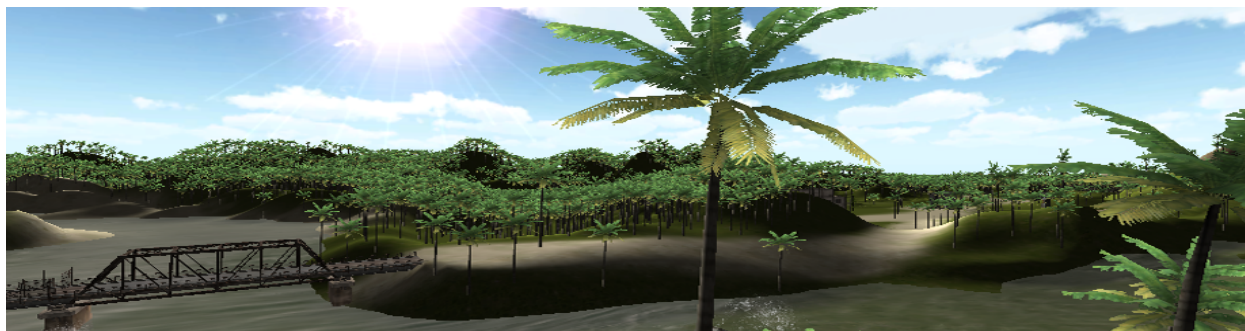


Metaverses, knowledge construction and social change: the "Pirarucu-Gente Project" Case

Maigon Pontuschka and Luís Carlos Petry*

Universidade Federal de Rondônia and Pontificia Universidade Católica de São Paulo*



A view of the topography of the first prototype of the Pirarucu-Gente metaverse.

Abstract

This paper intends to show a possible use of videogames in knowledge construction¹ through the participatory action research methodology in the areas of agro-ecology, fisheries engineering and solidarity economy. The paper presents the initial state of the activities of the "Pirarucu-Gente Project", a research and extension project focusing on advisory, training and social change. The project aims to assist family-based farmers, fishermen and fish farmers of the region called "Território Central da Cidadania" (the Central Territory of Citizenship) of the State of Rondônia, Brazil, in the use of sustainable practices in the management of production, processing and commerce of their products, so as to ensure their autonomy and livelihood. A metaverse will be used as a working tool for the dissemination of best practices.

Key-words: metaverses, virtual worlds, environment, knowledge-building, participatory action research, fisheries engineering, sustainability, solidarity economy

Authors' contacts:

maigonp@gmail.com and allestator@gmail.com*

1. Introduction

In recent years, several game engines enabled the creation of multiuser 3D virtual worlds of the MMORPG type (massive multiplayer online role-playing games) on the Internet. These are the "metaverses", whose best-known example is *Second Life* [2011]. The word "metaverse" comes from

¹ "Knowledge construction" is a term widely used by Brazilian scholars derived from the works of Jean Piaget and Lev Vigotsky to describe the acquisition of knowledge and how new discoveries and definitions become new bases for new ideas and solutions.

science fiction, borrowed from the novel by Neal Stephenson, *Snow Crash* [Stephenson 1994] in which it named a fictional virtual world that simulated real life in a virtual space on the Internet.

With the advent of metaverses we have the opportunity to participate and live in 3D virtual environments, interact with objects, NPCs and avatars of other humans. Currently, most of the metaverses provide structured experiences in the areas of entertainment, social networking and business. These are some of the reasons why most part of the current literature focuses metaverses and their potential only for entertainment and business purposes.

Another possibility is to consider metaverses from another point of view, asking ourselves if they could not also be objects and environments for the production and transmission of knowledge, *strictu et lato sensu*.

When thinking of "knowledge construction", one of the many possibilities to be considered is to use metaverses within processes of academic research related to the creation of content in new areas of scientific knowledge by communities of researchers and general users. An interesting work in this direction is by Schlemmer and Backes [2008], in which the authors claim that the metaverses are new spaces for knowledge construction and discuss their applications in the educational field, mainly for distance education strategies.

