T. Gaudy, S. Natkin et D. Archambault. Playing audiogames without instructions for uses: To do without instruction leaflet or without language itself ?
In *CGAMES 2006, Dublin, 21-24 novembre*, 2006

Playing audiogames without instructions for use?
To do without an instruction leaflet or without language itself.

Thomas Gaudy
Centre De Recherche en Informatique du CNAM
292, rue St Martin, Paris, France
00 332 35 62 91 79, 75003
tomgody@yahoo.fr

Stéphane Natkin
Centre De Recherche en Informatique du CNAM
292, rue St Martin, Paris, France
00 331 40 27 20 64, 75003
natkin@cnam.fr

Dominique Archambault
University Pierre et Marie Curie, Inserm U483 INOVA
9, quai Saint Bernard, Paris, France
00 331 44 27 26 10, 75005
Dominique.Archambault@upmc.fr

ABSTRACT

Audiogames, which are supposed to be accessible to the blind, have two problems related to language to be understood by most of their users : the first one is linked to an instruction reading phase, which is often essential, and the pleasure of which is often very different from the pleasure of playing the game. The second problem is even more bothersome: the major part of candidates for playing do not understand the language used by those games. In games, we can discern two approaches to learning how interactivity works: the instructions for use and the interactivity itself. So, if the purpose of a game is to learn in a friendly but challenging way how interactivity can became complex, why not first start this process from the very beginning, without the need of textual instructions ? We have therefore designed a audiogame in two versions: one with the instructions incorporated in the game, so that it is possible to play without an instruction leaflet, another without any language at all. Through the analysis of case studies in which players test those games, the version with linguistic instructions incorporated in the game appears more efficient for understanding the game and the pleasure of playing seems good. The version without linguistic instructions was properly used by two players out of five. These results, though still insufficient to prompt us to do without any language at all, encourage the improvement of the game design and sound design principles allowing a greater internationality of audiogames.

KEYWORDS

Audiogames, accessibility, interactivity, sound design, non-verbal communication

1. INTRODUCTION: AUDIOGAMES WITHOUT LANGUAGE FOR A GREATER ACCESSIBILITY

1.1 Without visual support, languages are less understandable

We want to understand how visually impaired people can easily interact with new games. There are more than 300 audiogames. The audiogames.net website [1] is great to become familiar with this type of entertainment. To have an idea of the current game styles, we can say that there are some sort of audio "Pac-man" like "Dynaman" [2], "Doom" audio remakes like "Shades of Doom" [3] and clones of "Space Invaders" like "Mudsplat" [4]. Video games that stand as standards for audio games are quite old. The reason is that the developing conditions of audio games are closer to the antique video games than the industrial developing conditions of latest video games. There are four great different kinds of audiogames: action games, exploration games, simulation games and board games (Gaudy [5]) but almost all of them are based on interaction and the understanding of this interaction. The interaction has to be accessible: it is better if these games have adjustable and attractive interfaces (Archambault [6]) so that they remain accessible to people who suffer from different sorts of disabilities. For users, the understanding of the interaction is also very difficult to master. Since users may be of any nationality, the communication process through games should not depend on a specific language but only on sounds. This is a desire for a particular design: the use of English is often deemed as sufficient for good understanding for interactivity with few instructions. But language is also an inaccessibility factor for those who cannot master it. For instance, I was able to note that most of the pupils with eye disability from the schools in Lille and Toulouse (France) have little or no knowledge of audiogames. Those same pupils seemed more familiarized with video games, which yet are supposed to be inaccessible to them. Moreover, haveing recourse to translation, which implies increasing development costs, does not enable us to target all the potential users: there are too many languages, even among the most spoken, to do all the translations.

Now, a significant part of existing audiogames requires a good understanding of interactivity principles. For this reason, the comfort given by language is tempting but, even for those who master the adequate language, can be an obstacle to amusement. For example, the audiogame "Pipe 2 Blast Chamber" [7] is very interesting but needs much reading to understand how it can be played. For players who do not master English, the game is not accessible. That is the reason

why it can be advantageous, for accessibility studies or for economic needs for international distribution, to develop games, and then other kinds of software, without communication via language.

