Dia-log: a tool to identify communication deficits in synchronous environments

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Abstract: This paper presents a tool developed to identify communication deficits in synchronous environments, and particularly in this study, this tool is applied to subjects with autism. This identification is given by means of analysis and classification of conversational markers. Based on the detection of these markers, and consequently of conversational deficits, compensational mechanisms that aid in the communication of these subjects can be proposed, thus improving their social interaction.

Keywords: person with autism, markers, intelligent agents

1. Introduction

Conversation is one of the communication elements that interlocutors are able to interact and exchange knowledge that will generally result in a cognitive outcome. In autism, communication limitation is characterized by the difficulty of using, with meaning, all aspects of verbal and non-verbal communication, including gestures, facial expressions, body language, rhythm and modulation of verbal language, of ecolalia. Furthermore, the difficulty of socialization is a crucial element in autism and the easiest to generate misinterpretations. This means the difficulty to relate with others, to share feelings, tastes, and emotions. These communication difficulties and social interaction result the generation of social problems and problems of isolating from people with autism, mainly when adolescents or adults, as they normally stop attending the school environment. In these cases, they isolate themselves, are dependent of their families and friends to take them to places and ambiences that promote a social life, known as “ordinary” but, in several times, they remain at home, either watching TV programs or
accessing the Internet. In case of the Internet, more specifically of synchronous communicators, it is possible to have more interaction through the use of technology. In communication, either verbal or non-verbal, markers are important to guarantee fluency, logic, and comprehension of the conversational process. These markers are very stereotyped words and expressions. They appear in general context, either private or personal of conversation, and do not depend specifically on new information for the development of the issue. There are two kinds of markers, namely, of interaction and of processing. Conversational markers of interaction are produced by the speaker and by the hearer, and are always “a set of particles, words, syntags, stereotyped expressions and clauses, or even lexicalized expressions.” For instance, “so”, “isn’t it”, “see”, “don’t you think so?”, “yes”, “sure”, “certainly”, “oh yes”, “what’s up?”, “I doubt it!”, “really?!”, “hum”, among other elements.

However, conversational markers of processing are produced only by the speaker, and reflect an organization of thoughts – among them are the disfluencies which initially would be flaws occurred during the language process. Taking into account that disfluencies play an important role in the spoken language, it is necessary to develop a study of their kinds, their causes, their effects in the sentence comprehension, in short, of all their aspects.

Before the importance of communication for social interaction and for social interaction for the development of people, especially of autistic subjects, in this study it is sought to introduce a software that aids in the analysis of verbal markers in order to further propose compensation mechanisms for the identified communication deficits.

Communicative processes among human beings began as a result of a need of cooperation among them. They needed to encounter a manner to be united in order to search for common objectives and make the survival of their species possible. This communication made the creation of links that similar people need possible and effective. According to Watzlawick, Beavin and Jackson (2000), if any behavior in an interactional situation has value of message, that is, it is communication, this indicates that even though an individual makes all efforts, it is impossible to not communicate. Yet, according to these authors, even inactivity or silence possesses value of message, exerts influence on others and these, in turn, are not able to not answer to these communications and, thus, they are also communicating.

Besides, it cannot be asserted that communication only occurs when there is intentionality or when it is conscious or successful, that is, when mutual comprehension occurs.

[…] if the sent message equals to the received message is important, but has a different order of analysis, as it ought to fundamentally sit on the evaluations of specific, introspective data reported by the subject, of which we prefer to neglect for the exposure of a behavioral communication theory (Watzlawick, Beavin, Jackson, 2000).
In order to exchange communication, it is not sufficient that two or more individuals speak alternatively, yet it is necessary that all participants are involved in the exchange and engaged to the process, recurring to several procedures of interlocutory validation. Greetings, presentations, salutations and other rituals perform an important role, but the interlocutory validation is consolidated through important means namely, (kebrat –Orecchini, 1996) sender, receptor, and international synchronization which mainly corresponds by the functioning of speech turns, body behaviors participants of interaction, theme choice, exchange register, among others.

Communication is the core for social interaction and it can significantly interfere in school, professional or social communication performance. When the individual communicates, s/he permits others to know her/his thoughts, feelings, needs, and learns another person’s feelings, thoughts, and needs. We can communicate with others by writing, speaking, representing, or even making gestures. Some researchers can divide all these forms of communication into groups as verbal behavior and these forms constitute a recent acquisition of human species.