Beyond the interesting focus provided by the authors, we believe we might also think metaverses in other areas of academic research, for example, in participatory action research, an endeavor to which we are dedicating ourselves in our current research efforts.

Towards incorporating metaverses in academic research, we found that Thiollent [2007] indicates that the participatory action research methodology has as a

goal to integrate researchers and members of an organization in a cooperative and participatory way, in order to solve a social problem. The observation of this researcher shows some elements that may be present in metaverses, these massive collaborative worlds. Well, in metaverses we have an interaction between real individuals through their avatars and this interaction may cause significant changes in the real world as well as in the digital world [Murray 2003]. When used in social projects, metaverses may have the ability to leverage changes and introduce their users in new worlds that may, in their turn, open new perspectives in the real world. It will be with this view in mind that we will present the “Pirarucu-Gente” metaverse.

2. The original Pirarucu-Gente Project

The “Pirarucu-Gente” Project (or Pirarucu-People Project) emerged from a CNPq (Brazilian Agency for Research Development) call for projects for technological development in rural areas. Originally meant to be completely offline, it is a project for technical assistance and rural extension developed by the Fisheries Engineering and Aquaculture Department of Universidade Federal de Rondônia (the Federal University of Rondônia – UNIR). The project has this name because it works with family-based farmers, fishermen and fish farmers of the region called “Território Central da Cidadania”. Considered a real dinosaur of the rivers, the “Pirarucu”, also known as “Arapaima”, is the largest and one of the most resistant fishes of the Amazon. Just as the Pirarucu, the long suffering people of the Amazon get past difficulties, bravely endure hardships and, yet, manage to survive. The project will help the various associations of workers to achieve better results in their activities. It aims to foster organizational development and provide training focused on autonomy, management of production, processing and commerce of their products. In addition to family-based farmers, fishermen and fish farmers, other groups take part in the project such as technicians from the government rural development agencies, as well as researchers, professors and students of UNIR. The project aims to make a diagnosis of the current situation in the state and also pinpoint best practices in order to subsidize self-management and sustainability of these organizations.

Based on the “participatory action research” methodology (or just “action research”), the project encourages participants to do the “*problematization*”, which is a critical thinking process technique to raise the important problems that need to be discussed, solved and improved in their daily practices, and develop projects with the help of the university to solve these problems and plan the future of their own institutions.

The project’s kind of rural technical advisory based on participatory action research opposes another kind of rural advisory held until very recently in which the government or institutions of technical advisory came with a finished project in which farmers were mere receptacles of an alleged technical knowledge. This is what Paulo Freire calls “banking education” [Freire 1983]. Some own the knowledge and others simply receive it in a passive way. This type of extension takes for granted that farmers and fishermen do not have any kind of knowledge and need to receive it from those who hold it. The result of this practice is often disastrous, because farmers simply end up completely disengaged from these projects, since the actions developed do not always meet their real needs. Even worse, this practice ends up leaving farmers into debt with the banks. The participatory action research takes as assumption that farmers are active subjects and have a wealth of knowledge that is not always recognized by the academy or by the government. All farmers, fishermen and fish farmers have their history and specific knowledge of their own, and this knowledge is of fundamental importance because it is based on practical life and discoveries of empirical observation. This knowledge can greatly enrich academic research and the interaction of the various stakeholders can bring about a completely new kind of knowledge with innovative solutions [Freire 1983; Williams 2011].

The works of the project will be developed in seven presencial modules of 40 hours each over a 24 month period, with the goal of making a diagnosis of the situation and assist each institution in defining their own “project of future” and their strategic plans according to their interests and values. The themes of the modules are: 1) Participatory methodologies to support management of shared natural resources, fisheries and biodiversity; 2) Agro-ecology: history, principles and foundations, family-based farming, fishing and peasantry; 3) Rural extension: history and evolution, 4) Diagnosis, environmental inventory and support of ecosystems; ecological economics: development and participatory involvement; climate change; environmental technologies and services; recovery of water resources, riparian forests and degraded areas; 5) Food safety and sovereignty; 6) Ecological aquaculture; 7) Solidarity economy: solidarity social networks (offline) and ways of doing commerce as a group.

