CONTACTLESS BREATHING MONITORING SYSTEM USING IMAGE PROCESSING AND OPENCV-PYTHON

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ABSTRACT:

Vital signs monitoring is pivotal in clinical environments and emerging in home-based healthcare applications. Different kind of sensors can be used to monitor the breathing pattern and the respiratory rate. However, respiration rate remains the least measured vital sign in several scenarios, due to the intrusiveness of the sensors usually adopted. Measuring a breathing rate has multiple clinical applications from early detection of diseases to monitoring of patients in a critical condition. The conventional breathing rate monitoring systems are contact-based and expensive, and sometimes their presence will interfere with the normal breathing system and thus produce an incorrect reading. Furthermore, they are not used in case a patient's skin is sensitive (or burned skin).The Contactless Breathing Monitoring System is developed to overcome drawbacks of traditional system as this system is conventional and will not cause any discomfort to the patients body.

Keywords:

Contact based, Measuring rate, Breathing pattern.

I. INTRODUCTION:

We introducing a system for contactless measuring system for respiration signals. For this we using a OpenCV-python. OpenCV is a software toolkit for processing real time image and videos. The proposed measuring system is able to detect small chest wall movements caused by the respiration by calculating the pixel colour differences between consecutive frames in order to extract respiratory pattern even with low resolution of cameras The breathing rate is the number of breaths a person takes per minute, and it’s usually measured when a person is at rest by counting how many times the chest rises in 1 min. Normal respiration rates for an adult person at rest range from 10 to 20 breath per minute (BPM). For a newborn and infants it ranges from 30 to 40 BPM, and a condition where a breathing rate is less than 10 or greater than 40 indicates a respiratory problem. The application of measuring breathing rate (BR) ranges from intensive care units to inpatient hospital wards. BR is measured as a part of several medical examinations like tracking the effective ness of a drug used by the patient, sleep analysis, pulmonary screening, asthma detection and can be used to early detect medical situations like cardiopulmonary arrest, sudden infant death syndrome, apnea and other diseases. Furthermore, it can also be used in a criminal investigation like lie detection (as one part of polygraph) and athlete fitness analysis.

II. LITERATURE SURVEY:

[1] The conventional way of measuring BR involves touching a patient's chest and counting the number of up and down for 1 min. This method is time-consuming (since you need to wait 60 min) and may be difficult to perform in busy postanesthesia care units. The other techniques are classified into contact-based and contactless measurement.

[2] The contact-based method involves attaching a sensor to a human body to measure BR. These methods are not always convenient to use since they cause discomfort (as in case patients' skin was burned or is sensitive). Furthermore, using contact-

[3] based technique will alter the normal BR which may add noise to the measured output which further leads to wrong decision to be taken

[3]. Contact-free methods involve measuring the contraction and expansion of thorax using image processing techniques, wireless sensors, radars or temperature variations which are generated by the movement of the airflow through mouth and nose. Thus, a contactless technique will be a preference to measure a respiration rate especially for sleep monitoring, ambient-assisted living and long-term respiration monitoring

[4, 5]. IoT devices and applications like sleep apnea detection and monitoring for sudden infant death syndrome would also greatly benefit from such a system. In the literature, several camera-based BR measurements have been introduced. For instance, a frame differencing technique has been used by Tan et a.

[6] to detect respiratory motion between two adjacent frames, but their approach highly depends on the type of clothing and is not robust to non-respiratory motion or illumination changes.

[7] Introduced a way to manually select the chest region which, however, fails to work in case there is a significant movement after the initial setup.

[8] Demonstrated the feasibility of using a seat sensor designed for occupant classification from a production passenger vehicle to measure an occupant's respiration rate and heart rate in a laboratory setting. Their main goal is to improve emergency response by adding a direct measure of the occupant state to an Advanced Automatic Collision Notification system. For this purpose, they collect data from eleven participants with body weights ranging from 42 to 91 kg using a Ford Mustang passenger seat and seat sensor. Using a ballistocardiography (BCG) approach, the data were processed by time-domain filtering and frequency-domain analysis using the fast Fourier transform to yield the respiration rate and heart rate in a 1- min sliding window. For analysis, they compare their system with the laboratory physiological instrument result. Their time series comparisons for respiration rate are promising. However, it's quite difficult to accept the final result since they used to separate data of a person at a different time. In a similar way,multiple techniques have been developed to monitor human respiratory activities

[9] For the purpose of sleep apnea detection and general health evaluation.

