Playable And Collaborative Art: The *MonMazes* Case-study

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Abstract
MonMazes is a collaborative and physical game inspired by Piet Mondrian paintings that consists of two benches with smart seat cushions that track the user's seating movements. The objective is to guide a ball through the mazes/paintings until the final point. The process of MonMazes' development was driven towards an exploration of collaborative possibilities together with a computer-supported physical user interface, focusing on the interdependency between players who shared a common goal. We start this article by discussing the social aspects of gameplay, the collaboration and interdependence between players, ending with a description of MonMazes project.

Author Keywords
Games; Collaborative; Interdependence; Art; Piet Mondrian;

ACM Classification Keywords
K.8.0 [Personal Computing]: Games.
H.5.2 [Information Interfaces And Presentation]: User Interfaces

General Terms
Design; Experimentation; Human Factors;

Introduction

MonMazes is a collaborative game developed in Unity3D with physical computing, where the collaboration and team work between users is fundamental to achieve the goal: make a ball go through a determined path until it reaches the end of each level. The collaborative action stems for the interdependence among players in order to surpass the game's challenges.

Costikyan [4] predicted in 1994 that "the solitary nature of most computer games" was a "temporary aberration" being this a consequence of technological limitations, what can be verified nowadays with technological mass market penetration that led to new styles of interaction and play [9]. High technological costs and logistics restraints hindered the equal development of multiplayer games despite of this typology of games be more "fun and challenging". However the technological breakthrough is now facilitating the implementation of electronic multiplayer games [14]. Although there have been made large investments made in online multiplayer gaming, little research has been done on the social aspects of this type of games [3].

Multiplayer Game Design

MonMazes focuses on the multiplayer capabilities as the core of the game, stimulating a high degree of social interaction. According to the game theory, games can be classified into three different categories: competitive, cooperative and collaborative. This game fits in the collaborative category since the players work together as a team, "sharing the pay-offs and outcomes" [13], unlike cooperative game design where individuals may not share the same goals and rewards of their decisions [13] and also competitive game design that puts the players as opponents.

Like a seesaw that offers kinetic pleasure, MonMazes only works with the interdependence of two subjects. It can't be played or manipulated alone. The subjects pick up this fact very fast. When his/her friend or colleague goes up he/she goes down and vice-versa, and this keep them engaged in a collaborative experience. More than a game, MonMazes aims to be a spontaneous pure playing experience. The joy of collaborating and sharing the experience with each other make both players win.

Bunten [2] asserts that multiplayer's game design should include cooperation and there are still numerous unexplored possibilities (despite the amount of logistical issues that are related with this format).

As Zagal *et al.* state [14], in this kind of games "the main goal can be achieved only if there is social interaction among the participants". This interaction occurs because the rules of the game stimulate (or force) players to interact socially and also because they share the same physical space, striving towards a common goal [14].

The Importance of the Social Aspects of Gameplay

Computer research shifted from the plain software analysis to the game study within a sociocultural context of play, partly because of the advances in the game industry toward the social aspects of play. A new generation of game consoles, like Play Station 3 Home [12], try to apply concepts of social connectivity and player community, where players meet to socialize and share gaming experiences. The game play goes beyond

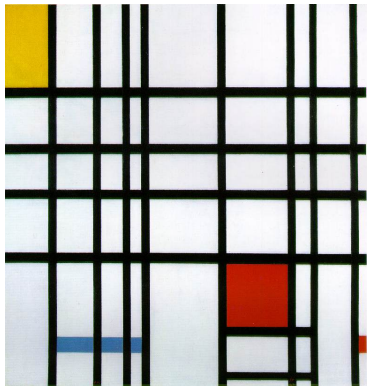

Figure 1. Piet Mondrian, "Composition with yellow, blue and red" (1942)

what happens within the game software itself, encapsulating a game culture that arises from it [1].

Ang *et al.* [1] state that in order to fully understand computer games, we need to examine gameplay in a sociocultural perspective to realize the evolvement of the game as a tool, the changes of the reasons of playing and the emergence of extrinsic play activities. Despite the existence of relevant work in the area of sociocultural play, ludological and narratological game studies they do not include insights into the sociocultural perspective of computer games.

Much like a kaleidoscope that mirrors social and emotional reflections, the observation, (re)action and collaboration of the players create mutual dependence. The members of the playing group are made interdependent through the sharing of a common end and when they perceive this shared purpose, a "state of tension arises that motivates movement toward the accomplishment of the goals" [6]. As the interdependence is a relationship of mutual dependency, Zagalo and Gonçalves state that it "represents a vital condition for the creation of cooperative action" [15] and of collaborative action as well, we can add.

The playful moments of collaborative games bring out the importance of communities. Zagalo and Gonçalves [15] state that the game success is connected to the interest of players in returning to feel the game experience with others. It doesn’t depend directly from the interdependency, but from the activation of the social relations.

