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GRADUATE THESIS REPORT

Communication of emotions between a child with autism and a service pet

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Abstract
It should be taken into account that both humans and animals can contribute in ways that benefit both sides. Considering the aforementioned, an area where benefits can be derived from the communication between two beings is when the support of a pet is needed, particularly in the case of assistance dogs for individuals facing certain illnesses that require their aid. This encompasses a crucial aspect of human development from an early age to prevent future issues and to allow individuals to thrive in a society without limitations. Autism is an incurable condition but depending on the age of diagnosis and the treatment received, it can play a pivotal role in social and mental development as well as in emotional expressions. Assistance dogs for individuals with autism aid in their well-being by providing emotional companionship, and the profound connection that can be established between them has been demonstrated. Many individuals with autism find it challenging to engage in social interactions, and having a companion can make these interactions more comfortable. Furthermore, assistance dogs can serve as bridges to facilitate social connections, thereby helping the user improve their social behavior. Another benefit or support provided to users with autism lies in sensory stimulation, and these animal companions also contribute to reducing the levels of anxiety experienced by the patients.

Keywords:
Assistive technology, assistance dogs, emotional support, human-computer interaction, animal-computer interaction, nonverbal communication, therapy for children with disabilities, human-animal bond, human-animal interaction.

1 Context and motivation
Autism is presented from an early age, which is defined as a "psychological disorder characterized by an intense concentration of a person in their own inner world and the progressive loss of contact with the external reality"[14]. This condition doesn't have evident physical characteristics; therefore, other people may experience difficulties in understanding those who have autism or developing empathy with them. This generally happens because a neurotypical person doesn't comprehend the reactions or attitudes of those diagnosed with autism. Worldwide, as of March 29, 2023, it is known that the prevalence of autism is approximately 1 in 100 children, according to estimates by the World Health Organization. In Mexico, the situation is similar, as it is estimated that 1 in 115 people presents some level of autism, according to a study conducted by Autism Speaks and the Mexican Autism Clinic (CLIMA), with a 17% increase each year [15]. It is mentioned that even though the percentage increases each year, what it actually means is that the diagnosis is becoming more timely. Detecting this condition as early as possible in the patient has the consequence that one can work in an early stage of the person's life to manage their emotional, social, and autonomous behavioral development. The above is extremely important since, at present, the condition is incurable, so the person's adaptation to the social environment depends greatly on the monitoring and support they receive.

The use of assistance animals, mainly dogs, which have received special training to support these patients, has been investigated. The results indicate an improvement in the quality of life of children with autism by positively impacting their social and emotional skills [6]. For example, the article "Emotion Facial Processing in Children with Autism Spectrum Disorder: A Pilot Study of the Impact of Service Dogs" discusses how facial expression recognition is crucial in human social interaction, as individuals with autism spectrum disorder find it difficult to decipher and perform facial expressions. In this research, a study was conducted with 15 children, divided into groups (those with a service dog and those without). It was observed that individuals who have a service dog seem to develop specific visual exploration strategies for processing expressions, leading to the conclusion that having an assistance dog promotes the development of the ability to identify expressions and emotions in others [8]. The main function of these dogs is to increase the safety of the children, as they can prevent escape behaviors by stopping them if they occur, as well as alerting in case the child displays anxious behaviors. Being a child's companion, the dog also helps draw the attention of other children, thus fostering social interaction. This boost in security allows children to develop autonomy and reduce their level of anxiety. Additionally, the dogs can provide support to the family in situations such as leisure activities or outings, where the service pet becomes a constant companion throughout the child's development. These dogs are trained to be with their users anywhere, which also makes them a great support in helping the children fall asleep, as they help reduce their stress through tactile and sensory stimulation. With this information in mind, there is a motivation to strengthen

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the bond between the human user and their assistance dog in order to enhance the interaction between them, taking advantage of the benefits that the assistance dog provides to the child. The hypothesis is generated that strengthening this bond helps the child better understand their pet's feelings, while at the same time, the dog can respond more appropriately to the expressions that the human displays. The goal is to provide important information along with the initial design of a technology that contributes to the emotional well-being of children with autism from an early age while also benefiting the assistance dog.