1.2 Some studies encourage the making of audiogames without language

Are audiogames without language realistic? A. Darvishi [8] confirms that an Information Technology environment using various sonorities provides support for the understanding of the interactive process. But this study does not say if sounds alone could be sufficient for proper interaction. For this reason again, the meeting between experimental research on audiogames and the field of non linguistic communication could bring interesting results. This can be a way to orientate the purpose of audiogames towards a more musical outcome: interactive music.

In this way, J.L Alty [9] points out that music is usable as the main means of communication, with three centres of interest: the communication of musical algorithms, debugging, and communication for visually impaired people. Regarding this third area, A. Darvishi [8] uses sound synthesis in a virtual environment accessible to the visually impaired people, each sound being the result of a particular configuration of the environment. One of the problems of this approach could be the very abstract result of the first contact between users and this type of software and the difficulty to communicate more concrete information. However, there are various ways of reaching a fuller level of communication.

For example, B.N. Walker [10] manages to communicate numerical data via a musical abacus. In addition to scientific studies, others ways of investigation may be very helpful. Studies of other audiogames are of course essential, but experiments with multimedia may also provide clues for non linguistic communication even if these are unfortunately inaccessible for visually impaired people. These multimedia experiments are often very abstract audiovisually and with no instructions for use. Users have to discoverer by themselves how to interact with sounds.

1.3 Learning process of video games

Several simple learning processes may be combined together for the understanding of a more complex task. Over the last years, video games have more often been analyzed by scientific studies. These new studies enable us to define the nature of games, writing processes, technologies and the cultural impact (Natkin [11]). It is easier for the player to learn a game with instructions included in the first step of the game. In this way, the players use their memory less and can practice without delay the instructions they learnt without the risk of forgetting them. Moreover, it is only when a lesson is understood by the player that the next instructions are given. A complex task may be divided into a great number of short, funny and easy-to-understand lessons often called “tutorial”.

For more complex games, we might fear that the amount of instructions could be much greater. In most cases, this is not true. Linguistic communications are sometimes used but not always. The first basic actions are explained with language and the players have to combine what they can do by themselves. The great difference with simpler games is that learning is no longer introduced before the game but incorporated in the game itself. Tutorials often have the following characteristics:

• No or very few « game over » situations.

• Players face situations that can only be resolved in a single way.

• Clues make the resolution easier. Clues may be audio, visual and / or tactile.

• There are few advantages for the player to go back.

• Players should be very interested in going further.

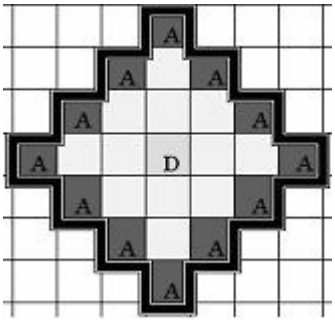

Figure1. Representation of the first level of our audio maze game: no walls, The character appears in the centre (D) and is surrounded by exits (A). No game over situation, players just have to move in any direction to reach the next level. But without visual, it can be harder that it seems. During a test before this experiment, a subject was lost in this level: he goes up and down repeatedly.

Approaching each of these characteristics from an auditory rather than a visual point of view may be of great interest (Figure 1). Consequently, there is a paradox. The number of instructions does not depend on the degree of complexity of the game. For complex games, developers are looking for other ways to make players learn and quickly enjoy themselves without being discouraged. Is the learning principle used by video games applicable to audiogames, which are still presently impeded by a not so obvious learning process, often requiring the preliminary learning of an instruction leaflet? We have tried to apply these interaction principles while designing a game that was used as the base of the following experiment.

2. EXPERIMENT

2.1 General hypothesis

Ideally, a game should be playable as soon as a player has a first contact with it during the learning phase, and without the help of someone else.

2.2 Study environment

In the game used as the base of this experiment, named “Pyvox, Musical Maze”, the player directs a character in a 70-floor labyrinthine tower, 70 floors corresponding to 70 game levels which can be explored one after other in an unchanging

order. This character can also be considered as a cursor that can be moved on a grid from one square to the other.

