# D FOR TWO

## cooperative game controller

# Concept and Interaction

The concept that we are proposing is a *cooperative game controller*. This is a term that we are introducing to describe an input device that is capable of transforming a single-player game into a cooperative two-player game by means of splitting the set of interactions between two players. Our goal with this is to move the *point of cooperation* out of the digital environment, into to the physical world, beyond the controller, onto the bodies of the players themselves.

An important thing to make clear before taking this any futher is what we will consider to be the difference between two controllers and two parts of the same controller. We would like to argue that a controller should be defined by its set of interactions, not by the characteristics of its physical manifestation. Thus, two controllers are two controllers because they each have a full set of interactions. If this full set of interactions is split over several devices, then these devices are all parts of the same controller.

The prototype that we intend to build in order to illustrate our concept of a cooperative game controller will be based on a classic and very common design pattern in the field of game controllers: the D-pad. The D in D-pad stands for directional, and the D-pad is used to navigate in four or sometimes eight directions. These directions will be our main interactions, and we will also add an ”action button”. Thus, our full set of interactions will be: left, right, backward, forward and a dynamic ”action”.

Direction, in its basic format, has fundamental descriptions in movement. These would be forward, left, right and backward as well as up and down for a three-dimensional environment. In most game controllers today movement is no longer controlled with a D-pad, but instead with the analog sticks accessible by the thumbs of both hands. Analog sticks give 360 degrees of movement for a player. The left analog stick most often acts as the new D-pad (with the left and right sides executing strafe-like movement), while the right analog stick is for what is called "free-look”. This is similar in its function to a mouse, with which one can look around the immediate area. In addition to this, more recent D-pads now have eight directions instead of the standard four, giving players a less right-angled navigational experience.

The body language and behavior involves using the player's own shoulders and their cooperative player's as a displaced d-pad. The D-pad itself is split vertically in the middle between the two players. The prototype will consist of two wearables, and our set of interactions will be split over these two wearables. As far as wearable technology and the application of what is fashionable is concerned the inputs are placed in such a way that their affordances are more apparent. That is, to have them slightly raised and appear like they can be pressed. This is to encourage the act of ”play” and allow the ability to acknowledge that they are inputs intended for that purpose.

Players start out facing each other, with their sides towards the screen. To move left or right, one user must interact with the other user's wearable. This will be accomplished by one user pressing both of the other user's shoulders. The shoulders of the player on the left would direct the avatar to the left, and vice-versa for the shoulders of the player on the right. To move forward or backward, both users must interact with both wearables at the same time. This will be accomplished by both users pressing one of the other user's shoulders. The shoulders nearest to the screen are to make the avatar on the screen move forward. The shoulders furthest away make the avatar move backwards. The same goes for the ”action button”, which can be used by both users pressing both of the other user's shoulders. The interactions are illustrated in fig. 1. In our prototype as of current, to the sides facing the screen, there is a D-pad-shaped container. The container in itself only serves as a reminder that a controller is present.

From the perspective of Thulatimutte's ”Three Agent model”, we are attempting to meld the player together with the controller part of the controller/peripheral part of this model. This changes the dynamics of the model itself, so that the players are no longer simply an ”entity that affects change in the mainframe's game state by means of direct interaction with the C/P [controller/peripheral], whose decisions are made independent of the mainframe". Instead, there are now (in our prototype) two players who both engage as entities acting independently from the mainframe but also become controllers in which input is expressed cooperatively to ”affect change in the mainframe”.

