

Facial analysis in thermal images for pilot stress recognition

Objective:

The division for Applied Thermodynamic and Fluid Dynamic started together with the division for Computer Vision and the company Termisk System Teknik a preliminary study on facial thermal imaging for pilot stress recognition aiming to examine the relationship between experienced mental workload and physiological response by noninvasive monitoring of physiological parameters. This thesis includes multiple challenges! The first one deals with finding quantifiable indicators in the face, such as skin temperature or pupil diameter, which relate to the subject's personal stress level. This requires automatic detection of relevant measurement areas in the pilot's face. Second, since the pilot and aircraft are constantly moving an automatic image stabilization is needed. Third, aircrafts are normally operated by more than one aircrew which call for an automatic solution for image calibration. The last challenge focus on data validation to ensure the reliability of the measurements.



Credit: Nottingham University and Flir

Task:

1. Do a comprehensive literature study concerning the thesis problem
2. Familiarization with the experimental equipment
3. Implement a program facial thermal imaging program for stress recognition
4. Test, verify and validate the program's result

Pre-Knowledge:

The applicant should have an engineering background with good knowledge in computer vision. Further knowledge in the field of thermodynamics, heat transfer and basic cognitive science are of advantage.

Time Frame:

The thesis can start in beginning of 2020 or later

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References:

[1] Adrian Cornelius Marinescu et al, *Parameter Response to Variation of Mental Workload*, HUMAN FACTORS, Vol. 60, No. 1, 2018, pp. 31–56, DOI: 10.1177/0018720817733101

[2] Saurabh Sonkusare et al, *Detecting changes in facial temperature induced by a sudden auditory stimulus based on deep learning-assisted face tracking*, Scientific Reports, 9:4729, 2019, <https://doi.org/10.1038/s41598-019-41172-7>