The player can move the cursor towards target areas but obstacles block up some access paths.

The game describes the target areas as being lifts that give access to the next floor. Disregarding the semantic framework, this device enables its users to move a cursor on an area that can be explored to activate the practicalities enabling them to explore other areas.

This game is therefore a maze with a square-to-square moving system, divided into game levels, each level presenting an exit and a certain number of walls. The aim of the game is to teach the player to recognize an exit sound in order to reach it. The game also aims at bringing the player to recognize the sounds coming out of the walls in order to avoid them without hitting them. As a first contact, the game introduces the character sleeping. The keys of the keyboard almost all trigger alarm sounds. The closer the player gets to the arrow keys, the louder the alarm sounds become. The use of the arrow keys wakes the character up and the exploration of the maze can start.

2.3 Aim of the study

We want to optimize the handling of audiogames by tackling the problems linked to language in two ways: in a first way, we want the player to do without reading a manual beforehand. In a second way, we also want the player to be able to do without verbal communication.

2.4 Operational hypothesis

As a first hypothesis, we assume that linguistic instructions judiciously introduced during the course of an audiogame enable the player to learn how to master it without having to consult complementary instructions.

We assume that our game without language but including the learning principles previously suggested could be understood and properly played by at least a few people, yet without equalling the quality of the handling of the same game with explicit instructions.

2.5 Variable independent from the user

The studied system has two versions: one with incorporated linguistic instructions (Verbal condition) and the other one without any instructions (Sounds condition).

2.6 Variable dependent from the user

The game automatically counts different categories of interactions realized by the player.

• The interactions on the arrow keys (Arrows) (Figure 2), with three subcategories: The instructions amounting to a move of the character (Moving), those amounting to a collision against a wall of the maze (Hurting), those amounting to a short vocal sound effect (Singing). During the transitions between the levels, the character cannot either be moved or be knocked against a wall. This last category is mentioned for information only, for it is not directly used for the evaluation of the game versions.

• The interactions on other keys than those of the arrow keys (Wrong Keys).

The counting of these interactions enables us to provide two indicators, given in percentage and rounded off without decimal places. The first one is the efficiency of the use of the good controls employed by the game, the arrow keys, with the following formula:

Arrows / (Arrows + Wrong Keys) * 100

The second one is the efficiency of the understanding of the maze exploration principles. It depends on the formula:

Moving / (Moving + Hurting) * 100

To give an indication of the interest felt by the player vis-à-vis the game, we provide the time spent in playing. Finally, at the end of the game, we ask the player to tell us what he has understood about the game rules.

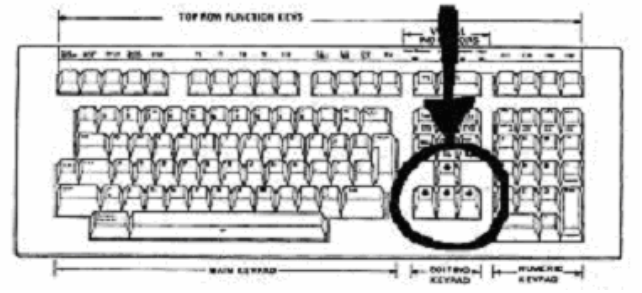

Figure2. Blind players have to find four keys between more than one hundred without any verbal instruction.

2.7 Studied population

We have preferred a more analytical approach based on case studies to a statistical approach for several reasons. First, it was not possible to gather a sample of people significant enough and with characteristics similar enough for such an analysis to be valid. Then we are not looking to quantify the proportions from which the observed game behaviours can be applied generally but rather to understand the potential causes of the behaviour with a psychology-based procedure. The testers selected for the experiment are ten persons who work in the specialized school in Toulouse (France). They are all familiarized with computers or videogames. However, they do not know audiogames, except a tester who knows an audio pinball game. Among those selection criteria, we want to mention the diversity of the profiles of male and female players. That is the reason why we will briefly indicate the level of knowledge of games, their age and their visual acuity. Each tester only does a single game on only one of the two studied devices, without preliminary training.

