Heart Rate From RGB Video

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ABSTRACT

Non-contact heart rate measurement has been an area of interest since late 90s due to its wide range of applications from checking driver's conscious to monitoring students engagement in online educational platforms. despite the huge improvements over years, their robustness is in doubt. in this report, an implementation inspired by [4] and [2] and [1] is provided and also the model is evaluated on HCI Tagging Database [5]. code is available at link

1 INTRODUCTION

A person's heart rate can reveal a lot about his/her emotions like whether he/she is interested in something or not. traditional methods for this purpose include electrocardiogram(ECG) which requires patients to wear chest straps. heart can also be measured by oximetry sensors that may be worn on the fingertip.

variations in blood volume cause different wavelength of light to be absorbed and transmitted by skin. Verkruysse *et al.* showed that we can detect heart rate via a regular color camera.

2 PROCESSING PIPELINE

The approach taken here, is based on signal processing, the three main steps are :

(1) Detect Region of Interest (ROI) of Face
(2) Process RGB signals and detect the one associated with heart rate
(3) Calculate beats per minute (BPM)

the processing step outputs are depicted in Figure 2

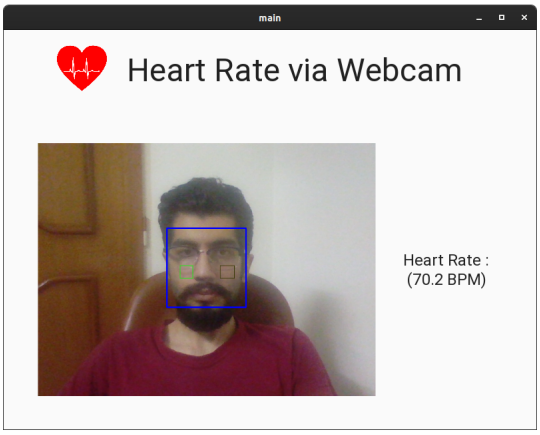

Figure 1: Graphical User Interface Provided

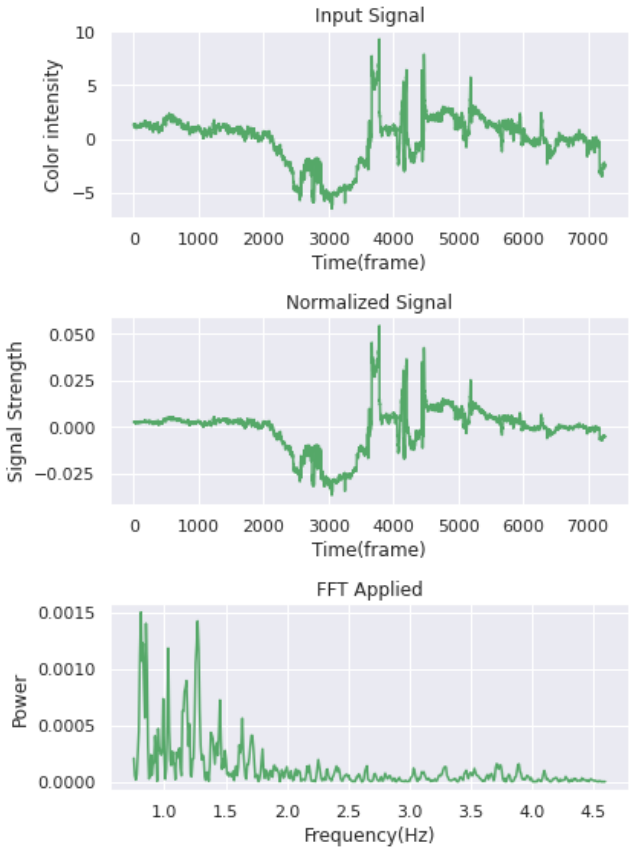

Figure 2: An illustration of signal processing pipeline

3 HEART RATE ACCURACY

HCI Tagging Dataset [5] has been used to do evaluations. since BPM is not directly included in this dataset, an extraction of BPM from ECG signals was done by pyheart[3], though there are a variety of heart rates in this dataset but due to uncertainty in conversion with high heart rate (> 100), I decide to put them aside.

finally 86 samples has been left, each contains a video about 2 minutes of a person.

sometimes algorithm failed to pick up the right pulse as the dominate frequency so I divide samples into inlier and outliear measurments. an inlier measurement is defined as any measurement within 10 bpms of the actual heart rate. the calculated heart rate error was 5.06 bpms and 37 out of 86 (43%) samples were outliers.

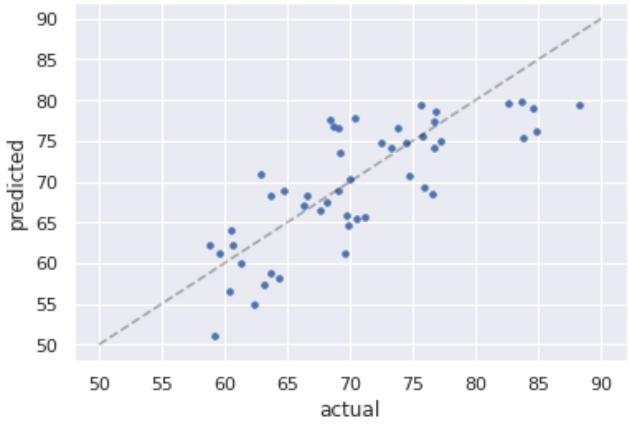

Figure 3: Actual Versus Predicted Heart Rates.

4 CONCLUSION

It seems there is a long way to go to achieve desirable results, 43% of outlier measurement is not a neglectable number with that said 53% of time you're predicting the heart rate with 5 bpms error which may be useful especially if it's used with complementary approches.

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