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Social Robot in Attentional Therapies

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Abstract: *This paper describes how social robots can be used in philological therapies to improve the attentional capacities of children. A social robot is a powerful tool especially if the users are children. A social robot can be a playful tool, as a toy, but can direct some activities and gain the child interest in it.*

Keywords: *social robot, assistive robot, social interface, attention deficit, therapeutic, behavioral interventions.*
MSC2010**:** *97C20, 97C30, 97C40, 97C60.*

1. INTRODUCTION

A social robot is able to interact with humans and also is able to help humans to do some task. In this respect there are many social robots that have been developed to help children to increase their social capacities.

Using a social robot is possible to help in a physiological way children, especially to stimulate their attentions in school years. It is possible to use a social robot as part of psychological therapies as a complementary tool. In order to reach the goal of this research is necessary define Attention Deficit and Hyperactivity Disorder (ADHD). ADHD consist in persistent patterns of inattention and/or hyperactivity and impulsivity, which are severe and common in children in school years in it age and level of development [1].

There are different test that help to measure the attention capacity, so it is possible to establish the necessary parameters and characteristics that the social robot need to have in order to develop the robot social abilities that can help the child.

2. ROBOT AS A FRIEND?

In our days the robots are common, there are presents I almost every industry and also in almost every daily activities. Robots were tools to do some task that were hard for the men to do it, to reduce the time in productions processes and to do some works in dangerous environment. But, in the last years robots has been introduce not only as a tool to do hard jobs, but also as a tool to interact, collaborate and assist humans been. The main idea was and is in this days is create a robot able to communicate and interact with people until specific task has been accomplish.

A robot that is able to interact with humans been is define as a "Social Robot". To talk about social robot is necessary to include some concepts such as: embodiment, social environment, and the capacity to reach it social goals [2]. A robot can be social depending on

aspects such as: it physical body, level of intelligence and behavior.

To interact with people, a robot needs to have a social intelligent, and also it body need to have a body design according with the goal of the interaction (body conception)[3]. To have a robot with body is important, but most important is that it body have some specific characteristic that can help the users to build a mental model that help them recognize the robot as a partner in the interaction process.

A social robot needs to have an anthropomorphic body, which means to have a body with human characteristics as head with face, arms, or hands. This body is necessary to have sensors so it can feel the environment, and will enable the robot interaction [4].

Talk about a social robot is talk about a robot that is able to interact with people in a common environment that could be deterministic or non-deterministic. In social robot area is possible to talk about assistive robots and collaborative robots. An assistive robot help people to do some task, assist people in their activities, in other aspect, a collaborative robots can participate with human doing some task together.

If the robot is able to assist people to do some task and also is able to interact with people at the same time, is possible to define two kinds of classification, Socially Interactive Robot and Socially Assitive Robots [5, 17]. These kinds of robot use the interaction and also provide assistance by combine its skills.

2.1 Embodiment and Antropomorphize. To create a social robot is necessary creating a physical body with specific characteristics. This process, give a body to the robot is called Embodiment [6]. The embodiment of the robot implies to give to the robot physical similarities with human, this means that the robot body will have some human's characteristics and functionalities; this process is called Anthropomorphize [7].

When the embodiment is given to the robot is necessary measure the empathy level of the robot with the user. Mori in his Uncanny Valley theory has define a curve, in this curve is possible to see that the empathy will decrease until the similarity with the human been is been reaching [8].

2.2 Robot as a Friend? Is it possible that a robot be a "friend" with a human been? As a machine that has been given a social intelligent and a friendly body, is possible to use it as a toy. A child has the enough imagination to play whit it toys and convert them in his friend, establishing a relationship with his toys. This give as the idea that for the children is possible to establish a friendship and confidence with a social robot. This is an advantage that can be useful in rder to use a robot in attentional therapies with children in school age.

There are some factors that has to be consider, in order to reach a good orientated anthropomorphize and they are the elicited agent knowledge, the effectance motivation and the socially motivation [9].

3. ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD)

Attention is an important process when children are in school age, because it can help them to retain and acquisition of essential knowledge and to process the information. Also is important in order to develop their personality and socialization.

Attention Deficit and Hyperactivity Disorder (ADHD) consist on persistent pattern of inattention and/or hyperactivity and impulsivity, which are more severe than expected in children in school years [1].

The causes are unknown, "many children with ADHD show no evidence of structural damage to the central nervous system. Contrastingly, children with known neurological disorders caused by brain injury do not have attention deficit disorder and hyperactivity "[1, 15]

Children with attentional deficit are expose to stressful events and has problems with their families [15].

4. ROBOTS IN ATTENTIONAL THERAPIES

A social robot can be used as a tool that is able to reach the child interest as a toy. This characteristic can be useful in order to use the

robot as a tool assist in the attentional therapies with children in school age, which means between 7 and 12 years old. The process of increase the volume of care and attention span becomes voluntary in school age [10].