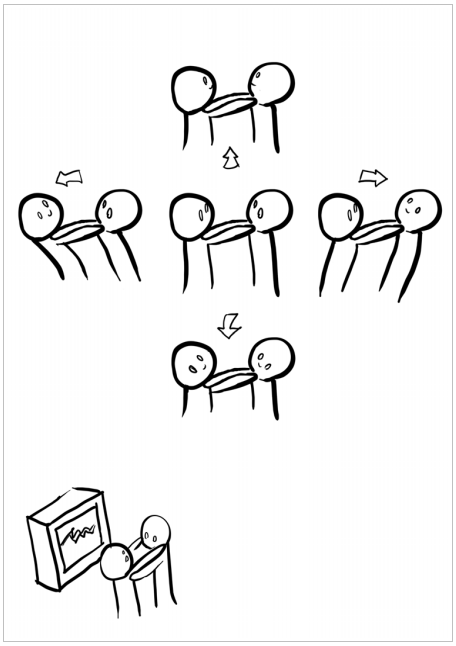


*Fig. 1: Interactions (larger version in app. 2)*

Having to expand on our prototype further with more inputs would present a challenge. Just to give an example, removing the D-pad-shaped container that is in the current iteration, action buttons as well as an interaction to bring up an options menu would need to be considered and well-placed. Freeing ourselves from the paradigm of having the D-pad on the left side does allow new and perhaps innovative ways to execute inputs, yet still keeping part of the theory behind why it was established in the first place. This from an example that Guiard suggests that ”in a right-handed person writing on a paper the right hand is for finer movement, while the left for more contextual ones” [3]. Following this suggestion and basing our prototype on something tested and tried in the past, we will have to place interactions for more intricate and intensive things on the right-hand side of each player, and perhaps more gestural commands or inputs on the left-hand side. We will not go deeper into this discussion as we simply want to illustrate that further development of the prototype is feasable and could be interesting.

Introducing wearables presents new perspectives on interaction with three-dimensional navigable environments. Wearable technology mashes the physical and the digital worlds together such that the users could transfer their inputs as expressed (in gestures, for example) from the physical realm

to the digital realm in some form that is similar or equivalent. Wearing the attire for this type of cooperative play enhances the gameplay experience and has a crucial role in making the controllers part of the player. Literally and for the moment, the controllers act as a ”second skin”, and this allows the use of ”different skins” for catering to specific games. In the future there might also be customizable interfaces that are literally a part of the player. So for now, there is an affordance in having fashioned wearables, an unintended side-effect.

Our vision of the wearables is two simple t-shirts, with touch sensors or pressure sensors located at the shoulders. We would like to build the prototype using LilyPad Arduino boards connected to the computer using BlueSmirf bluetooth modules or XBee WLAN modules, in order to make them wireless yet lightweight. However, the costs for these components could become too high in relation to the scope of the project. It is more likely that we will build a version with one Arduino board inside a lasercut plastic box, wired to the sensors and connected by cable to the computer. All this is illustrated in fig. 2. The planned schematics can be found in app. 1.

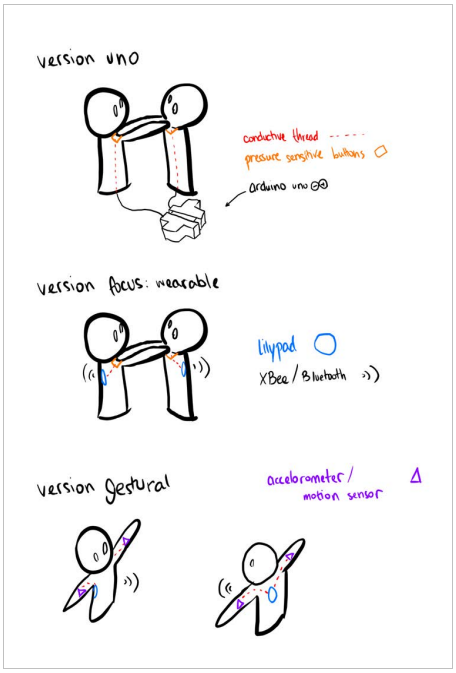



*Fig. 2: Three possible versions (larger version in app. 3)*

## Context and Relevance

Let us take a moment to define the meaning behind *point of cooperation*. This is another term that we are introducing, this one to describe the focal point of the cooperation between the players. We have created a model for dividing cooperative gameplay scenarios into three categories based on this focal point: *environment-focused cooperation* at the *representation level*, *representation-focused cooperation* at the *input level* and *input-focused cooperation* at the *user level*.

Environment-focused cooperation is a very common form of cooperative play in contemporary games: two players with two controllers represented by two avatars (see fig. 3). The cooperation is focused on the environment (the game) and takes place at the representation level. The key element of cooperation here is *coordinated intent* at the environment level: let us go find gold together, let us kill some monster together, and so on. However, *coordinated movement* is most often not required.