A total of 11 entities participate in the work, including associations of fishermen and farmers, rural technical advisory bodies and the university, with support from the municipalities of the region.

The project includes the creation of booklets with agro-ecological best practices and other best practices identified to help family-based farmers, fishermen and fish farmers during the period of the project. A book

with all the material produced will be published at the end of the project.

3. A metaverse for the project

Several factors contributed to make us understand that a metaverse could enrich - and even revolutionize - the work of the Pirarucu-Gente Project. Some faculty of the Department of Fisheries Engineering and Aquaculture of UNIR were studying metaverses and the possibilities of their application within the subject of "Computing and 3D design" for undergraduate students. They realized that metaverses could enrich social coexistence and that they could also be applied in university extension activities, such as the "Projeto Pirarucu-Gente". As they recreate reality in a visual and interactive way, metaverses could be useful to work with people who do not have good domain of written or academic language, such as farmers, fishermen and fish farmers. The metaverses can provide information and teach in a visual and practical way that would work well in digital inclusion practices, provided people received some training. The Pirarucu-Gente Project already included some training in computing so that participants could use the computer, access the Internet and develop financial controls by using spreadsheets. The introduction of a metaverse would enrich these practices even further. Another factor was that the metaverse presented an ideal opportunity to bring together partners from different areas of the state, some living more than 400km away from others, into the same virtual environment and create a virtual community. Besides this, the metaverse, associated with the creation of a website for The Pirarucu-Gente Project [2011], could expand the scope of the project allowing any person to have access to the material produced.

4. The metaverse and its objectives

Metaverses and MMORPG-type games enable digital environments to become spaces for community discussion. They can also become environments for training and serve as virtual libraries owing to their storage and distribution capacity.

In the case of the Pirarucu-Gente Project, the metaverse can be a virtual meeting place and a place of reference in which participants have access to a summary of all activities through simulations and virtual instructional materials (videos etc.). The metaverse is designed to provide these resources so that all partner institutions can replicate their practices in local actions of technical assistance and rural extension, in a way that other institutions, farmers, fishermen and fish farmers who were not directly involved in the Pirarucu-Gente Project can profit from it.

Ultimately, the goal of the metaverse is to be a public knowledge base to provide the results of all work done during the Pirarucu-Gente Project, so that this material can be useful for other associations and organizations concerned with sustainability in agriculture, fisheries and aquaculture. This is the "knowledge construction" aspect we mentioned earlier.

Besides the issue of digital and social inclusion another objective of the metaverse is to benefit the academic community (research and training). To create the metaverse we organized a team that will be responsible for all its technical and conceptual implications, boosting research and teaching activities within the university. The metaverse will require that students of the Fisheries Engineering and Aquaculture Department of UNIR be trained in using 3D software for the creation of 3D objects and simulations.

From an operational standpoint, the engine chosen for the development of the metaverse is Unity 3D [2011], which facilitates the work of integrating the design team with the scripting team. The project will be carried out by the team at UNIR in association with professors and students of the undergraduate videogame course of Pontificia Universidade Católica de São Paulo (PUC-SP) supervised by faculty from the Technologies of Intelligence and Digital Design Department.

5. Conceptual framework and development method

Our proposal for the metaverse of the Pirarucu-Gente Project started our initially with our study of the Ilha Cabu (Cabu Island) [2010] academic videogame, coordinated by Dr. Arlete dos Santos Petry [Petry, A. 2010]. Another reference was the analysis of the games produced by Belgian studio *Tale of Tales*, specifically the videogames, *The Endless Forest* [Tale of Tales 2005] and *The Path* [Tale of Tales 2009].