2.8 Instructions

In this study, the testers are not faced with the device freely, they are aware of the following details: They are going to try a game, the purpose of which is not given. The name of the game is not given to the subjects. They can play as much as

they want, which was, unfortunately, not always the case. They can give up the game whenever they want to but they cannot resume it. They can adjust the sound volume with the controls indicated by the experimenter. The controls to adjust the sound volume are tested by the players. The experimenter starts the game and leaves the players to use the device until they want to stop or stop the game by themselves. The experiment being realised in a school and not in a laboratory, it happened that games were stopped because of outside events. It will be mentioned for each of the subjects whether the game was voluntarily stopped by him/her or not.

3. RESULTS

In the "verbal" condition, the highest level reached at the end of the game is the 55th whereas the lowest level is the 26th. As for the "sound only" condition, the highest level reached at the end of the game is the 29th whereas the lowest level is the first one.All the main results are reported on the table 1.

N°	Player	Experimental condition	Knowledge of game	Level reached (start at 0)	Gaming duration (minutes)	Way of ending the game ?	Efficiency of the good use of keys	Efficiency of movement	Understanding of the tested game
1	22-year-old blind woman	Verbal	Plays essentially on "Tekken III"	26	20	External event	98%	83%	Very good
2	19-year-old blind woman	Verbal	Good knowledge of various video games. Know one audiogame	29	27	By herself	98%	68%	Good but did not recognize the sounds produced by the exit
3	15-year-old visually impaired boy	Verbal	Final fantasy video games, elder scrolls…	37	41	By himself	99%	65%	Very good
4	20-year-old blind woman	Verbal	Plays essentially on Fighting games	55	128	External event	98%	78%	Very good
5	18-year-old visually impaired boy	Verbal	Good knowledge of various video game	41	62	External event	99%	67%	Very good
6	16-year-old visually impaired boy	Sound only	Good knowledge of various video games	5	4	By himself	46%	38%	Bad, but recognized a sleeping character he could wake up
7	30-year-old blind woman	Sound only	Trivial pursuit on PC	29	22	External event	93%	58%	Good but thought she was going back sometimes to the previous levels
8	13-year-old blind boy	Sound only	He has regularly been playing videogame for about one year	10	10	By himself	59%	51%	Bad, but recognized a sleeping character
9	10-year-old visually impaired boy	Sound only	Good novice videogame player	1	2	By himself	3%	100%	Bad, but recognized a sleeping character
10	14-year-old visually impaired boy	Sound only	Plays essentially on a pinball video game	29	40	By himself	90%	56%	Good

Table 1 : Main results

4. DISCUSSION

We can note that the level 29 is too difficult: three players end the game at this level. It becomes the 63rd level in the final version of the game (figure 3). None of the players of the sound condition managed to go through it.

The five first testers are used as a reference. The game has incorporated instructions and it seems to be globally well understood. The system therefore appears to work well globally as players who do not know the game can play without any outside help and without reading instructions. However, even with the incorporated instructions, some of them may not understand. Thus, the second tester explained during the final interview that she could not knowingly localise the exit as she did not understand that sounds referred to it. If we now study the testers who tried the game without linguistic instructions, firstly we note the difficulties to start the game without instructions: which keys should be used? What is the aim of the game? What do I have to do? Those questions do not have explicit answers in the version without incorporated instructions. But we also note that all the subjects were motivated enough during their first contact

with the game to explore the keyboard until they found the adequate controls to truly start the game. During this first contact, the game is felt more as a sound puzzle and it seems that this device works. On the other hand, it appears that for two persons, the game went properly and was appreciated (testers 7 and 10) but with very personal interpretations of the scenario.

