

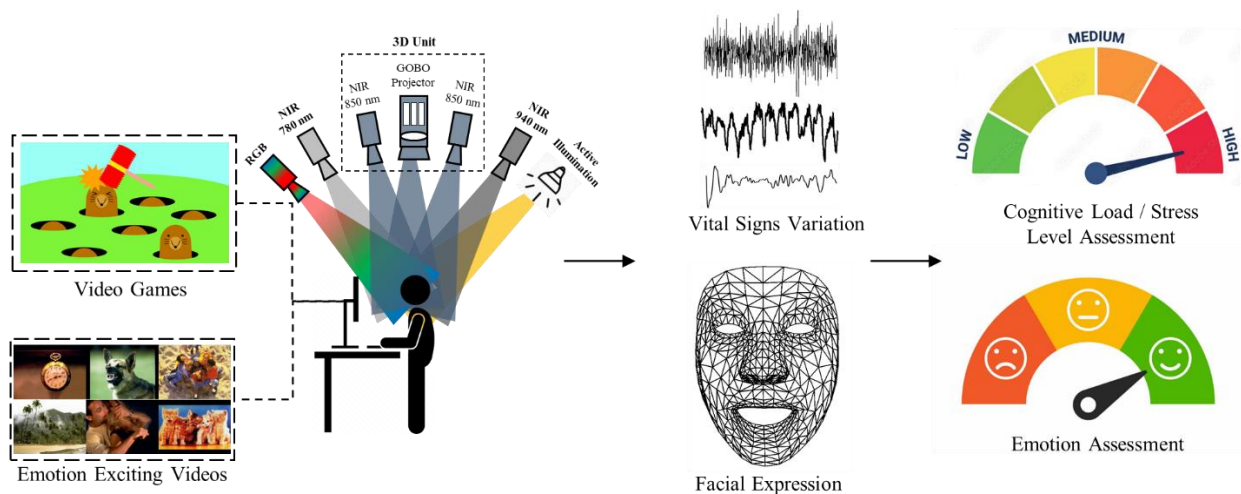
Task Description for the Master Thesis

of N. N. and N. N.

Contactless Assessment of Psychological Responses based on Multimodal 3D Imaging

General Description:

Assessment of a person's psychological response such as cognitive load, stress level and their macro and micro expressions in human-machine interaction signifies the ability to make interactive systems more intelligent and personalized. Traditional contact-based methods utilize various human vital signs, as well as Photoplethysmography (PPG) and Electrocardiogram (ECG) signals, employing analytical and machine learning techniques to detect psychological responses. Non-contact approaches can expand the application scenarios of psychological responses assessment, which do not require direct contact with the human's body, reducing disturbance to the user, allowing continuous monitoring with comfort and hygiene. Contactless approaches have been explored in some studies, which realized by analyzing facial expressions and muscle movements, remote PPG (rPPG) or camera-measured heart rate variations, and changes of facial temperature.



Task:

In the previous work of TU Ilmenau QBV, a multimodal 3D camera system was used to simultaneously measure 3D body and facial movements as well as estimate different vital signs such as heart rate (HR), oxygen saturation (SpO₂), body temperature (BT) and respiratory rate (RR). In this work, a method for the assessment of psychological responses, such as stress, emotion, etc., should be developed based on measured motion information and estimated vital signs.



At the proof-of-concept stage, after setting up an integrated cameras / sensors system, participants will be recruited to play video games (e.g. Whack-a-Mole or Tetris) and watch emotion exciting video stimuli for the purpose of data and label acquisition. Algorithmic approaches are anticipated to be developed to recognize macro and micro facial expressions from 3D motion data and to link facial expressions and vital signs to different levels of psychological responses such as stress and emotion.

In the context of this work, the following tasks arise in particular:

- Building the proof-of-concept test scenarios and experimental setup
- Participants recruitment and data acquisition
- Selection and implementation of methods for the preprocessing of vital sign signals
- Development of algorithms for the recognition of macro and micro facial expression
- Development of algorithms for the assessment of selected psychological responses
- Documentation and presentation

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