Washkewicz College of Engineering

Faculty Sponsored Senior Design Project Description

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Desired Team Makeup:

- **Primary discipline:** Computer Science
- **Additional (optional, for multi-discipline project):**

Project Title: Contact-Free Heart Rate Measurement System Based Real-time Human Face Video.

Project Objectives:

The objective of this project is to develop and design a simple and efficient system to achieve robustness in the non-contact heart rate (HR) and respiration rate (RR) measurement under more challenging and realistic capturing scenarios in real-time based on human face video.

Project Description:

In this work, a non-contact method is used to extract the heart rate (HR) and respiration rate (RR) in real-time based on a human face video analysis. The arterial pulsations can be extracted from the subject's forehead by measuring the variations of the color space average of the same areas in different frames and convert the data to the frequency domain. To this end, we first detect the subject's face and eyes, after that detect his/her forehead based on the face and eyes' location. Then we find the variation in the Hue (color space) of the same areas from different frames and convert the data to the frequency domain. Since the frequency of HR and RR is in a certain range, we can calculate the HR and RR.

The students will investigate the relationships between different camera-based non-contact methods to extract the physiological parameters like HR and RR, with detailed justification of the aid of these typical types. Then characterize the methods that fit the system structure to analyze the signal in real-time.

Success Criteria:

The project will be deemed successful, if the following criteria are all satisfied by the end of the project.

- Acquiring the heart rate and respiration rate using the video of individuals' faces.
- Create a model that is able to measure the captured heart signals with high accuracy rates.

Assumptions / Risks / Obstacles:

The success of this project relies on a number of existing software packages in different programming languages from different communities. Acquiring the heart rate and respiration rate in real-time will be the main challenge.