Children as active partners: strategies for collaboration in spatial tasks through Virtual Worlds

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Abstract

This paper, referring to a work in progress, describes functional elements of the user interface of a Virtual World that may provide an important contribution to the process by which primary teachers and pupils collaborate in negotiating spatial configurations of educational spaces (classroom, playground, set for a theatre play, etc.). We have observed this process and some of its inherent difficulties and identified requirements or the functional elements of the interface. Finally, we reflect about factors impacting children's feelings of lack of authorship and ownership of spatial configurations resulting from collaboration and how a computer system may help in this regard.

This Virtual World is therefore configured to be applied in educational contexts where curricular models reflect the new childhood culture where children have an active role in the spaces where they spend most of their time, as schools that adopt the Portuguese Modern School Movement pedagogical model.

1. Introduction

The role of children in society and what it means to be a child has been redefined in the last decades by a new culture of childhood where the notion of competent child is emphasized: children are now recognized to have the capability of constructing meanings of the world that surrounds them and develop an autonomy that allows them to make decisions [1]. Therefore, the childhood culture that established that children could only give personal contributions to society when they became full developed adults is being replaced by one that defends that children should be active participants in some decision processes namely the ones related with the configuration of spaces and infrastructures where they live or spend most of their time, such as schools and playgrounds [2][3].

A child's implication in this process may take place in the school itself, where teachers can frame this process as an activity in their work methodology. In Portugal, as in other countries, school spaces that reflect educational models that put great emphasis in collaborative work and lay in the notion of the competent child are emerging. Examples of such pedagogical models include the Portuguese Modern School Movement [4] and Institutional Pedagogy [5] in which classroom activities require the student's active participation either in negotiation and decision-making processes or others (e.g., vd. [6]).

However teachers face several difficulties in building school activities where such participation and negotiation can take place. In particular, children in primary school contexts offer special challenges as the necessary cognitive and social skills to develop such a collaborative process are still developing.

Virtual Worlds (also know as Multi-user three-dimensional environments) seemed to us a feasible support for such activities as they provide an adequate simulation of a three-dimensional physical reality and allow several users to interact simultaneously with that simulation. As some virtual worlds include programming and modeling environments, we considered that we could implement some mechanisms that would give both teachers and children a better mediation tool to support the negotiation process.

This article presents a work in progress, where some difficulties in spatial negotiation processes in a primary school activity were identified and where requirements for interface elements in a Virtual World are proposed to support/mediate these activities which may help overcome or minimize these difficulties.

This Virtual World in particular will be developed with OpenCroquet, a software development kit that supports the creation and distribution of collaborative multi-user 3D applications [7]. OpenCroquet is based in the Squeak environment, which is "a modern, open source full-featured implementation of the powerful Smalltalk programming language and environment" [8]. All images presented in this paper are snapshots of OpenCroquet worlds.

2. A Virtual World in an activity scenario: challenges and user requirements

Negotiation of the spatial configurations that take place in a school environment (e.g. spatial position of toys in the playground, furniture in a classroom or props of a theatre play) is a collaborative task that presents a great number of challenges to its participants. In particular, when the participants are the school children themselves which are expected to work collectively with the proper guidance from their teacher, particular challenges arise.

In this paper we present three of those challenges, which where observed and discussed with a teacher from Amélia Vieira Luís Primary School in Carnaxide, Portugal, that uses the Portuguese Modern School Movement's methodology with his 2nd year students.

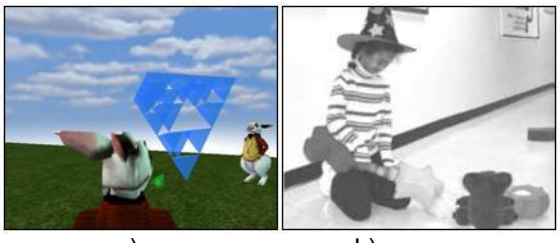
We also present the requirements to the user's interface of the virtual world that can, in principle, help to minimize or overcome these challenges and although it is not in the line of our current investigation efforts, we reflect why these challenges can, if not properly addressed, affect the child's sense of authorship and ownership in the final negotiated spatial configuration (and therefore mine the competent child paradigm of such activities). These requisites and user interface elements are properly framed in an activity scenario that is described along this article.

