EMJD ICE EMJD ICE II Cohort Additional Grants Projects

1.Learning and recognition of emotion patterns from automatic analysis of cognitive entities interactions

Computer based representation of emotional patterns as well the identification of learnable dynamic automatic pattern recognition schemes to detect, classify and predict interactions evolution in a cognitive environment is the topic of this PhD project. The models to be studied should be used to detect emotion while interaction and be applied to the actuating part, for example generate stimuli and feedback according to the detected and predicted emotions.
Emotions and interaction will be considered of a person or multiple people involved in a responsive environment as they can be estimated by sensors signals as well as used to modulate planned actions of the responsive environment itself in adaptive and proactive way. Research will included probabilistic signal processing models and techniques for analysis of correlation of behaviors, interaction, detection and estimation of emotion, conscious and unconscious starting from first sketches of paradigms present in literature. The research will also include the propose of a design concept for a real interactive environment or mixed reality games, system implementation and evaluation with users.

2.Distributed Adaptive Signal processing and Estimation (Networked Embedded Systems)

For sensor networks the collaboration between the sensors is an important issue. Interesting research topics in this context are in the area of adaptive signal processing and parameter estimation. The investigation of such distributed adaptive signal processing and estimation algorithms will be the aim of this project. A special focus will be on non-linear filtering algorithms for Bayes estimation in a distributed environment, e.g. distributed (non-linear) Kalman Filters and Particle Filters. Application scenarios for such algorithms might include distributed monitoring and tracking of system parameters, e.g. the position of a moving object. The quality of different algorithmic approaches shall be compared with the help of analytical investigations and numerical simulations.

3.Collaboration in Networked Unmanned Aerial Vehicles

Unmanned aerial vehicles (UAVs) are typically used for aerial imaging, police and fire rescue operations, and military missions. Such small helicopters fly in the air, sense the environment, and communicate with the ground station to provide feedback to the users. State-of-the-art UAVs are typically manually controlled by a human operator using a remote control or using predefined routes. The use of a single UAV has, however, severe drawbacks, demanding for a system in which several UAVs fly in a coordinated manner and cooperate to achieve a certain mission.

This PhD project should investigate methods for distributed coordination of data transfer and processing among several small UAVs (microdrones). The project involves a clear analysis of state-of-the-art approaches for various UAV mission scenarios. Based on this, new distributed algorithms and protocols should be developed, implemented and tested. The type of coordination will strongly depend on the mission goal, e.g. area coverage or search missions, and its environment (outdoor, indoor). The developed methods will be integrated into a UAV system simulator available at Klagenfurt University and be tested with real UAVs also available at Klagenfurt University.