Advanced Metrics to Evaluate Autistic Children's Attention and Emotions from Facial Characteristics Using a Human-Robot-Game Interface

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Abstract

Several studies have discussed how to support children with autism spectrum disorder (ASD) using technological resources and the difficulties in their social interaction and non-verbal communication. In recent years, some authors have explained that a way to treat ASD syndrome has been through robot-assisted therapy, expecting to capture their attention. This study analyses aspects of the results obtained using the social robot 'LOLY,' which allows the children's interaction with games, recorded for therapeutic and behavioral analysis. Aiming to refine the metrics used to automatically assess the degree of attention and emotions of children with ASD when interacting with a social robot, several human-robot interaction sessions were analyzed in the laboratory and the field. The results of the automatic processing of the video signals corresponding to the interactions were compared with classical observational techniques. Part of the analysis will also consist of comparing the results of the videos taken from different reference points of the robot, such as from the head and bust. As a result of the trial-error follow-up, the comparative analysis between automatic and observational techniques proves the effectiveness of these adjustments.

Keywords

Human-Robot Interaction | Social Robot | ASD | Socially Assistive Robot | Videogames | Serious Games

References

1. Gil, V., Quintero, C., Velez, J., Gómez, N.: Analysis of learning abilities in children with autism. ESPACIOS **41**(48), 341–349 (2020). https://doi.org/10.48082/spaces-a20v41n48p25

Article Google Scholar

2. Cardona, V.: Social Robots and Autism. Proposal for intervention in the educational context

Google Scholar

3. Delgado, P.: Autism Spectrum Disorder (ASD) in education. Observatory/Institute for the Future of Education, 18 June 2021. https://observatorio.tec.mx/edu-news/autism-spectrum-disorder-tea-education/. Accessed 5 June 2023

4. Pinel, V., Rendón, L., Adrover-Roig, D.: Social robots as promoters of communication in Autism Spectrum Disorders (ASD). Letras de Hoje **53**(1), 39–47 (2018). https://doi.org/10.15448/1984-7726.2018.1.28920

Article Google Scholar

5. Bennington, J.: Robots will soon become our children's tutors. Here is why that's a good thing. NBC News, 19 April 2017. https://www.nbcnews.com/mach/technology/robots-will-soon-become-our-children-s-tutors-here-s-n748196. Accessed 5 June 2023

6. Ferrer, S.: Siri, why do they call me autistic at school?. elconfidencial.com, 23 October 2014. https://www.elconfidencial.com/tecnologia/2014-10-23/siri-why-at-school-they-call-me-autistic_403728/. Accessed 5 June 2023

7. González, C.: Intervention in a child with autism through play. Rev. Fac. Med. **66**(3), 365–374

Google Scholar

8. Tanaka, F., Kimura, T.: The use of robots in early education: a scenario based on ethical consideration. In: RO-MAN 2009 - The 18th IEEE International Symposium on Robot and Human Interactive Communication, Sep. 2009, pp. 558–560 (2009). https://doi.org/10.1109/ROMAN.2009.5326227

9. Dautenhahn, K., Nehaniv, C., Walters, M.: KASPAR – a minimally expressive humanoid robot for human-robot interaction research. Appl. Bionics Biomech. **6**, 369–397 (2009). https://doi.org/10.1155/2009/708594

Article Google Scholar

10. Baños, G.: Recognition of human emotions and its application to Social Robotics

Google Scholar

11. Solorzano, N., Herrera, L., Lima, L., Paillacho, J., and Paillacho, D.: Metrics design of usability and behavior analysis of a Human-Robot-Game platform. In: Botto-Tobar, M., Montes León, S., Camacho, O., Chávez, D., Torres-Carrión, P., Zambrano Vizuete, M. (eds.) Applied Technologies. ICAT 2020. CCIS, vol. 1388, pp. 164–178. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-71503-8_13

12. Paillacho, D., Solorzano, N., Paillacho, J.: LOLY 1.0: a proposed Human-Robot-Game platform architecture for the engagement of children with autism in the learning process. In: Botto-Tobar, M., Zamora, W., Larrea Plúa, J., Bazurto Roldan, J., Santamaría Philco, A. (eds.) Systems and Information Sciences. ICCIS 2020. AISC, vol. 1273, pp. 225–238. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-59194-6_19

13. Solorzano, N., Paillacho, D., Arce, M., Tomala, J.: Metrics for a Human-Robot-Game platform to evaluate attention and emotion in children with ASD. In: 2022 International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), Nov. 2022, pp. 01–06 (2022). https://doi.org/10.1109/ICECCME55909.2022.9988747

14. Castro, P.: Validation in a Real Environment of the CASTOR Social Robot for Use in Therapies with Children with Autism. Universidad del Rosario, Bogotá (2020). https://repository.urosario.edu.co/server/api/core/bitstreams/7ff66895-692f-4c51-9796-39725e16b3cb/content

15. Solórzano, N., Elizalde, E., Carrera, D., Park, D., Sornoza, L.: MIDI-AM model to identify a methodology for the creation of innovative educational digital games: a proposed serious game methodology based on university research experiences. In: Improving University Reputation Through Academic Digital Branding, IGI Global, 2021, pp. 133–167 (2021). https://doi.org/10.4018/978-1-7998-4930-8.ch009

16. Solorzano, N., Herrera, L., Lima, L., Paillacho, D., Paillacho, J.: Visual metrics for educational videogames linked to socially assistive robots in an inclusive education framework. In: Mesquita, A., Abreu, A., Carvalho, J.V. (eds.) Perspectives and Trends in Education and Technology. SIST, vol. 256, pp. 119–132. Springer, Singapore (2022). https://doi.org/10.1007/978-981-16-5063-5_10

17. Baltrusaitis, T., Zadeh, A., Lim, Y., Morency, L.: OpenFace 2.0: facial behavior analysis Toolkit. In: 2018 13th IEEE International Conference on Automatic Face & Gesture Recognition (FG 2018), Xi'an: IEEE, May 2018, pp. 59–66 (2018). https://doi.org/10.1109/FG.2018.00019

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