

Hey Robot, Help Me Grow Up!

Requirement Analysis for a Learning Platform and a Robotic Learning Assistant to

Help Children with Autism Overcome Behavioral and Social Challenges

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Children diagnosed with autism spectrum disorder (ASD) encounter various behavioral as well as social challenges growing up (Swaggart et al., 1995; Wing, 1978). Since they struggle with the processing of their own and others' emotions, they often show deviant, reduced, or unexpected behavior leading to general difficulties to handle everyday situations and encounters on their own (Dziobek et al., 2008). Frequently, this is associated with difficulties in social interactions and may hinder the affected from vocational or academic success (Krasny et al., 2003). Although these problems do not vanish, these children are able to improve their social skills substantially when in planned intervention programs facilitating their empathic capacity (Donnellan & Kilman, 1986; Herbrecht et al., 2009; Krasny et al., 2003). Particularly, an early treatment of ASD can mitigate the effects of the disorder and improve the quality of life for affected people (Corsello, 2005; Smith, 1999). These interventions often comprise repetitive exercises, are laborious and time-consuming. Additionally, there is a high demand for ASD therapists in Germany that cannot always be satisfied due to insufficient personnel and structural resources. This is particularly the case in rural areas with a lower density of specialists (Johnston et al., 2019). Furthermore, in a culturally and socially diverse society, as in Germany (Bender-Szymanski, 2000), potential language barriers in the therapeutic context need to be considered.

To enhance this deficient situation, therapeutical treatment opportunities need to be adequately and efficiently improved and expanded. In the MigrAVE project, we propose a low-threshold, technology-based learn assistance, which further overcomes language barriers. Two complementary tools are planned to support both therapists and parents in the treatment of children with ASD. An online portal provides information and exercise material for

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parents and a complete learning curriculum for children at different levels of the disorder and different stages of development. A robotic learn assistant is further used to accompany and support the children with exercises. The robot will be able to create a unique learning environment for children by reducing the pressure of challenging social situations. The portal and the robotic assistant are both developed to be multilingual so that the tools can be used by families with a migration background and by that, reduce potential language barriers.

For a successful launch of these tools, an extensive requirement analysis is needed to adequately address the stakeholders' needs and demands. For this reason, explorative, in-depth interviews are executed with parents of children diagnosed with ASD as well as therapists specialized in ASD treatment. Questions first cover the children's learning deficits, therapy methods, exercises and challenges, as well as usage and acceptance of technology (in general and in the therapeutic context). Then the planned online portal and robotic assistant are presented together with example videos. Subsequently, parents and therapists are asked about their opinion, acceptance, concerns, requests, and suggestions regarding the two tools.

The results show that children with ASD as well as their caregivers face a variety of challenges caused by the disorder itself (e.g., impaired communication skills, struggles with independence, and deficits in emotion detection and regulation) but also by deficits in the care system (e.g., lack of reliable information, insufficient expertise, and missing exchange opportunities between affected families). This underlines the potential of using new technologies as support and enhancement of existing therapeutical intervention programs. The current study presents a promising approach since therapists and parents evaluate their own as well as the children's technical affinity as rather high and display great interest and openness towards using new technologies in the ASD therapy context. Against this background, necessary requirements and valuable insights particularly for the design of the online portal and learn-assistant robot are derived. For instance, the platform should be easily

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accessible, offer well-prepared and trustable information on ASD and current therapy forms, and provide a possibility to get in touch with other affected persons. Requirements for the robot include variable, customizable, and adaptable behaviors and tasks, sufficiently sophisticated communication skills, and automatic state detection to react adequately to the child's currently displayed behavior. In the further development process, the insights obtained via the requirement analyses will be considered to enhance the success of the two technology-based support tools for children with ASD.

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