"Attentional problems are persistent and occur frequently associated with other early problems" and its triggers as aggressive, shy and cognitive deficits that require t be attended by special education [11].

A social robot can be used in attentional therapy by development of a physiological model and the evaluation of the complex interaction model [12]. This to things can create a robot as a powerful tool in to be use in the therapy.

The goal if the social robot is to accelerate the result of the child therapy, been used as a complementary tool, and to work with the psychology. To reach the goal, a social assistive robot will be used, combining at the same time the characteristics of a social interface, define by Breatzel [16].

4.1 The Robot. The social robot needs to have some specific characteristic to reach the interaction whit the child. This is called peer-to-peer interaction skills, and the characteristic are: [13, 15].

- Express and/or perceive emotions.
- Communicate with high level dialogue.
- Learn/recognize models of the agents.
- Establish / maintain social relationships.
- Use natural cues (gaze, gestures).
- Exhibit distinctive personality and character.
- May learn / develop social competencies.

A social robot, also needs to have verbal and nonverbal behaviors, this means that the robot should be able to express it "emotions" with it body language, facial gestures, dialogs and sounds [14].

To define the robot "personality" is possible to create a computational model that describes how the robot will answer to the environmental stimuli. This model will establish time answer, levels of task accomplish and times in collaborative task [9].

4.3 Robot in the therapy. The social robot will work together with the psychology. It is possible to do the therapy in groups and also have an individual therapy. The activities will be focus in reinforce the child attitude by dialogs that encourage the child when he/she do some task in the correct way [15].

5. CONCLUSIONS

A social robot with an orientated skills and behaviors can be useful in attentional therapies with children in school age. The child imagination allows establishing a friendship between the robot, and the child and this help in the therapy because the confidence is gained and makes easier the interactions and the reach of the task.

The robot will assist the psychology work, and will guide the task of the child with friendly dialogs, facial and body gestures.

This research is the beginning of the project that has the collaboration of a primary school, where the attentional capacities of the children will be test and them an attentional therapies will be accomplish in order to measure the level of improve in each child.

REFERENCES

1. Sadoc, B., Sadoc, V., Kaplan and Sadock´s Synopsis of Psychiatry.

Behavioral Science/Clinical Psychiatry. Phyladelphia (2003).
2. Duffy, B., Rooney, C., O´Hare, G., O´Donoghue, R. What is a Social Robot? Source. [online]. Available: http://www.csi.ucd.ie/prism/publications/pub1999/AICS99Duf.pdf (March, 2014).
3. Dautenhahn, K., Getting to Know each other Artificial social intelligence for autonomous robots. *Robotics and Autonomous systems.* Issue (1995).
4. Ishiguro, H., Kanda, T., Hirano,T., Eaton, D., Interactive Robots as Social Partners an Peer Tutos for Children: A field Tria. *Human-Computer Interaction*. Issue (2004).
5. Feil-Seifer, D., Matari´c, M., Defining Socially Assistive Robotics. *Procedings of the IEEE, 9th International Conference on Rehabilitation Robotics.* Issue (2005).
6. Bartneck, Ch., Forlizzi, J. A Design-Centred Framework for Social Human-Robot Interaction. *Proceedings of the Ro-Man2004.* Issue (2004).
7. Duffy, B. Anthropomorphism and the social robot. *Robotics and Autonomous Systems 42*. Issue (2003).
8. Mori, M. The Uncanny Valley. *Energy*. Issue (1970).
9. Epley, N., Waytz, A., Cacioppo, J. On Seeing Human: A Three-Factor Theory of Anthropomorphism. *Psychological Review.* Issue (2007).
10. Luria, A. Atención y memoria. Barcelona: Kairos (1984).
11. De la Barra, F., Toledo, V., Rodríguez, J. Estudio de salud mental en dos cohortes de niños escolares de Santiago Occidente. III: predictores tempranos de problemas conductuales y cognitivos. *Revista Chilena de Neuropsiquiatría.* Issue (2003).
12. Scassellati, B. Imitation and Mechanism of Joint Attention: A Developmental Structure for Building Social Skills on a Humanoid Robot. Source. [online]. Available: http://groups.csail.mit.edu/lbr/humanoid-robotics-group/cog/cog-publications/springer-final-scaz.pdf (March, 2014).
13. Fong, T., Nourbakhsh, I., Dautenhan, K. A Survey of socially interactive robots. *Robotics and Autonomous Systems 42*. Issue (2003).
14. Yan, R., Peng Tee, K., Chua, Y, Huang, Z., Li, H. An Attention-Directed Robot for Social Telepresence. *The 1st International Conference on Human-Agent Interaction*. Issue (2013).
15. Velez, P. Ferreiro, A. Social Robotic in Therapies to Improve Children's Attentional Capacities. *Review of the Air Force Accadem.* Issue (2014).
16. Breazeal, C., Toward sociable robots. *Robotics and Autonomous Systems.* Issue (2003)