

Improved Interaction by Emotionally Enriched Control

This project considers human emotions in human-robot interaction processes by combining emotion recognition with control mechanisms in order to improve efficiency and naturalness of human-system collaboration.

Emotions have a significant impact not only on the subjective quality of human-machine interaction but also on task performance (e.g. reaction times, probability of operating errors etc). Even though many approaches focus on recognizing emotions and responding with appropriate control signals, only few works consider the recursive dynamics of such technical systems.

The approach of this project comprises three aspects: recognition of a selected set of emotions relevant in a manufacturing context based on physiological data (HR, BVP, SCR), emotion modulation methods using a mechatronical robot head, and dynamical human emotion models for optimal control of human-system interaction.

Major innovative contributions are the investigation of interaction-relevant, non-extreme human states in a real-world human-robot collaboration scenario, the dynamic integration of emotion recognition and control methods, as well as a control theoretic approach to emotionally enriched human-robot interaction.

So far, states of under- and overchallenge occurring during a virtual manufacturing scenario can be discriminated evaluating physiological data. Furthermore, the influence of animal-like features of a mechatronical robot head on perceived emotion states is evaluated for intensification and variation of emotions. Finally, a first step has been done in developing a dynamic emotion model based on Markov chains. Next steps are the recognition of additional states and the integration of emotion recognition and display approaches in a human-robot collaboration scenario using a LEGO-parts support interface with two robot arms.



Photo courtesy by HFI UBW
Virtual LEGO-manufacturing scenario



Photo courtesy by ACE TUM
Mechatronic robot head EDDIE

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¹⁾ See next page for Abbreviations