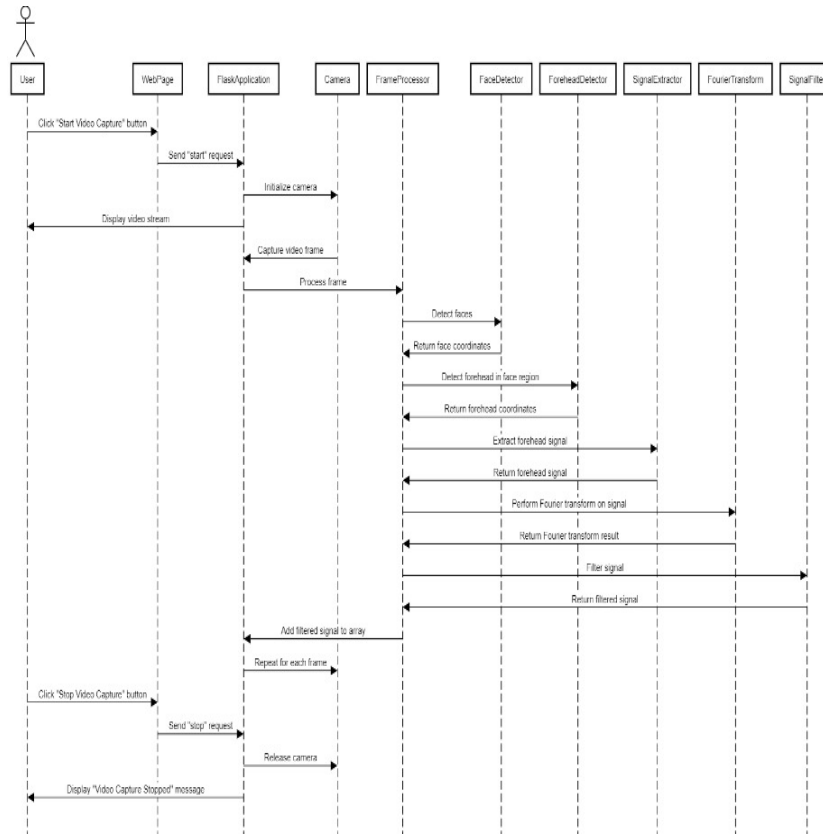


Figure 5.1: Sequence Diagram

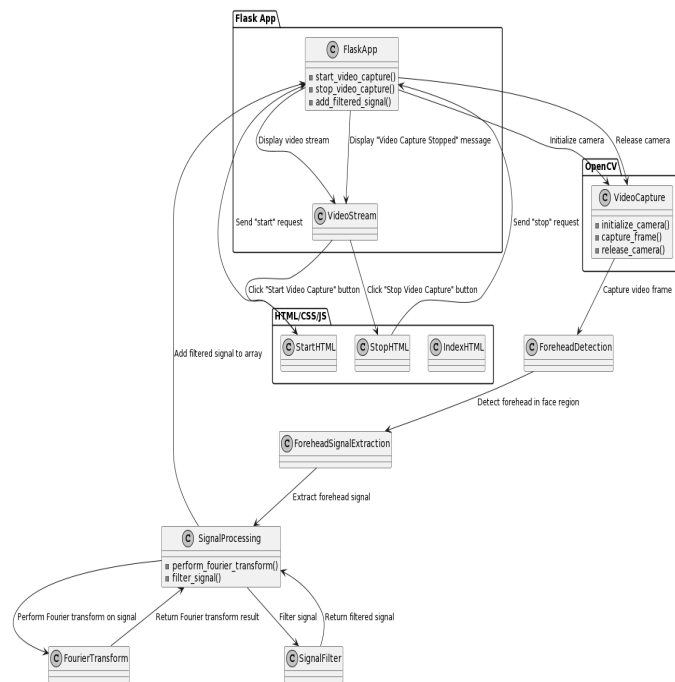


Figure 5.2: Component Diagram

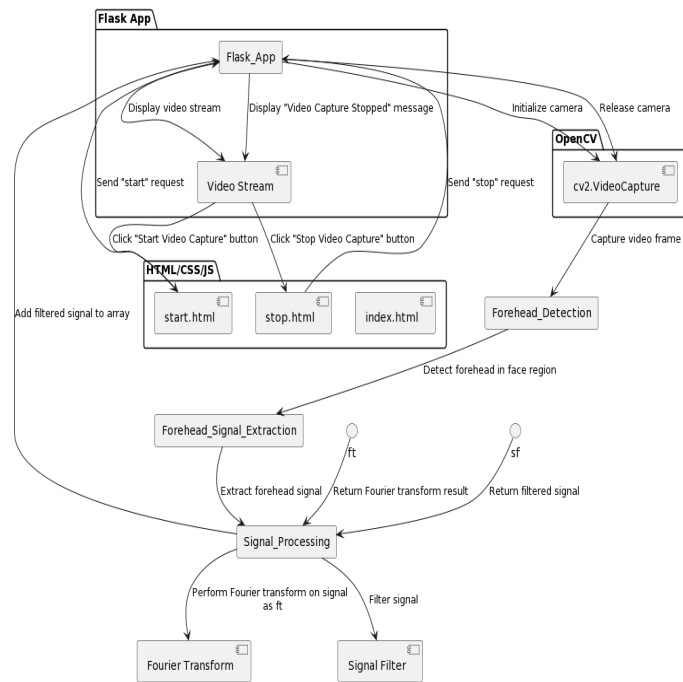


Figure 5.3: Class Diagram

6 Appendix

1. Frame capture: This refers to the achievement of a frame through a webcam connected to the computer.
2. Face detection: This refers to the process of locating faces within an image or video frame. It involves identifying the position and size of the face in order to extract features for recognition.
3. ROI Definition: A region of interest is a sample within a data set identified for a particular purpose. The concept of a ROI is commonly used in many application areas.
4. Trace Extraction: This refers to the standardization of image obtained in RGB format, eliminating the mean value for every color frequency, creating the variance between samples unitary as follows:

$$\hat{C}_i(n) = \frac{C_i(n) - \mu_i}{\sigma_i} \quad (6.1)$$

Here i is for R, G and B, μ_i and σ_i are the mean and standard deviation for each frequency, respectively.

5. Frequency Domain Filtering: Frequency Domain Filters are used for smoothing and sharpening of image by removal of high or low frequency components.
6. Peak Detection: A common requirement in scientific data processing is to detect peaks in a signal and to measure their positions, heights, widths, and/or areas.
7. Recurring Point of Interest Analysis: This refers to execution process of heart rate estimation by studying the prevailing peaks in the found signal in the prior step of frequency domain filtering.