2 Objective

The main objective of this research is to design a digital tool that allows improving communication between both users, both the assistance dog and the person requiring its help. In this way, the aim is to assess the improvement in the emotional state of the human user through observation and to understand to what extent the user has strengthened their bond with their pet. The intention is for the child to also get to know their companion animal through the movements made by the canine. Similarly, it can be easier for the dog to recognize the child's emotional state. In pursuit of achieving the aforementioned purpose, several questions are sought to be addressed, such as: How does technology improve communication between the assistance dog and its user? To what extent can the emotional well-being of the user improve with better communication between these two? What types of danger warnings can the assistance animal detect, and at what percentage of efficiency? How much does the human user's level of autonomy improve (independently of the company of another person) when a

3 Background

Autism is a developmental disorder that affects the ability to communicate and relate socially. Children with autism often experience difficulties in verbal communication. Therefore, having a trained dog for this situation is of great help as it provides emotional support and improves the child's developmental quality. According to B.W Davis, K. Nattrass, S. O'Brien, G. Patronal, and M. McCollin [11], the needs that require an assistance dog modify their training, so an assistance dog supporting a user with autism helps to develop or improve social and emotional skills. This, in turn, encourages social interaction and communication improvement. In the article "Parents' perspectives on the value of assistance dogs for children with autism spectrum disorder [9], a cross-sectional study" concludes that parents perceive the intervention of assistance dogs as valuable for children with autism spectrum disorder (ASD). "Experiences of Australian parents having an assistance dog for people with autism" [10] reveals that Autism Assistance Dogs (AAD) help reduce the stress and isolation of families, as they fear for the safety of their children within society.

t has been previously demonstrated that assistance dogs help improve the quality of life for users with specific illnesses where these dogs can provide support. Recently, they have also been implemented for children with physical or developmental disabilities. The results obtained in the research "Placement of assistance dogs in the pediatric population: benefits, risks, and recommendations for future application" show that 88% of families experienced physical benefits. However, 53% of the families involved considered the financial risks significant, which could be a burden for them. Improvement in communication between these two users (human with autism and assistance dog) could be achieved through different forms of technology. The most acceptable, efficient, and user-friendly way needs to be researched. This could involve using a touch device containing images that the human user can easily manipulate or through signals emitted to the canine user, such as sound or other forms, to find the optimal way for each participant to express themselves easily. Nuñez Gómez [12] suggests that communication through new technologies is an advantage that can facilitate the connection between emotions and other people. Information and Communication Technologies (ICT) are an essential instrument in today's educational environment. Focusing on the user's emotions, Dr. Sandra Baldasarri [13], in her research titled "Affective Computing: Technology and Emotions to Improve User Experience," mentions that for therapeutic purposes, people with emotional problems can have their facial features monitored or receive information about the user through physiological sensors. Another point mentioned by the doctor is that the objective of affective computing is to offer an interaction and user experience taking into account the user's emotional state. For example, children with communication problems have been able to overcome these "barriers" through the affective aspects in application design.

4 Approach and research methods

The main focus decided upon was the creation of a design that will showcase a bidirectional communication system, allowing children with autism to convey their emotions to their assistance dog. The approach to developing the system is user-centered, as it takes into account their experiences and needs. The aforementioned will be carried out through a series of stages within the methodology: Gathering expert opinions: The consulted experts will be professionals in the field with experience in autism. Additionally, opinions and information from experts in assistance dog training will be sought. This information will be analyzed and integrated into the process. Surveys and interviews with families: Taking into consideration the guardians of what will be one of the end users, interviews and surveys will be conducted to obtain information about their experiences and challenges of having an assistance dog to support their child. This will provide ideas to create a better outcome and ensure a positive user experience. Design creation: Once the information gathering is complete, the development of an initial design will commence. This design will be presented to the experts and target users to obtain feedback on its correctness thus far and potential improvements. Design evaluation: Considering the feedback from experts and users, usability, efficiency, and areas for improvement will be assessed. In case additional features are needed, each stage will be repeated, taking into account that it won't be the same as certain information is already available.

5 Results

So far, initial results of the process have been obtained, which has involved an exhaustive review of previously conducted research aimed at finding support and knowledge to be able to have the appropriate approach for making it beneficial for children with autism. The literature review has provided background information on what has been achieved so far. However, no progress has been made towards enabling bidirectional interaction between the pediatric patient and their assistance dog. The aim is to create a design where communication between the assistance dog and its user can establish a closer relationship in terms of expressing emotions, so that both can understand what is being conveyed. This is particularly important since, due to health reasons, the child finds

it challenging to express their feelings, which also hinders their social interaction.

