

# Developing Iconic and Semi-Iconic Game Controllers

Lennart E. Nacke, João P. Costa, Dennis L. Kappen, James Robb, Daniel Buckstein  
HCI Games Group, Faculty of Business and IT, University of Ontario Institute of Technology, 2000  
Simcoe St. N, Oshawa, ON, Canada  
lennart.nacke@acm.org , joao.costa@uoit.ca, dennis.kappen@humber.ca, james.robb@uoit.ca,  
daniel.buckstein@uoit.ca

## ABSTRACT

We propose the notion of *semi-iconic* game input (i.e., sharing some properties of game objects instead of being a complete iconic representation of them) and investigate influence of controller representation on player experience. In particular, we developed game controllers at different degrees of realism (*symbolic*, *semi-iconic*, and *iconic*). We present the developed controllers and initial usability findings.

## Author Keywords

Games; Player Interaction; Controllers; Player Experience

## ACM Classification Keywords

H.5.2. Information interfaces and presentation; K.8.0 Personal Computing – General: Games.

## INTRODUCTION

Some of the most successful recent video games are based on non-traditional controller concepts, which map game objects to real-world objects. These controllers have a strong aesthetic representation of game objects and there is a lack of research addressing whether these novel controllers provide a better player experience. Game designers strive to create more realism for their games. Therefore, it is important to understand whether realistic (or iconic) representations of game objects as part of controllers have a greater impact on player experience or if they are just eye candy for players.

Past research has made a distinction between symbolic and iconic controllers of tabletop games. Researchers have explored how iconic and symbolic [2,3] game tokens affect the enjoyment of a game and how these tokens maximize or deter the learning process of game rules for a digital tabletop board game [1]. In this particular study, two sets of custom game tokens were created: iconic and symbolic play pieces. However, these researchers did not explore or design controllers as icons or symbols of in-video-game objects. Therefore, we designed our own sets of iconic and semi-iconic controllers for a game called Balloon Fight (Nintendo). We define semi-iconic game controllers as input devices that share a common feature with an in-game object (e.g., shape) without being a complete (or iconic) representation of them.

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To develop semi-iconic and iconic controllers for Balloon Fight, we used the *MakeyMakey* controller prototyping hardware (available at <http://www.makeymakey.com>) to create representative game interactions using three balloons to represent iconic game objects and three balls to represent semi-iconic game objects, representing a game element controllable by the player. Thus, our definition of game controller iconism is *the overlap and sharing of representational (i.e., aesthetical) properties between an object used as input and a game element controlled by the player*. This definition is grounded in the works of Familiant and Detweiler [2] as well as Gregersen and Grodal [4]. In contrast, we understand symbolism as a lack of overlap or sharing of aesthetical properties.

We contribute new knowledge to the design of game controllers by documenting our process of implementing the design of novel game controllers that represent specific game objects. This contribution is relevant for product designers and game designers when creating game controllers.

## ICONIC, SEMI-ICONIC AND SYMBOLIC CONTROLLERS

We developed game controllers that had different levels of metaphorical representations of game elements (i.e., more iconic than a standard symbolic game controller). To study these controllers, we chose to develop controllers for a game with modest interactions to make it easier to simplify the controllers, thus reducing possible usability issues. We used a Nintendo Entertainment System (NES) game because the control scheme uses only two action buttons and directional input, which was easy to map to different tested controllers. The player controls a character that has balloons tied to its back. The character flies around in consecutive platform levels by flapping its arms and changing directions. A level is completed once the player pops the balloons on the back of the opponents and lands on them while they are either falling or on the ground. The game ends when both of the player's balloons have been popped three times.

## Controller Design

We compared three controllers: (1) a Microsoft Xbox 360 gamepad, representing a standard controller. This is a highly symbolic controller and the most traditional form of input; a type of input that the game was originally developed for.

(2) A 3-balloon controller, representing an iconic game controller (see Figure 1) because it maps visual game objects on the actual game controller. The balloons on the controller represent the balloons in the game.



**Figure 1. The 3-Balloon Controller.**

(3) A 3-ball controller, representing a semi-iconic game controller (see Figure 2). We consider it a semi-iconic aesthetical representation of a game controller for this game, because it is similar to the 3-balloon controller in its control scheme. However, it does not represent any game object in particular, but maintains iconic properties (i.e., the round shape).



**Figure 2. The 3-Ball Controller.**

The two last controllers were developed using a fast controller prototyping device called *MakeyMakey*. We deliberately chose to use balloons and a similar round object because they are tied to the character's avatar, and thus were controllable elements in the original game interaction.

The *MakeyMakey* is an electronic hardware device that – when plugged in via Universal Serial Bus (USB) – can be connected to any object that conducts electricity to simulate keyboard inputs. By using cables linked to the *MakeyMakey* and conductive objects, it is possible to map those objects to specific key presses and play a game with such arbitrary objects as a *controller*. Furthermore, pieces of electrically conductive adhesive tape can be attached to crocodile cables to make surfaces responsive to touch, acting as input devices.

Three red balloons, resembling the ones that the player character has attached to their back in the game, were connected to the *MakeyMakey*, so that touching these balloons would map to game input (similar to a button press). The balloons were laid out in a line along a long piece of cardboard, where the middle balloon controlled the *flapping* action, while the left and right two balloons represented the directional controls. This constitutes the iconic controller version, because the controller represents a game object (i.e., red balloons). The second controller that we created is similar to the three balloons and represents the semi-iconic representation, consisting of a controller with three beach balls. It is a semi-iconic controller because – instead of using red balloons – we broke the direct reference to game objects by replacing them with balls of different colours that are only similar to the game objects in their shape.

## PILOT STUDY RESULTS

After a pilot study, the two controllers that we designed were often criticized because of the lack of action affordances.

Players often struggled and became frustrated when controlling the game with our new controllers. Shifting from the traditional gamepad input mapping to the new mapping caused some interaction problems, because players had to move their arms and change around hands often to efficiently control the character using a control scheme not immediately perceptible or intuitive to them. To address this issue, we changed order of actions mapped to the input objects (more precisely, the flap input action) to meet the recommendations of the pilot study participants. Instead of the pilot study configuration, where the middle object makes the character flap and the others makes the character change directions, the flap action balloon and ball were changed to be on the right-hand side of the controllers, as suggested by the players. This change reproduced an experience similar to the gamepad input. After changing the control scheme, and looking at the actions involved with all the controllers, each hand is related to one action alone: the left hand changes direction, the right hand elicits the character action (i.e., arm flapping).

## LIMITATIONS AND FUTURE WORK

This pilot study is limited in the controller designs, since we developed a semi-iconic and iconic controller to the best of our knowledge for one particular game: Balloon Fight, but could not find proper representations for all in-game actions. Future work should focus on evaluating gameplay experience with these different controller types to understand the impact of different game controllers. It is important to investigate whether semi-iconic or iconic controllers are more engaging than standard controllers. This is an important design consideration, because if it is possible to design semi-iconic game controllers that are equally engaging for players, this could mean less production cost than iconic controllers.

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