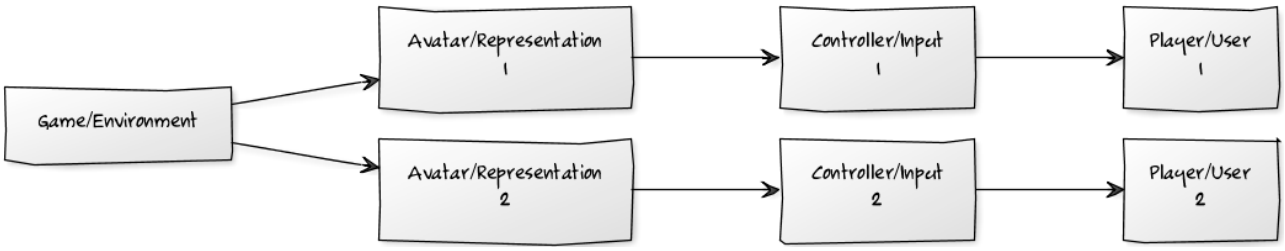



*Fig. 3: Environment-focused cooperation at the representation level*

World of Warcraft, the successful massively multiplayer online game with millions of users, is an obvious example of environment-focused cooperation at the representation level. Zagalo and Prada agree that this is a good example of cooperative play [2]. The players use one controller each (the keyboard and mouse make up the full set of interactions) and are represented by one avatar each. This is how most cooperative games of this type work, whether the players are physically next to each other or on the other side of the world. The list could go on forever and include a number of different genres: Starcraft II (real-time strategy), the Call of Duty series (first-person shooters), Bubble Bobble (platform game), and so on.

Representation-focused cooperation is not as common as environment-focused cooperation, but can still be found in the wild: two players with two controllers represented by one shared avatar (see fig. 4). The word avatar should in this case not be taken too literally, as the shared representation of the players could be a very abstract one. The cooperation is focused on the representation (the avatars) and takes place at the input level. The key element of cooperation in this case is coordinated intent at the representation level, but coordinated movement at the input level is most often also required.

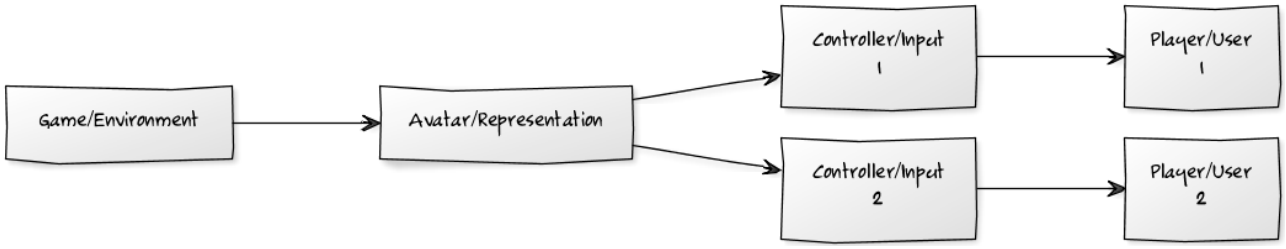



*Fig. 4: Representation-focused cooperation at the input level*

An interesting example of representation-focused cooperation is The House of the Dead. This is an arcade game released by Sega in 1996 that achieved cult status and was followed by a number of sequels. The players assume the roles of special agents on a mission to defeat a mad scientist and his army of zombies. The light guns used by the players each have a full set of interactions: aim inside screen and pull trigger to fire, aim outside screen and pull trigger to reload. Thus, the players have two separate controllers. However, the game is a rail shooter in which the players share the same first person perspective. Thus, the two roles described are only a thought construction and the players share the same representation. This means that the cooperation is representation-focused and takes place at the input level.

Input-focused cooperation is not common at all: two players with one shared controller represented by one shared avatar (see fig. 5). The cooperation is focused on the input (the controllers) and takes place at the user level. Here, coordinated intent at the input level as well as coordinated movement at the player level are required. This is the level that our prototype will be working at.