2.1. Discussion management

Any teacher who has already put a subject under discussion for the class has faced the problem of discussion management. Any chosen method, as defining an order by each child intervenes in the discussion or defining no order but asking children to raise a hand whenever he/she wants to speak, has its drawbacks and its efficiency is never total as children interrupt easily one another to present or defend their point of view.

In a Virtual World this problem may also occur since, as it is desirable, all children have editing privileges to express their own opinion and propose a spatial configuration. Therefore two or more students can change simultaneously the position of different objects in space which would easily mine each child's perception of what was his own personal contribution. This is also a problem to the teacher as he will eventually loose the notion of which children have or have not intervened and the sequence in which their interventions took place. Such an open environment can, in an extreme situation, lead to a full anarchy of the process. Therefore, a mechanism where editing concurrency is forbidden (or controlled by the teacher) could help to overcome this problem by giving a meaningful sequence to the negotiation process.

We propose an approach inspired in a programming context with physical objects (fig. 1b) where identical challenges existed [9]. A "special" object exists in the Virtual World that serves as a token (a magic wand, for example) and gives the child holding it exclusive edition privileges. In this context, a child's personal contribution to the negotiation process (his/her configuration) will be all the spatial changes between the time that the child grabs the token and the time he/she releases it (which would then become available to another child) (fig. 1a). This matches, metaphorically speaking, the real life situation where a child raises his/her hand (asks for the token) to speak and give his/her contribution to the activity that is taking place in the classroom but, by mediating this process with such an editing concurrency control tool, with a more efficient discussion management.



a) b)

Figure 1. a) The user with the 'green ray' above his right shoulder is the one who presently has the rights of spatial configuration editing. b) Magic wand from the Physical Programming system [9].

2.2. Limitations in current support materials

When teacher and children engage in a spatial collaborative negotiation, a vast array of support materials is used by the teacher to help children visualize spatial configurations that result from their contributions (such as drawings, plants, measurings and maquettes). Although these materials help the negotiation, some of their intrinsic limitations difficult the process.

Let's take the maquette as an example. The teacher can use this tool as a better way to promote discussion, as it simulates a spatial configuration reality with a good degree of realism (assuming that each object has the correct proportions to one another). But as each child collaborates, by proposing his own configuration, changes are done in the maquette that may radically change the configuration proposed by the child that intervened before him – therefore destroying the vision of this child. In this sense, each child may have difficulties to believe that it gave a positive contribution to the collaborative process (if any at all) by seeing a final configuration which is possibly very different from his own.

Teachers may develop a strategy by starting to propose an initial configuration and give the several intervenients (children) a sequential order for suggesting small changes to that configuration. These successive changes would constitute new versions (2nd version, 3rd version, etc.) – as many as the number of iterations taking place in a negotiated process. This strategy may help the child realize that it gave a positive contribution to the process as it was his/her configuration that served as the basis of the next child's configuration. In this sense, the teacher may help the children see that the final configuration may be seen as the product of all interventions combined.

Virtual Worlds could help this strategy have a bigger impact as they could offer in their interface a history tool through which the several proposed spatial configurations can be easily accessed. With this tool (and under this perspective) a teacher could help children realize that negotiating a spatial configuration is a dynamic process - one that changes during time. A child would not see his/her configuration entirely disappear as it is changed by others, but would instead, having seen it saved in an historic log, help him/her realize that his/her configuration is part of the nature of an evolutionary process (which would correspond to the evolutionary process that a collaborative task goes through, until it reaches a final state).

Virtual Worlds could therefore be a place where all proposed configuration co-exist and are easily accessed, but where just one of those configurations (the last one) has objective reality in a moment in time.

It is therefore necessary that the history tool interface element gives both students and teacher an immediate access to any configuration so that this evolutionary process is easily seen. We therefore propose a solution based in the notion of "portals" in virtual worlds, which are already implemented as a feature of OpenCroquet as links between worlds. With these portals, teachers and children can navigate to different spaces (different spatial configurations) as illustrated in fig.2, accessing configurations proposed by someone in an earlier stage of the discussion. Portals would be used as access doors to the same spatial reality that suffers changes during time.

Figure 2. A default OpenCroquet virtual Word, representing Mars, with a portal where another world can be accessed.

2.3. Egocentrism

In a primary school context where spatial configurations are negotiated, we deal with actors (children) that have unique characteristics. One of them is the difficulty in giving up their own perspective to the other one's, as they do not totally understand the relations that involve "giving and receiving", facing unilaterally needs and points of view [10]. This problem of egocentrism characterizes participants that are in a cognitive development stage which difficults a full collaboration by the lack of necessary competences to the negotiation and decision making process.