In case of Communication Mediated by Computer (CMC), Herring (1996) defines it as the kind of communication that happens among human beings through instrumentalization of computers. CMC can occur in various modalities – textual, graphics, auditory, visual, among others. The modality that is important for our research object is CMC based on texts. The participants interact through the written word, typing messages that are simultaneously read by other people on their video screens – synchronous CMC (chat) – or in any other later moment – asynchronous CMC (forum, e-mail and blogs). Communication Measured by Computer (CMC) has promoted the arousal of new forms of sociability of which individuals gather around common interests, independently of space distances.

In spite of the ample use of computer in special education, there are still a few studies that refer its application to people with autism, mainly what it refers to its use as a tool for measuring communication. Without any doubt, it was one of the causes that triggered us (researchers) to study more about this issue and create this research project.

2. Conversational Markers

According to Marcuschi (2002), there are structural and linguistic relations between the organization of conversation in turns and the internal link in constructive unities of turns. Text markers have both conversational and syntactic functions and can be divided into three categories, such as verbal, non-verbal, and supra-segmental. Markers can work as beginners of turns or communicative units, or as finalizers. Markers are very stereotyped words or expressions. They appear in general context, either private or personal of conversation, and do not depend specifically on new information for the development of the issue.
Conversational markers are of relevant importance as they aid to construct and provide coherence and cohesion, functioning as articulators, and determining expressions of interaction between interlocutors.

Concerning the form, markers can be either verbal or non-verbal. Verbal markers can be lexicalized, that is, composed by words, such as “you know?”, “I think that”, or non-lexicalized with expressions like “ahn” (to indicate “yes”), “eh” (to indicate “really?”), among others. Non-verbal markers can be the most prolonged pauses and have emphases on phrases or syllables for demarcation.

In relation to semantics, most of these markers present no importance for the comprehension of texts, but sometimes expressions like “I think that”, “I have the impression that” do not contribute effectively to the development of the conversational issue, but have the role of revealing the speaker’s viewpoint or testing the degree of the hearer’s attention.

Concerning the function of these markers, they can perform more general functions, such as of articulators and structurers, and more specific functions of monitoring the hearer, of search of approval, of hesitation signalizers, of attenuation, or of reformulation, besides the intention and interaction of the speaker.

3. Autism and Communication Deficits

Autistic disorder is comprehended among the invasive disorders of the development that cause several damages in various areas of the development, among them, of social interaction.

The most acceptable criteria to define or to diagnose people with autism are of World Health Organization’s, registered at the DSM IV\(^1\) which defines the following:

- Qualitative loss of social interaction;
- Qualitative loss of communication, manifested by, at least, one of the following aspects:
  a. delay or total absence of development of spoken language (not followed by an attempt to compensate it by means of alternative modes of communication, such as gestures or mimics);
  b. in individuals with adequate speech, serious loss of capacity to initiate or to maintain a conversation;
  c. stereotyped or repetitive use of language or idiosyncratic language;
  d. absence of games or games of variable and spontaneous social imitation appropriate of the development level.
- Restricted and repetitive standards of behavior, interests, and activities.

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\(^1\) Diagnostic Statistical Manual, developed by the American Association of Psychiatry (APA, 1994)
With almost no exception, people with autism present delay or total absence of development of verbal language that is not compensated by the use of gestures or other forms of communication. In spite of not demonstrating significant alterations in their babbling, practically half of these children do not acquire verbal language and, those children who acquire them present serious language deviations.

People with autism who developed language present marked difficulties to either begin or maintain dialogs and, many times, in spite of using speech, they do not focus on communication.

In those children who can speak, the limited and stereotyped use of language is well described. For instance, Kanner (1943) described an girl with autism who followed a strict routine before she went to bed, demanding her mother to participate in a dialog that was identical day after day. Other aspects of the limited and stereotyped language are the immediate or delayed ecolalia, the pronominal inversion, the metaphoric language, and the invariability of rhythm and tonality of the verbal language.