[10] The new method to measure breathing rate which is computationally faster and also more accurate than the FFT methods and instead of tracking motion frame by frame or by sub-region, a representative corner which needs to be measured is extracted automatically which makes the easy of computation

III. EXISTING SYSTEM:

This module is responsible for extracting and tracking the visual features (corners) over multiple frames to quantify the amount of motion. For feature selection, OpenCV implementation of Shi– Tomasi good feature to track algorithm was used. In this method, we can find the top N corners, which might be useful in case we don't want to detect each and every corner.

This module is responsible for color conversion from RGB to gray level and histogram equalization to have a uniform brightness distribution.

IV. SYSTEM ARCHITECTURE:

The high-level view of the proposed system is given in Fig. The system begins with capturing a sequence of frames from a live camera or files which is then used by the detection module to locate the chest region This is followed by the feature selection module which primarily is used to sample good corners from the region of interest, and then the movement which is made by those features is tracked and measured using optical flow.

Furthermore, principal component analysis (PCA) is applied and the eigenvector with the largest eigenvalue will be selected as the representative movement. This value is then band-pass-filtered by utilizing concepts of human breathing system which lies in the range from 10 to 50 BPM (which is equivalent to 0.1–0.8 Hz). The sampling is done at the half of the maximum frequency (following Nyquist–Shannon sampling theorem), which is later divided by the time interval to yield an approximated BR(Breathing Rate).

Conventional techniques for measuring respiration parameters require sensors in contact with the subject. Measuring techniques based on the monitoring of several parameters sampled from inspiratory and/or expiratory flow (e.g., temperature, RH, CO_2, and flow) are widely used.

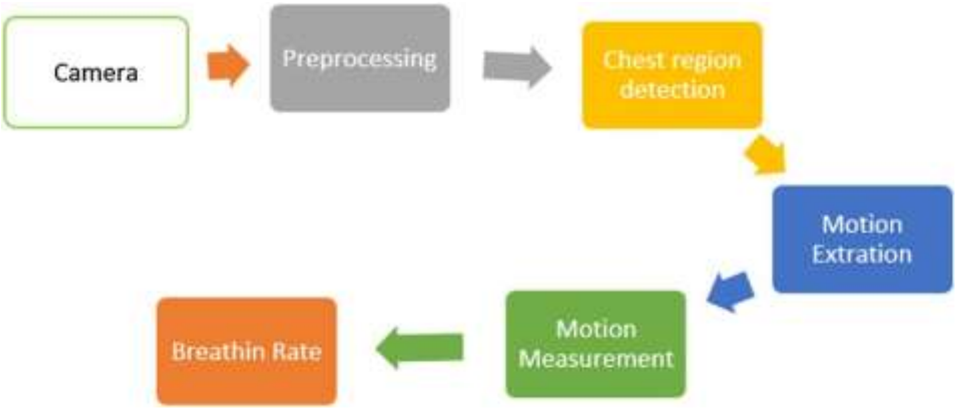

Figure. System Architecture

V.CONCLUSION:

The proposed measuring system is able to detect small chest wall movements caused by the respiration by calculating the pixel colour differences between consecutive frames in order to extract respiratory pattern even with low resolution of cameras. The errors calculated by comparing the average respiratory rate and the breath-by breath analysis between instruments are acceptable for using the proposed measuring system for accurately monitoring the subject with commercial single camera, even at lower sensor resolutions in the absence of breathing unrelated movements. The proposed algorithm utilizes a concept from the face detection algorithm, EVM, optical flow and signal filtering to produce the equivalent BR measurement.

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