We chose an iterative incremental model of software development [Cockburn 2008], typical of agile methods, for the development of the metaverse. Agile methods require constant contact between developers and users/customers, and its basic idea is to develop a system through successive cycles (iterative) and small portions with new functional capabilities each time (incremental), resulting in functional prototypes that become increasingly elaborate versions of the system. The process begins with the implementation of a set of basic requirements that are iteratively improved over the development of new versions of the system. Each increment is developed through an iteration which involves a complete cycle of development including planning, requirements analysis, design, coding, unit tests and, finally, acceptance tests, during which the working prototype is presented to users for review and approval before a

new iteration of a new increment begins.

6. Basic elements of the metaverse

During the first conceptual meetings of the development team we began to imagine the design elements that we would like to see in the metaverse to achieve the objectives above and how we would organize the virtual space of the metaverse for those purposes. As for the general topography of the metaverse, the team is working on a stylized recreation of the region of "Território Central da Cidadania" of Rondonia.

Each entity will receive a virtual building, in which the evolution of their practices, activities and records will be displayed. It will be possible to see texts, graphics and images that present each entity, its action goals during the project, the diagnostic and planning tools as well as the future plans of each one of them. For example, there will be Venn diagrams, institutional involvement analysis graphics, strategic plans among other documents and graphics. All these elements constitute a history of the entire process, from beginning to end. Each entity is working with the 3D team to choose the design of their digital building by participating in creation laboratories. Currently, the group discusses the insertion of these virtual buildings on the digital topography of the metaverse, their location, spacial relations and roads for its users.

In addition to the buildings for the entities there will also be a "Virtual Research Center" dedicated to teaching and extension activities of the Pirarucu-Gente Project. One of the models under study is a virtual arena, similar to the one used by *Slactions* [2011] in *Second Life*. Its purpose is to bring together the avatars of the users of the metaverse for discussions, meetings, lectures, advisory sessions and training. In the Virtual Research Center it will be possible to find learning materials such as virtual brochures, texts, images and videos produced in the project for online consultation or download.

As for the agro-ecological best practices, the project also previews the creation of mini-games called "technical virtual experiences" showing various interactive scenarios that would allow recreational and educational activities through 3D simulations of best practices in agronomy, fish farming and other sustainable agro-ecological activities. The themes of these scenarios will be defined according to the work done during the meetings of the presencial modules. Some proposed ideas for the mini-games are:

1) Geo referenced mapping of recovered water springs in the state and practical virtual examples of how to do this recovery;

2) Methods of recovery of riparian forests recreating environments similar to the real ones with

plant species that are native to the region;

3) Examples of "agro-ecological gardens" that consist of a circular system that has a fish tank in the center and cultures of various types of vegetables around and which uses water and other resources in an optimal way;

4) Examples of agro-forestry systems and socio-environmental technologies under development in the region ;

5) An interactive mini-game that teaches techniques for the exploitation and processing of fish leather for the production of purses, shoes and other utilities;

In July 2011 the first prototypes of the metaverse were made available on the website of the project [Pirarucu-Gente Project 2011].

7. Conclusion

In recent years we have seen a real explosion in Internet use in Brazil owing to social movements and public policies toward digital inclusion and increased broadband Internet access across the country. Millions of people, even in the most distant places, can count on access to consoles like the Playstation 2 and 3, Wii and Xbox 360 in ever lowering prices and find in videogames a form of leisure and entertainment..

The metaverse of the Pirarucu-Gente Project indicates a direction that shows that it is possible to use the structure and technology of videogames, specially metaverses, to work on ideas as a community, to develop new techniques and construction practices in several areas of knowledge. The language of videogames is widespread even in the poorest and farthest regions of Brazil. If this asset can be used and associated with proper training as well as with academic research projects, we believe this may promote and accelerate digital and social inclusion in Brazil.

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