Below we can verify a dialog with an autistic subject who demonstrates some deficits related to the use of verbal markers:

R: Good morning
R: Didn’t you sleep straight?
D: I didn’t leave bed at ten to eight in the morning
R: okay
R: And what time did you go to bed? It was 1:00 and you were still online
D: I saw the h20 girls and pillow club sitcoms
D: h20 mermaid girls
R: Which channel on TV?
D: what did you do last Saturday
D: 57
D: during Farroupilha week
R: As I have a little baby, it is complicated to leave home like this
D: the Gaucho (sic) then like barbecue
D: of the region of Passo Fundo
(Dialog with subject D, carried out on September 23rd, 2008)

Subject D is a person with Asperger’s syndrome, literate, 33 years that maintains frequent dialog using MSN (The MicroSoft Network). It can be noticed, for instance, the absence of response of the greeting made by subject R. In the sequence, it can be perceived the lack of use of punctuation and of sequence in the dialog.

R says: Good morning D
R says: did you like maradona as the selection coach?
D says: a little
R says: Did you?
D says: The would choice (sic) the caniggia as the coa (ch - missing) of the Argentine selection
D says: And not maradona
R says: I agree with you
D says: inter or boca pass gets chivas of mexico
D says: rabello’s planning Christmas still in November
(Dialog with subject D, carried out on November 6th, 2008)

In the dialog above, it can be again perceived the difficulty of granting sequence in the dialog and the absence of the conventional pair of greetings. Subjects with Asperger’s disorder typically have a highly artificial manner of speaking, using a formal register, many times, improper to the context. A five-year-old child with this condition can speak regularly as if s/he gave a speech when the subject interests her/him (Attwood, 1997).

The literal interpretation is a very common feature, although it is not universal of Asperger’s syndrome. Attwood (1997) provides with the example of a girl with Asperger’s disorder that one day answered the telephone and the speaker asked her, “Is Paul there?” Paul was at home, but he was not at the same room where she was. Thus, after she looked around to certify herself of this, the girl simply replied “No”, and hang up. The woman on the other side of the phone line had to call again and explain to her that she wanted the girl to find Paul and gave him the telephone.

Subjects with Asperger’s disorder also have difficulty to understand the metaphors, that is, also in these cases, interpreting literally as, for example, the expression “even if it rains cats and dogs.” Despite these difficulties, they can demonstrate too many advanced skills in relation to speech, reading, Mathematics, notions of space or music, sometimes to the level of “highly-gifted”, but these talents are counterbalanced by retardations considerable in the development of other cognitive functions. Thus, as seen in this chapter, what refers to the features of people with autism, Asperger has common characteristics such as ecolalia (repetition or echo of the interlocutor’s speech) and palilalia (repetition of own words).

4. Analysis of Markers to Identify Communication Deficits

The first step to analyze markers is the storage of dialogs. In order for this to be possible, the authorization of the subjects’ parents who participated in the research project was obtained. Ethical rules that are involved in the process and the guarantee of anonymity of the participants were observed. Currently, dialogs with subject A, an person with autism, 33, male, and literate even without attending regular school have already been collected. This process has occurred since August 16th, 2008 and sixteen dialogs have presently been stored, approximately two dialogs per week. The selected participant, subject B is a 17-year-old autistic
participant who attends special school, and is male and literate. The dialogs with the second participant, subject B, have not been carried out yet, as the authorization and the signature of the Term of Approval previously described for the outset of the collection process have been awaited. The interactions have been carried out through the synchronous communicator MSN Messenger and stored in XML format, standard of its own applicative and organized by date and time of the interaction, with the objective of facilitating the classification. These dialogs are stored to further classify communication deficits through software Dia-Log and insert the analysis of the researcher concerning the markers used in the dialog. Dia-Log is the software specially developed for this study, totally in web environment, and it permits to classify the collected dialogs through MSN, according to Figure 1.

![Figure 1 Form to register dialogs at Dia-Log software. Source: Primary.](image)

In Figure 1, we can verify how the dialog was stored, that is, besides the information regarding the participants, the researcher was able to edit the information about her/his analysis and classification of deficits encountered in the dialog.
The period of collection and interaction through MSN will be of 4 months, or until it completes 50 dialogs with each subject. There is a possibility to interrupt the phase before this period, that is, as soon as it is detected that the markers are often been repeated and no new data are presented in the analysis and the classification.

The software of register of the dialogs allows other researchers to also be able to assess and register conversational deficits, as it is available to access it via web with guaranteed safety by a login with a user and a password.