We therefore propose a tool that allows or facilitates collaboration by using the previous mentioned historic spatial configuration tool in a particular way: spatial configuration confrontation. The creation of a two-spatial configurations side-by-side comparison mechanism can be an adequate way of helping the teacher to place children discussing strengths and weaknesses of two suggested configurations.

One way to do this is by splitting the child's screen in a 50-50 proportion and making his/her avatar walk in two worlds at the same time - i.e., the two versions the teacher wishes to confront (fig. 3).

Teachers can use such tool to take children in a "time travel" visit where a previous configuration can be re-visited and where a constructive discussion – by confrontation with another configuration – can be achieved. Encouraging children to observe and compare two particular configurations by framing the discussion in several perspectives (as "which playground may be safer?") may help them reflect and overcome some of the disagreements that arise and evolve to a final agreed solution.

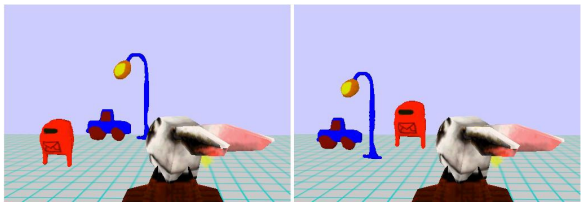


Figure 3. A child walking in two different worlds, both referring to the same space but as it existed in different moments in time.

3. Final reflections

The task of deciding about the configuration of a certain space is an activity that is taken by the future users of that space in several scenarios. This means that a collaborative task is necessary and a negotiation must be made to reach a final conclusion.

In this article we have identified some difficulties when this process is given in a school context where the child, under the new childhood culture, can make decisions about the several spaces he spends most of his time (playground, classroom, etc.) and we suggest that a virtual world properly configured can help teachers in managing this process. This is achieved by an activity that is teacher-oriented and where children and teacher use some tools to overcome or minimize these difficulties. The tool we find the most promising is the one that offers a clear method of comparing different configurations that were suggested during the negotiation process.

We have also reflected about the child's feelings of ownership and authorship in a collaborative project and how our interface tools could help in this particular field. However this problematic is not the scope of our current investigation.

Finally, we are confident that these tools in a virtual world can give a relevant contribution in other contexts where negotiation of a 3D configuration is necessary. Two possible examples are the reconstruction of destroyed historic buildings (through the cooperation of historians, archaeologists and people with living memory of the building) and the participation of citizens in the decision-making process regarding an infrastructure proposed by a county government. Although each context has specific difficulties in the negotiation process, some of the ones we identified in this paper are common and therefore this tool or a variant of the same could be a useful mediation for the discussion process.

4. References

[1] Lourenço, O., 2002. Psicologia de desenvolvimento cognitivo (2ª Ed.). Coímbra, Almedina, ISBN 972-40-1801-6.

[2] Sarmento, T. & Marques, J., 2006. A Participação das Crianças nas Práticas de Relação das Famílias com as Escolas. Interacções 2, 59-86, ISSN 1646-2335.

[3] UNICEF Innocenti Research Centre, 2005. Cities with children - Child friendly cities in Italy, Innocenti Research Centre, ISBN 88-89129-25-5.

[4] Niza, S.,1998. O Modelo Curricular de Educação Pré-Escolar da Escola Moderna Portuguesa. In Modelos Curriculares para a Educação de Infância, Júlia Oliveira Formosinho (ed.), (2ªed.) , pp. 137-159, Porto, Porto Editora.

[5] Vasquez, A. & Oury, F., 1977. Da classe cooperativa à pedagogia institucional II. Lisboa, Editorial Estampa Lda.

[6] Grave-Resendes, L. & Soares, J., 2002. Diferenciação Pedagógica. Lisboa, Universidade Aberta, ISBN 972-674-369-9.

[7] OpenCroquet, 2007. http://www.opencroquet.org. Last accessed in 20th September, 2007.

[8] Squeak, 2007. http://www.squeak.org. Last accessed in 20th September, 2007.

[9] Montemayor, J.,Druin, A.,Chipman, G.,Farber, A.,Leigh Guha, M., 2004. Tools for children to create physical interactive storyrooms. Computers in Entertainment 2(1), 12-36.

[10] Selman, R. & Selman, A., 1979. Children's ideas about friendship: a new theory, Psychology Today, October, 71-114.