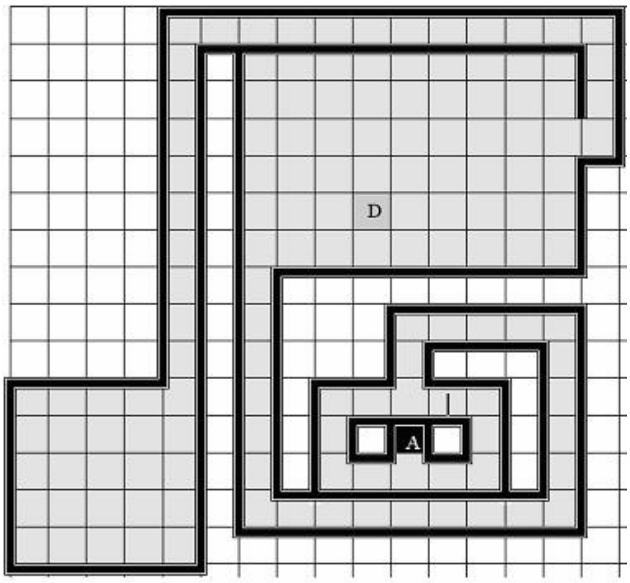

Figure3. Representation of the 29th level of our audio maze game: the character appears in D and must go out in A. Players have to properly understand the gameplay to find the audio path. It can be done easily with verbal instructions, but with a game without language, we probably need more intermediate levels.

The efficiency of their character's movement is nevertheless less good than the one of the game with linguistic instructions. The principle of the exit through sound and especially of the sound walls is less obvious and the exploring was at first much more hazardous. The test number 9 is typical of a totally misunderstanding game. The player used the arrow keys and thus started the exploring of the maze but he did not remain on these controls and gave up quickly. Testers 6 and 8 did not understand the game rules either and it seems that they got bored because the game did not give them an aim to reach after the first contact with waking up of the character by the use of the arrow keys. However, it is particularly interesting to note that in spite of these defects of understanding, their interactions enabled them to go through the first levels properly (level 5 for player 6 and 10 for player 8). If it seems too delicate to give an aim in a non-linguistic way, it would perhaps be more judicious to insist on the effects of the realised interactions. Thus, the emergence of a game scenario could be made easier. It is not possible to say to what extent such a game can be understandable and playable by a population of players. The most important thing is to note that initiating such a game can be possible but that it is much more difficult to implement. The next question is to wonder how to improve the understanding of such games for a greater international accessibility of audiogames? At our level, and following this experiment, we prefer not to do without language for the next developments for it offers obvious practicalities, but we want to implement game principles that can also be understandable by people who do not master the language used. We are here reviewing the game principles that appear to be the most important. It seems that such audiogames could have the following characteristics:

• The game must encourage players for a first interaction, whatever this first interaction might be

The first contact between players and their interface may be as a call for interaction from the game. Some games show a game over sign if the player does not interact. "Game over" situations do not seem to be a good idea because they do not encourage players if they make them understand they lost. Players may interact in very different ways with the keyboard: For this reason, any key pressed should support interaction.

• Reward the player generously for this first interaction

After this first interaction, players must be encouraged to continue. It is better for the players' motivation if they hear a progression right from the beginning. The audio reward must be clearly heard and not confused with other sounds.

• Reward each interaction, but make some rewards more important

The third contact could be a different feed back to induce the search for more appropriate behavior. The simple renewal of interaction unadapted to the continuation of the game should not be as well rewarded as previously. From this point of view, the gratification offered to tester n° 9 for the use of arrow keys is insufficient.

• Let the players choose themselves the moment to act

We have noted that it is better if the player chooses the adequate moment for interaction by themselves.

• Introduce a set of sounds that can be used as a base for a coherent interpretation of the game situation.

The first contact offered by the game makes the player hear snoring and the interaction trigger alarm sounds. All of the testers found the necessary keys for the game which woke up the character and truly started the game. Then, during the exploration of the maze, it turned out that a same collision sound could be interpreted in very different ways. This imaginative aspect which is a great strength of audiogames is also a weakness for the understanding of rules when there are no explicit instructions. To be improved, this aspect requires a deep reflection on the staging of the game

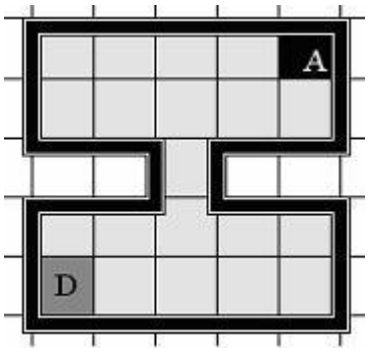

Figure4. Representation of the 27th level of our audio maze game: the character appears in D and must go out in A. Two players reached the next level, without any verbal instruction about the game. It seems easy when it is seen, but in the dark, it is more like a claustrophobic cell with a small hidden path.