In this collection phase, it is important to emphasize that the detection and the classification of communication deficits, starting from conversational markers, organization of turns and adjoining pairs, will be carried out with the use of software Dia-Log. In the sequence, after this classification, the phase of the mediator development begins, using agents to identify the communication deficits in real time.

In this phase, dialogs will be only collected and stored in order that the specialists can classify communication deficits. This classification will be conducted afterwards by its own intelligent agents, after they are trained with the basis created during the collection with the use of MSN Messenger and stored at the Dia-Log.

For the development of the chat system, intelligent agents will be used, as they function as personal assistants that aid the user in his/her diverse tasks, in this case, they may help users interact with the tool within it and with other users of the session, making learning attractive and challenging.

In addition to the agent mediating the environment at the right moment, it is important that s/he does not lose concentration of the user in the debated theme, but just gives some hints and/or suggestions, making the user to continue focusing his/her attention on the dialog.

For the development of the chat, Jchatbox, software of free category, developed in Java and with open code will be used. We decided to use the free software as the objective of this study is not the development of chat, but the integration of it with the agents that will mediate the conversation. Afterwards, this application can be accessed from any other tool of Distance Education of open code with Teleduc or Moodle.

To integrate the agent to the chat Jchatbox, framework JADE (Java Agent Development Framework), which is an environment for the development of applications, based on agents, according to FIPA (Foundation for Intelligent Physical Agents) specifications, for interoperability between multi-agent systems totally implemented in Java, will be used. It was developed and supported by CSELT of the University of Parma in Italy. It is an open source (LGPL7).

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2 Download at the webpage [http://www.javazoom.net/jzserlets/jchatbox](http://www.javazoom.net/jzserlets/jchatbox) can be done.

3 Jade is a trademark of TILAB ([http://www.telecomitalialab.com](http://www.telecomitalialab.com)), previously known as CSELT.

It was developed by TILAB with AOT ([http://aot.ce.unipr.it](http://aot.ce.unipr.it)) with the permission of TILAB.

According to JADE (2008), the main objective of the framework is to simplify and facilitate the development of multi-agent systems, guaranteeing a standard of interoperability through an ample set of system service agents. JADE was chosen as it is a framework developed in Java, making the integration with Jchatbox easier.

After the conclusion of chat integration with the mediation agents, the validation phase can be started. In this phase, it will be verified whether the use of this technology can contribute to the detection of conversational markers for further compensation of detected deficits.

The data collected, stored and classified at the Dia-Log will be analyzed by means of a comparison between observed behaviors in dialogs without the use of agents, and with the use of intelligent agents with process mediators.

It is in this phase that the validation of the developed system will occur, that is, starting from the comparison of the data that were stored at the Dia-Log with the classification obtained by the synchronous communication system with the mediation of agents.

Complementarily to the qualitative study, a study of a technological character in which tools and technological solutions for different stages of the qualitative research will be developed. At first, in the collection phase, the dialogs carried out at MSN Messenger, by means of a tool developed specially for this research, coined as Dia-Log, will be stored and classified. This software was developed specifically for this phase, as one of the objectives is to integrate directly to the data basis of the Dia-Log with a free-category chat, as it will not deteriorate in the development of the synchronous communication tool. The intelligent agent that will have the function of carrying out the analysis of the conversation, identifying the markers and proposing compensation mechanisms in real time as a suggestion to the user, will be included to this chat. Before this, an ontology\(^5\) will be initially explained where the sets of definitions under the domain and tool developed in this study will be described. This process, since the data collection to the software validation, can be visualized in Figure 2.

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\(^5\) In Computer Science, ontology is a data model that represents a set of definitions within a domain and the relationships between them.
5. Final Considerations

From the theoretical reference described in this article, it can be perceived that communication is central for social interaction which can significantly interfere in scholar, professional or social communication performance. In the case of people with autism, the subjects who developed language presented difficulty to either initiate or sustain dialogs and, many times, in spite of making use of speech, they do not aim to communicate. Thus, the objective of this study is to identify communication deficits of people with autism through the analysis of conversational markers, using software Dia-log. This identification will be used to create knowledge basis that will promote intelligent agents an intervention through a chat that proposes compensation manners to the users. This method will aid the person with autism to maintain the interaction and, consequently, develop social skills, improving his/her life quality and, mainly, his/her insertion in the society.

References


