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2018 IEEE EMBS Conference on Biomedical Engineering and Sciences, IECBES 2018 - Proceedings

24 January 2019, Article number 8626697, Pages 112-116

2018 IEEE EMBS Conference on Biomedical Engineering and Sciences, IECBES 2018; Borneo Convention Centre KuchingDemak-Isthmus Bridge, Jalan Keruing, SejingkatKuching; Malaysia; 3 December 2018 through 6 December 2018; Category numberCFP1826K-ART; Code 144644

## GLCM correlation approach for blood vessel identification in thermal image (Conference Paper)

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### Abstract

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The maturity of detection in emotions via thermal camera is evolving recently since it is able to detect the hot parts of human face composition replicating the area of blood vessels. The notion of non-invasive tools for data gatherings via a thermal camera has also been vigorously highlighted. We hypothesize that, the impact of cutaneous temperature changes due to blood flows in the blood vessels could be correlated to specific emotion state for healthy as well as autistic children. The autistic children are less able to present emotion through facial expression. In this work, healthy children were assigned as subjects prior to the development of the algorithm for thermal imaging analysis to form a reference model. Facial thermal distribution was analyzed and a technique using Correlation in Gray Level Co-occurrence Matrices (GLCM) was proposed to determine the blood vessels' region. A k-Nearest Neighbor (k-NN) classifier shows a promising result for the proposed method and suggests that these analyses are momentous for distinguishing between five basic emotions and it could be used as non-verbal mediums to help on autistic children.

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### SciVal Topic Prominence ⓘ

Topic: Infrared imaging | Infrared radiation | thermal images

Prominence percentile: 79.428 ⓘ

### Author keywords

Autistic Emotion GLCM Texture analysis Thermal imaging

### Indexed keywords

Engineering controlled terms: Biomedical engineering Cameras Infrared devices Infrared imaging Nearest neighbor search Textures

Engineering uncontrolled terms: Autistic Emotion GLCM Gray-level co-occurrence matrix Texture analysis Thermal distributions Thermal imaging analysis Vessel identification

Engineering main heading: Blood vessels

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Goulart, C. , Valadao, C. , Delisle-Rodriguez, D. (2019) *PLoS ONE*

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## Funding details

Funding sponsor	Funding number	Acronym
Ministry of Higher Education, Malaysia	FRGS16-030-0529	MOHE

### Funding text

ACKNOWLEDGMENT We wish to express our gratitude to the Ministry of Higher Education (MOHE) for funding the project under the Fundamental Research Grant Scheme (FRGS), Grant no:FRGS16-030-0529

**ISBN:** 978-153862471-5

**Source Type:** Conference Proceeding

**Original language:** English

**DOI:** 10.1109/IECBES.2018.8626697




**Document Type:** Conference Paper

**Sponsors:** Physiological Measurement, Sarawak Convention Bureau

**Publisher:** Institute of Electrical and Electronics Engineers Inc.

## References (14)

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- 1 Levine, J.A., Pavlidis, I., Cooper, M.

### The face of fear

(2001) *Lancet*, 357 (9270), p. 1757. Cited 68 times.

<http://www.journals.elsevier.com/the-lancet/>

doi: 10.1016/S0140-6736(00)04936-9

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- 2 Kosonogov, V., De Zorzi, L., Honoré, J., Martínez-Velázquez, E.S., Nandrino, J.-L., Martínez-Selva, J.M., Sequeira, H.

### Facial thermal variations: A new marker of emotional arousal [\(Open Access\)](#)

(2017) *PLoS ONE*, 12 (9), art. no. e0183592. Cited 11 times.

<http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0183592&type=printable>

doi: 10.1371/journal.pone.0183592

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- 3 Ioannou, S., Ebisch, S., Aureli, T., Bafunno, D., Ioannides, H.A., Cardone, D., Manini, B., (...), Merla, A.

### The autonomic signature of guilt in children: A thermal infrared imaging study

[\(Open Access\)](#)

(2013) *PLoS ONE*, 8 (11), art. no. e79440. Cited 48 times.

[http://www.plosone.org/article/fetchObject.action?](http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0079440&representation=PDF)

[uri=info%3Adoi%2F10.1371%2Fjournal.pone.0079440&representation=PDF](http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0079440&representation=PDF)

doi: 10.1371/journal.pone.0079440

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- 4 Cruz-Albarran, I.A., Benitez-Rangel, J.P., Osornio-Rios, R.A., Morales-Hernandez, L.A.

### Human emotions detection based on a smart-thermal system of thermographic images

(2017) *Infrared Physics and Technology*, 81, pp. 250-261. Cited 18 times.

doi: 10.1016/j.infrared.2017.01.002

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