6 Dissertion status and next steps

During the literature review, which is the initial focus of this research, knowledge was gained about the main functions of an assistance dog for individuals with autism, primarily focused on early age, observing how these canines improve the quality of life for humans. Likewise, information was also obtained about what it means to be a person with autism, understanding their characteristics, how this condition changes the way emotional expression and social development occur in the individual. It was learned that although autism is an incurable condition, the "how" and at what age one begins treatment can create a significant impact on the person, making a difference among individuals with this characteristic. The important role and impact that an assistance dog, particularly in this area, can have on their human companion are well understood – the improvements can be both personal, such as emotional well-being, safety, and anxiety reduction, and social, helping to decrease the characteristic traits typically associated with people with autism. The intention is to continue the literature review to enrich knowledge and gather all possible information that can be useful in the development of innovative technology. Conducting interviews and field research is also planned to raise awareness about the subject being studied and delve deeper into the topic. Likewise, obtaining different expert opinions will help identify the path to follow in the design development process, potentially leading to one or several designs that cater to the specific needs of each user involved (the assistance dog and the human). This evaluation of optimal and ideal solutions, in case of discrepancies, will allow for result comparisons to achieve the best possible outcome.

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8 References

[1] Ferworn, A. and Sadeghian, A. and Barnum, K. and Rahnama, H. and Pham, H. and Erickson, C. and Ostrom, D. and Dell'Agnese, L. “Urban search and rescue with canine augmentation technology”. 2006. IEEE/SMC International Conference on System of Systems Engineering, Los Angeles, CA, USA, 2006, pp. 5 doi: 10.1109/SYSOSE.2006.1652317

[2] A. Valdivia, and M. Luzón Victoria and Francisco, H.. “Toward cyber-enhanced working dogs for search ar rescue” 2017 in IEEE Intelligent Systems, vol. 32, no. 4, pp. 72-77, doi: 10.1109/MIS.2014.77

[3] Alexander, Ferworn, B. Waismark, and M. Scanlan. “CAT 360 — Canine augmented technology 360-degree video system” 2015 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR), West Lafayette, IN, USA, 2015, pp. 1-4, doi: 10.1109/SSRR.2015.7443003

[4] Yoav, Golan, Ben, Serota Amir, Shapiro, Oren, Shriki and Nisky, Ilana. “A Vibrotactile Vest for Remote Human-Dog Communication” 2019 IEEE World Haptics Conference (WHC), Tokyo, Japan, 2019, pp. 556-561, doi: 10.1109/WHC.2019.8816079.

[5] Luisa Ruge. 2017. “Dog-Smart Homes: Portable controls optimised for mobility assistance dogs”. In ACI '17. ACM, NY, USA, , 1–6. https://doi.org/10.1145/3152130.3152133

[6] Sachs-Ericsson, N., Hansen, N. K., & Fitzgerald, S. (2002). “Benefits of assistance dogs: A review.” Rehabilitation Psychology, 47(3), 251–277. https://doi.org/10.1037/0090-5550.47.3.251

[7] Burrows K, Adams C, Spiers J. “Sentinels of Safety: Service Dogs Ensure Safety and Enhance Freedom and Well-Being for Families With Autistic Children”. Qualitative Health Research. 2008; 18(12) doi:10.1177/1049732308327088.

[8] Dollion, N. et al.. “Emotion facial processing in children with autism spectrum disorder: a pilot study of the impact of service dogs.” 2022. Frontiers in Psychology, 13, 869452. https://doi.org/10.3389/fpsyg.2022.869452

[9] L., Burgoyne L., Dowling A., Fitzgerald et al. “Parents’ perspectives on the value of assistance dogs for children with autism spectrum disorder: a cross-sectional study”. BMJ Open 2014;4:e004786.http://dx.doi.org/10.1136/bmjopen-2014-004786

[10] R., Appleby S., Wright L., Williams M., and Stanley “Australian parents' experiences of owning an autism assistance dog.” Health Soc Care Community. 2022 https://doi.org/10.1111/hsc.13805

[11] B.W. Davis, K. Nattrass, S. O'Brien, G. Patronek & M. MacCollin “Assistance dog placement in the pediatric population: Benefits, risks, and recommendations for future application”, 2004. Anthrozoös, 17:2, 130-145, DOI: 10.2752/089279304786991765

[12] María de la Cinta, Núñez Gómez. "La comunicación de niños con autismo mediante el uso de las nuevas tecnologías". 2021. Universidad Internacional de Andalucía http://hdl.handle.net/10334/5665

[13] Sandra, Baldassarri. "Computación Afectiva: tecnología y emociones para mejorar la experiencia del usuario" 2016. UNPL. http://sedici.unlp.edu.ar/handle/10915/53441
Tratamiento de los niños con autismo en etapa de 3 a 12 años de edad, (2021), https://doi.org/10.46377/dilemas.v8i.2572

Gobierno de México. "Día mundial de concienciación sobre el autismo" 2017.
https://www.gob.mx/conadis/es/articulos/dia-mundial-de-concienciacion-sobr e-el-autismo?idiom=es