

DREAM – Development of Robot-Enhanced therapy for children with Autism spectrum disorders

We present a new EC-funded research project, DREAM, which will design and evaluate therapeutic robots for Autism Spectrum Disorder (ASD) in the real world in full consideration of the challenging demands of clinical/psychology therapy and ethical implications.

Clinical therapies for children with ASD benefit from the inclusion of expressive artifacts (e.g. puppets, animated characters). Well-designed robots have proven to be particularly effective and are an increasingly important tool in robot-assisted therapy (RAT). However, to make a significant difference, therapeutic robots need to have a greater degree of autonomy than current remote-controlled systems. Furthermore, they have to act on more than just the child's directly-observable movements because emotions and intentions are even more important for selecting effective therapeutic responses.

DREAM will develop supervised autonomy therapeutic robots that can operate autonomously for limited periods under the supervision of a therapist. To that end, we will infer the ASD children's psychological disposition and assess their behaviour to select therapeutic actions, tailored to individual needs. The robot will operate under strict ethical rules and the DREAM project will contribute to relevant policy guidelines. The overall framework and methodology of DREAM is cast as five research challenges:

Child-robot interaction strategies

We focus on therapies suitable for improving social interaction skills. After completing the therapeutic programs, the ASD children may then be able to generalize what they learned during therapy to daily human interactions, like playing with their siblings, or interacting with their parents or caregivers.

Multi-sensory data fusion and interpretation for diagnostic support

Multimodal data will be used to provide quantitative support for the diagnosis & care/treatment of ASD, replacing current labour intensive techniques involving paper and pencil, or manual video analysis. Therefore, we aim to explore the potential of data that can be gathered through the interaction with the robot in providing further diagnostic indicators.

Child-specific behaviour assessment

The challenges are 1) to specify the psychological dispositions that should be tracked, 2) identify what sensory data are the best predictors of such dispositions, and 3) the creation of a model that can, over time, track and quantify changes in child behaviour as well as provide quantitative inter-individual comparisons to assist therapists in their tasks.

Cognitive social behaviour for supervised autonomy

We aim for supervised autonomy whereby the therapist sets high-level goals and occasionally complements the robot's artificial intelligence with human intelligence. DREAM will develop and evaluate a new cognitive controller based on the needs of human social interaction. The platform-independent cognitive controller will exploit the propensity of people to "fill in the gaps" in social interaction by generating behaviour that facilitates interpretation by ASD children even when the behaviour is somehow lacking.

Ethics of robotics and ethics of human-robot interaction

The ethical challenge of the project consists in ensuring that the technical design of the robot complies with existing ethical, social, and legal norms, and embracing new ethical and legal issues raised by the particular kind of interaction that emerges in the interaction between the child and an autonomous robot in a therapeutic context.