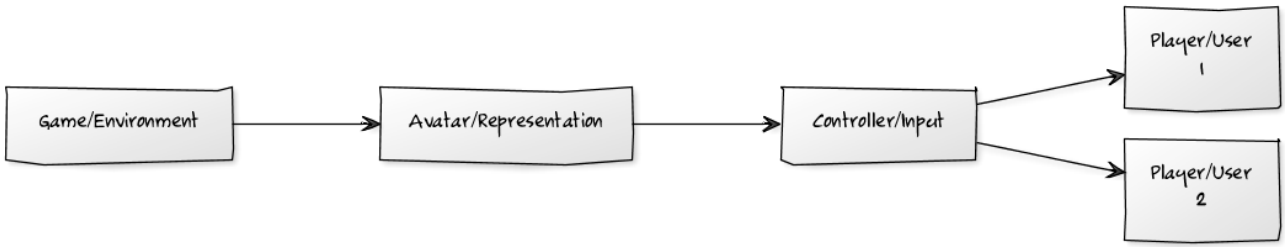



*Fig. 5: Input-focused cooperation at the player level*

This is as close to the players as the point of cooperation can be moved, unless we consider a purely theoretical fourth level. At this fourth level, the players would actually merge, mind and body, into one player and share a single-player experience (see fig. 6). This level is of course nothing but a thought construction to better understand our model.

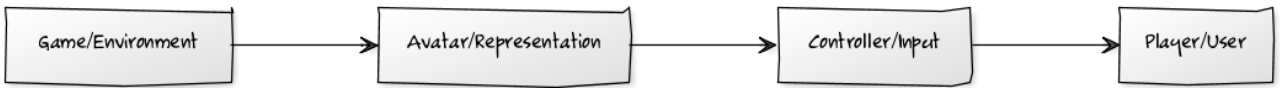



*Fig. 6: Theoretical fourth level*

We are not aiming to design a commercially viable game controller here. This is an explorative design project aiming to investigate the relation between cooperative gameplay and navigation in a three-dimensional environment as well as the input devices used for such navigation. Our hope is to be able to push some limits and stretch some boundaries in order to question prevailing ideas of what cooperative gameplay means. We would like to show that two avatars questing for gold and killing monsters together is not the only kind of cooperation possible in games. Whether the kind of extremely physical cooperation that we are prototyping is a good or bad idea in practice is a different discussion.

## Expectations and Scenario

What is important in this project is the response and feedback once the players understand that they themselves are the ones who will affect change in the environment. With the explorative approach and an open mind to interpretation we hope to gain new understanding about ways to make users cooperate under unique circumstances and change digital and perhaps even physical relations. This will also invoke lateral thinking and influence how the players perceive navigation in 3D space.
In terms of experience prototypes and user testing we will present our idea and have the participants attempt to simulate what we have in mind, asking along the way what they think and if they feel that it would be something they would be inclined to try. Our expectation is that the experience will feel "different" in that the users are forced to cooperate so closely with each other. The unnatural need of confirming each action they take, for example. An increased need for communication or at least some kind of compromise were our first thoughts about what could hinder the actual prototype from being an effective game controller, so we will also ask how the participants feel about these and other aspects during the course of the test. Of course, the main objective of the prototype is not to be effective. We imagine a scenario such as the following:

*Two users are standing in front of a screen, and see some on-screen instructions. The users position themselves facing each other and take a moment to understand what they have to do. The on-screen instructions help them understand what they should be doing. The users chuckle quite a bit at the awkward situation, but place both their hands on each other's shoulders. The first user, the one on the left, starts and assumes a leading role, deciding how they will start moving about. The player on the right follows the spoken instructions of the other player, moving forward a bit, and attempts to turn around, and going backwards. After playing around for about a minute, they decide that they understand how to handle the controls of this new system and finally head out to explore the virtual environment set out before them.*

Zagalo and Prada describe a set of design patterns for cooperative games: ”complementarity between characters”, ”synergy between abilities”, ”abilities that can only be used on another player”, ”shared goals”, ”synergies between goals” and ”special rules for players of the same team” [2]. It will be interesting to see how our prototype will relate to the qualities set forth in these. Our

prototype will augment single-player games that were not designed with these qualities in mind. At the same time, we think that we will see that the appropriate set of design patterns changes as the point of cooperation is moved to a different level.