In spite of being the main factor that leads to interaction, interdependency isn't enough to keep players engaged throughout playing. The game design of social interaction must be rooted in the creation of community ties, valuing human relationships and emotions, and being "deeply rooted in evolutionary influential factors for the maintenance of communities" [15], since the human species can only survive living communally. As Nardi and Harris claim [8], in games like World of Warcraft it is common for "players to play with offline friends and family. Playing together includes grouping, sharing items, chatting, and exploring", promoting offline social connections.

"Despite the many technological advances to support distributed interactions, people still spend a great deal of time traveling to meet face-to-face with colleagues, family, and friends. Interacting in a face-to-face environment is very engaging." [11]

MonMazes project

The MonMazes project intends to deepen the human need to create community, to share experiences in order to attain enjoyment through the experience of memorable moments. In this game, the action takes place inside a virtual art gallery and the levels consist of Piet Mondrian's paintings (Figure 1) reinterpreted in 3D that are hanging on the walls and may be controlled by the user's physical input.

Each player has a dedicated physical bench that applies rotation to the virtual mazes when seated on. The only way to achieve the level's goal is to collaborate with the other user in order to drive the ball to the end, during the available time.

The users' positions, sitting or standing, vary the data collected by the force-sensing sensors hidden in the cushions. This data is sent from an electronic circuit to a computer that processes it (Figure 2). The users' movements make the paintings rotate, influencing the direction of the ball, which also undergoes a gravitational force.

Figure 2. Users playing MonMazes

This project is based on a minimalist gameplay, the user doesn't need to learn complex controls with a variety of key combinations, poses or other unusual physical gestures or positions in order to play.

The enrichment of the interactions between participants isn't related with technically complex interfaces because "in play and games, it is the communicative, cultural and social aspects that are important", argues Manninen [as cited in 5].

We explored a common and universal daily gesture as the seating act. As Don Norman claims, "isn't this where the machine age started, with mechanical devices and controls? (...) the return to physical devices, where we control things by physical body movement, by turning, moving, and manipulating appropriate mechanical devices" [10]?

Aesthetic and formal influences

As the visual content of MonMazes game we elected paintings by Piet Mondrian (Figure 3), one of the most influential artists from the 20th century. The artist was one of the main members of the "De Sijl" Dutch artistic movement, also known as neoplasticism. This movement advocated that art shouldn't represent real objects but pure abstraction and the expression of the absolutes of life instead, trying to make art as simple and basic as possible and distilling it in order to approach precision. Neoplasticism rejected pre-war decorative tendencies and sought to push Cubism to a new extreme, recurring only to the most basic design components. This simplification was justified by the ambition to redesign the world in a purer way.

Figure 3. *First level screenshot*

This quest for order through simplistic geometry is, in our point of view, closely related to the Labyrinth game. It's a gender of game that requires physical skills in order to tilt the playfield - a maze contained in a box - and guide a ball until the end of it, preventing it from falling into any of the existing holes. The order and harmony of neoplasticism has a confluence point with the straight lines of the labyrinth game, with its own marked areas and structured shapes. At first sight the labyrinth grid may seem an unorganized group of interrupted lines but there is always a straight connection between segments, respecting the root grid.

MonMazes development

A) SYSTEM OVERVIEW

As said before, the system is comprised of two benches, each with a smart seat cushions that are the interface with the system. Inside each cushion is a dissimulated force-sensing resistor (FSR) connected to an electronic circuit. This circuit is based on the Arduino UNO microcontroller and is connected to the computer over a serial connection, where the Unity3D game engine is. When the sensors are pressed, there is a variation on the circuit's resistance, letting the system know the presence or absence of the player. The Figure 4 summarizes the system's functioning.

Figure 4. System's overview diagram

B) GAME ENVIRONMENT

The game starts with a minimalistic screen with two large rectangles that are highlighted when the corresponding player sits down and a text "Sit down to start". This first moment allows the users to understand the game's functioning and also verifies the existence of two players (mandatory requirement).

The action is located inside an art gallery exhibiting Piet Mondrian paintings. The game starts with a short camera travelling from the entrance, through the hallway, until the camera frames the painting related to the active level alone. A point-of-view shot also known as subjective camera is used in order to increase the immersiveness of the experience.

The game has currently two implemented levels based on Mondrian paintings "Composition with red, yellow, blue and black" (1921) and "Composition with yellow, blue and red" (1942) (Figure 1). The 3D model used in the game is a reproduction of each one of these paintings with minor modifications in order to create a maze effect, which allows the ball to navigate inside it.

Discussion

In informal tests conducted with this game, we realized that the learning curve of the game is fast, both because of the game setup (benches in front of a screen) and the self-explanatory immediate system's response to players' seating actions. Not a single player got confused about how the game worked and the majority of users felt challenged with the need to collaborate with one another to achieve the game's goals.

We observed that the players try to put themselves as opponents after achieving the initial goals. Players want to repeat the game experience with other partners and, in the following plays, they try to create secondary rules to defy their partners, for instance to see who can turn the maze to their side being both seated.

From this analysis, we identified that besides the human need of creation and collaboration in community, competition is also a natural heritage that plays a significant role in natural selection, according to evolutionary theory [7]. So naturally, the need for reward, leads players to defy the other players, facing them as opponents.

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