Technology-based aids for people affected by Autism Spectrum Disorder (ASD)

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Abstract

Individuals affected by Autism Spectrum Disorder(ASD), especially the not-verbal ones, are often unable to communicate in an appropriate way, they show strong difficulties in social interactions and in manifesting their affective states or their necessities. The conventional techniques, used to improve the performances of these people in the everyday tasks, are observation-based and can require a lot of effort in terms of time and money, with limited results. Technology-assisted therapies can result more powerful and fast.

Our aim is to analyze the current technology-based solutions that can help the therapist and the family of an autistic subject to interact with him. These solutions exploit the joint use of human intelligence and artificial intelligence to improve the powerfulness of therapies and to allow a better integration of these individuals in the society.

Index Terms

Autism Spectrum Disorder, Avatar-robots, Wearable Technology, Health Monitoring

CONTENTS

I. Introduction

Autism Spectrum Disorder (ASD) is a term used to cover a very big set of disorders. In this field there are a lot of studies and experiments, but still is one of the most unknown **(DP says: forse unknown non il massimo come termine qui)** disease. The symptoms are well known, while the causes are mostly unknown. Nowadays, *screening tests* are used to classify a person as affected by ASD, but these tests have an high percentage of error (false positive or negative) and they can be administered on a patient at least 3 years old. For this reason, several techniques have been studied to wonder if a children has this disorder in the first 2 years of life.

In this respect, this work is divided in two main sections. In section II we present some innovative tool to improve social skills of a child affected by ASD faster than a classical face-to-face therapy will does **(DP says: Questa frase fa schifo)**. In section III we present a couple of wearable products that allow a faster and easier integration of the subject in the everydays tasks.

II. Therapeutical techniques

The classical way to conduct a therapy session, is a face-to-face meeting between the subject and the therapist. Usually, is conducted in four phases: the first one is called *Instruction*, in which the therapist explain what is the skill that the subject is going to learn; the second one is the *Modeling* phase, in which the therapist show the patient what he has to do; there is then the *Rehearsal* phase, in which the patient tries to imitate the therapist and finally a *Feedback* phase in which the therapist draw its own conclusions about the test. The problem of this kind of therapy are the completely subjective evaluation procedure carried out by the therapist and that the subject's attention is not immediate.

To improve the performances of the sessions, the use of Virtual Agents (VA) has been introducted. VA consist of an Avatar, that can be a robot or a virtual character, a learning software that receive information from the Avatar, elaborate them and adjust the response of the Avatar, and an interface for the therapist to interpretate the results. In a VA session, the therapist, with the aids of the learning software, learns the Avatar in order to do an action that the child has to imitate, the child tries to imitate the Avatar learning new way to interact with the society. Different system has been proposed, we propose here two different solutions, one more general and one more complex and efficient.

A. *General AVATAR idea*

The idea of an Avatar-based therapy session is proposed firstly in [1]. They propose a

III. Everydays tools techniques

A. *Jumping Ball*

B. *Genetic Algorithm*

IV. Conclusions

References

[1] L. F. Guerrero-Vasquez, J. F. Bravo-Torres, and M. Lopez-Nores, "Avatar, autism: Virtual agents to augment relationships in children," in *2017 IEEE XXIV International Conference on Electronics, Electrical Engineering and Computing (INTERCON)*, Aug 2017, pp. 1–4.