We also think that we will see the prototype pose new and interesting challenges on the players. Zagalo and Prada divide challenges in cooperative gameplay into two archetypes: ”pure challenges” and ”applied challenges” [2]. Our interpretation of these categories is that pure challenges are of a more fundamental nature and applied challenges depend more heavily on detailed design decisions. We think that the prototype will mainly pose ”pure challenges”, and within this archetype mainly ”physical challenges” and challenges of ”coordination, reflex/reaction and spatial awareness”.

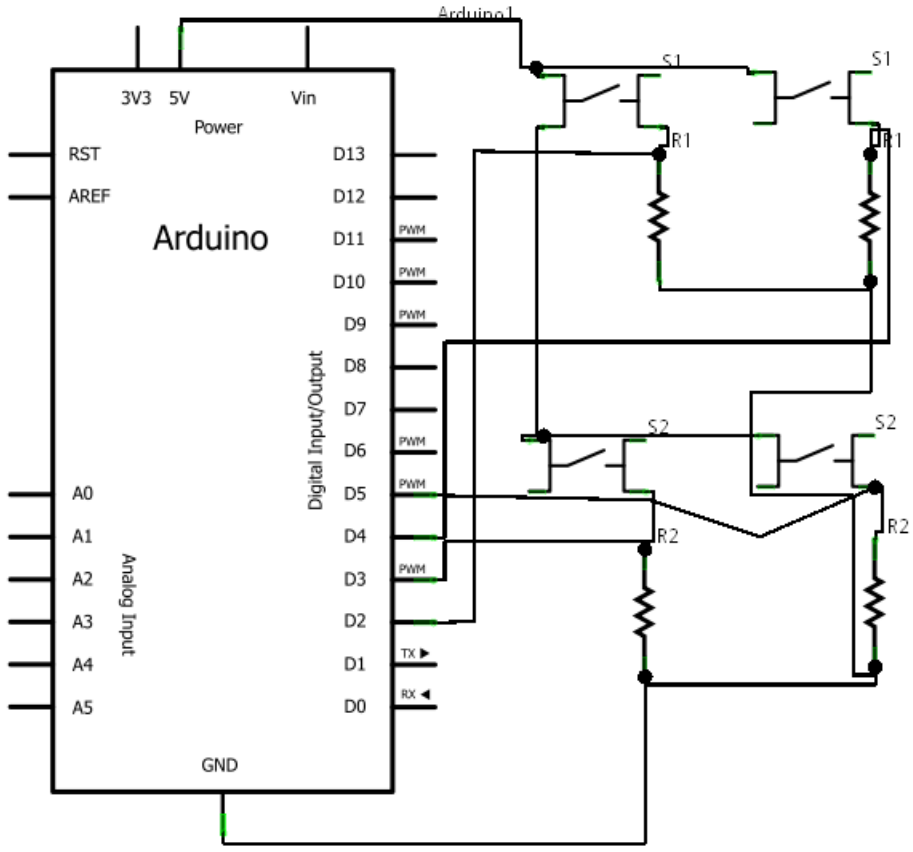
## References

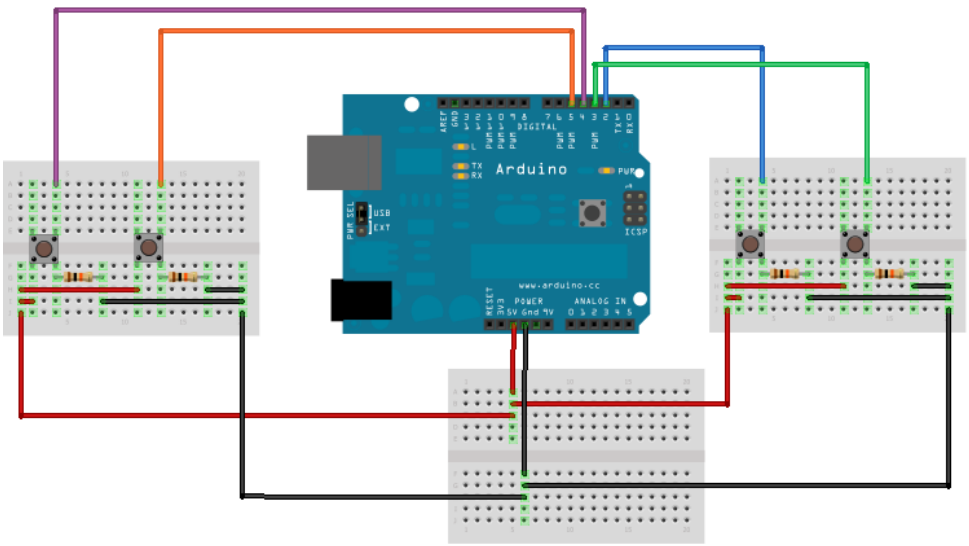
[1] Tulathimutte, Tony (2005). ”Controller Mediation in Human-Computer Play”. Stanford University, Palo Alto, California.

