

ABSTRACT

Respiratory rate holds an important role in diagnosing a person's health condition and might be an early sign of a severe illness. Respiratory rate measurement is generally performed using conventional methods that require physical contact and can cause discomfort to patients. This final project aims to design a non-contact respiratory rate measurement system based on an RGB camera by utilizing pixel intensity variations as the main source. The scope of the problem is focused on healthy subjects, data is taken in a sitting position, stable room lighting, and the system is not tested in medical conditions.

This system consists of several steps, including video acquisition using a DSLR camera, ROI detection, RGB pixel intensity value extraction, signal processing in the form of filter implementation and normalization, and respiratory rate calculation using the Peak Detection method. All signal processing and analysis steps were performed using MATLAB. The system performance was measured by comparing the system detection results with manual measurements and was conducted in two conditions, which are before and after physical activity in the form of running.

The results of the evaluation involving 35 subjects showed that the system was able to provide respiratory rate estimates, with a Mean Absolute Error (MAE) value of 5.47 RPM in the pre-running condition and 4.03 RPM in the post-running condition. Correction of the measurement results using linear regression reduced the MAE value in the pre-running condition to 5.17 RPM, but increased the MAE value in the post-running condition to 4.51 RPM. The system performed quite well when the subjects were in an ideal position and showed strong breathing movements. The accuracy of the system was influenced by various factors such as lighting conditions, the clothing type worn by the subjects, and movement noise from the subjects. Overall, this system has the potential to be used as a practical and affordable non-contact method of measuring respiratory rate.

Keywords: RGB Camera, Respiratory Rate, Mean Absolute Error, Non-contact, Pixel Intensity.