We now want to know how to promote even more the distribution of audiogames. One of the best answers would perhaps be to make them more attractive to non blind players. But then, what kind of connection can these games have to the picturing? The perceiving process is very different: the visual stands enable the recognition of a great deal of information in a glimpse whereas the audio sense depends more on a temporal dimension. As a consequence it is hard to create a game that can be played either auditively or visually. For instance, the game "Shade of Doom"[3] offers an optional visual help that I could do without for the first 8 levels but which has proven very useful in order to beat the big boss. There already are a few mixed games that offer an auditive accessibility as well as a visual one, like "Terraformers"[12]. Broadly speaking, we can hope for multiplayer mixed games that would bring together both the visually impaired community and the sighted community. In this idea we are looking forward to cooperative games rather than competitive games because the later category is likely to always advantage one of the two perceiving processes.

5. CONCLUSION

We have developed and tested an audiogame for which it is not necessary to read an instruction leaflet. The principle of linguistic instructions incorporated into an audiogame enables it to be played at once, as it does in most video games. But we know that language, even though it use is optimised, is a factor of inaccessibility. Almost none of the testers in this study, although interested in games and visually impaired, had heard of audiogames. Interviews with young French testers revealed their difficulties to understand English and those games seem hardly to reach non-English speaking players. Audiogames that can do without language, like most video games, would be internationally more important. But the audiogames already do without images. Thus, a first contact with such a game without language shows difficulties for the understanding of the objective to be reached. Despite these difficulties, we managed to have all our subjects use the controls necessary for the game, at least temporarily, after an exploration phase of the keyboard, presenting itself as a kind of brain-teaser with evocative sounds. We have observed two cases of players succeeding in handling an audiogame they did not know before and that does not provide any linguistic instructions. If it is still too risky to do without the practicality of providing instructions through language, the principles of game design and sound design that enable an audiogame without language to be handled satisfactorily have to be improved to ensure better distribution of this emerging leisure.

6. ACKNOWLEDGMENTS

Our thanks to CECIAA for making a helpful partnership.

We also thank the "Institut des Jeunes Aveugles de Toulouse" and the "Ecole Regionale des Déficients Visuels de Loos", the pupils and all the staff member.

7. REFERENCES

[1] audiogames.net, http://www.audiogames.net/.

[2] Draconis Entertainment, Dynaman.

[3] GMAGAMES, Shades of Doom v1.2, 2005.

[4] TimGames, Mudsplat, 2005.

[5] Gaudy, T., Natkin, S., Archambault, D.: Classification des jeux sonores selon leur type de jouabilité, Handicap 2006 Conference, 2006.

[6] Archambault, D.: Computers for the Development of Young Disabled Children, 2002.

[7] BSG_Games, Pipe 2: Blast Chamber, PC Windows, 2002. http://www.bscgames.com/pipe2.asp

[8] Darvishi, A., Guggiana, V., Munteanu E., Shauer, H.: Synthesizing Non-Speech Sound to Support Blind and Visually Impaired Computer Users, Computers for Handicapped Persons 1994.

[9] Alty, J. L., Rigas D., Vickers P.:Using Music as a Communication Medium, 1996.

[10] Walker B. N., Lindsay J. , Godfrey J.: The Audio Abacus: Representing Numerical Values with Nonspeech Sound for the Visually Impaired, 2002.

[11] Natkin, S.: Jeux Vidéo et Médias du XXIe Siècle - Quels modèles pour les nouveaux loisirs numériques?, Vuibert, 2004.

[12] PIN Interactive, Terraformers, PC, 2002.