[2] Zagalo, Nelson and Prada, Rui (2008). ”Game Mechanics for Cooperative Games”. Actas da Conferência ZON | Digital Games 2008. Universidade de Minho, Braga, Portugal. ISBN 978-989-95500-2-5.

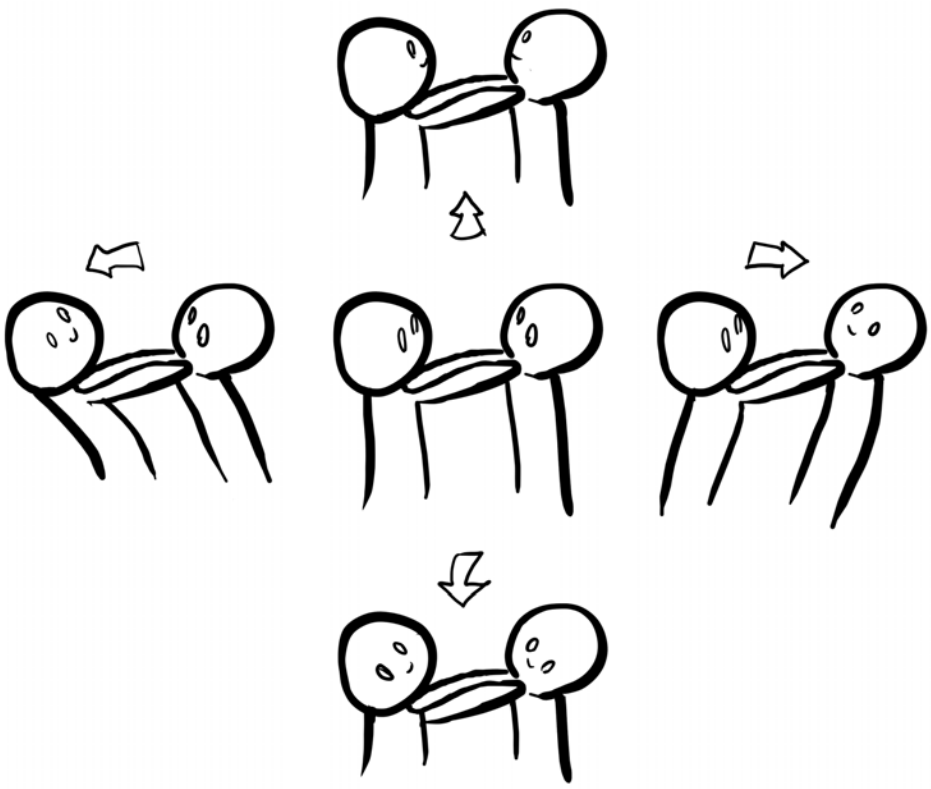
[3] Leong, Anthony. ”Why are D-pads on the left?”. http://www.1up.com/do/blogEntry?bId=7961739 (March 15, 2007).

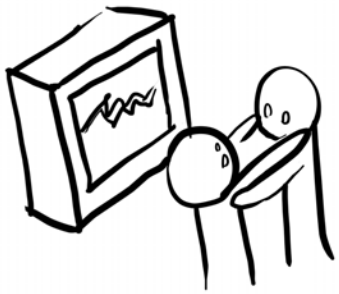
*Appendix 1: Schematics*



*Appendix 2: Interactions*





*Appendix 3: Three possible versions*