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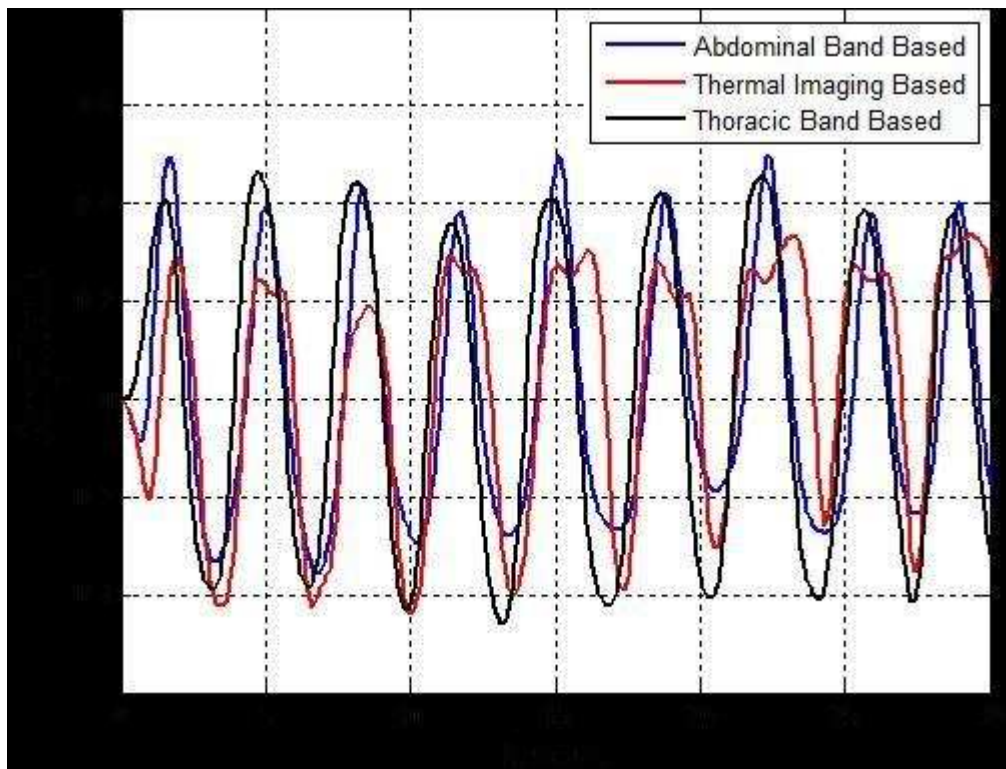
Thermal imaging method for measurement of respiratory rate

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Abstract

Background:Monitoring respiratory rate (RR) is an important task for medical diagnosis that is neglected due to complexities in performing it. Current methods require the sensing device to be attached to the subjects' body thereby constraining or causing them discomfort and thus potentially affecting the breathing rate. We have developed a noncontact method for RR monitoring using a thermal camera.
Method:Algorithms to capture images and detect the location of the face in each image were developed. The amount of emitted infrared radiation was then determined and signal processing techniques were then utilised to obtain the respiration rate in real time. A FLIR A40 thermal camera was used in this study. The evaluations were conducted against five existing contact based methods.
Results:Tests were conducted on 51 adults (mean age 35.7) and 20 children (mean age 6.4 years). Mean RR (thermal imaging) 14.8 per minute; (chest and abdominal band) 14.8 per minute in adults. The correlation coefficient was 0.88 - 0.998 in adults and 0.578 – 0.999 in children depending on the method used. Figure 1 shows a respiration signal for a child obtained during the evaluation.



Conclusion:A reliable non-contact method of measuring respiratory rate is needed to improve assessment of acutely unwell children and will potentially enable earlier detection of clinical deterioration. The thermal imaging method is accurate, however further evaluation in children is required.