

# **Evolution of Video Game Controllers and Their Users**

By Andrew Hookway

Final Draft: December 3, 2007

COM 490: Narrative Game Design  
with Drew Sabol

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## Evolution of Video Game Console Controllers and Their Users

One of the most important parts of any video game console system is its form of input, or specifically the controllers that the player interacts with. These have changed a lot over time. Innovations in the controls for video game consoles are used by players and, based upon their feedback, are often revised, improved, or eliminated altogether based upon feedback from the general public so that the next round of controllers available are generally better than the last.

There are a number of innovations in the past of video game controllers that are important. Covered in this paper will be: the simple joystick, the Intellivision wheel, the directional pad, the analog joystick, the number and placement of buttons, and the shape of the controller. In each section, the evolution of the concept will be discussed and the feedback from the general populace will be taken into account.

Please note that I will only cover first-party controllers. Many innovations were made by third-party companies, but most are mirrored to some extent in the original controllers.

### Directional Controls

A number of different interfaces have been attempted to work as the basic directional control for video game consoles, attempting to bring the ease of use of the arcade joystick into the portability and comfortable styles of home.

#### *The Simple Joystick*

The early days of video games were in arcades. An arcade box had plenty of room, and was a large stationary object. As such, it had plenty of room for different control configurations, though everything was on top of the surface. The most typical setup was a single joystick and two buttons. When Atari went to bring video games to the home market in 1977, they decided to stick with this sort of very basic setup. The controller for the **Atari 2600** had a single joystick and a single button. That is all that was needed.

This controller was, however, the only standard console controller to have a prominent joystick. The **GCE Vectrex** had a small joystick alongside four buttons, being slightly reminiscent of an arcade layout, and years later (1987) the **NES Advantage** controller was released for the Nintendo Entertainment System to simulate an arcade experience. By this time, however, it was a mere novelty.

Why were joysticks phased out so fast? I believe that ergonomics was one reason. The controller was, by necessity of being portable, quite small, and so had to be held in the left hand while the right hand operated the stick. From my own personal experience with this controller, I recall the strain on my wrists, especially my left wrist as it tried to keep a good grip on the controller. It became readily apparent to designers that a full-sized joystick would not work. The Vectrex went a small way towards rectifying this with a smaller joystick, but it wasn't until the Intellivision came out that the joystick found a suitable challenge.

### *The Intellivision Wheel*

Mattel's **Intellivision** was a different approach at video games. "[T]he Intellivision may have originally been envisioned as the evolution of television - as in, interactive television." (Sock Master) Released in 1979, the controller resembles a television remote, including a large number of buttons that will be covered later in this paper. What I would like to draw your attention to with this controller is the wheel at the bottom of the controller. It was capable of detecting sixteen directions of movement, making it very advanced, in fact more sensitive than the later directional pad.

The wheel is something of a missing link that acts as a precursor to the directional pad. It moves in the right direction, by giving a flat surface for the player to work with. However, it would be a few years until this mantle was picked up and improved upon.

Why did the wheel not catch on? Also having personal experience with the controller, I believe that I know why. Again, the controller was not ergonomic, because you had to keep a hand underneath the controller to counteract your wheel movements. Secondly, the wheel itself was made of a smooth plastic and was completely flat. A person's thumb slipped very easily on the wheel, and you'd have to pick your thumb up to put it back on the controller. And so, while the wheel stayed when the **Intellivision II** came out, Mattel suffered in the video game crash of 1983, and was unable to release a true successor to the Intellivision. By this point, however, a different company had created something that finally put the directional power of the joystick comfortably under the player's thumb.

### *The Directional Pad*

In 1983, the **Nintendo Famicom** was released in Japan. Two years later, it made its way to the rest of the world as the **Nintendo Entertainment System**. Nintendo had some success with the directional pad on some of their hand-held systems, most notably the Donkey Kong Game & Watch. Because of how easy it was to operate, the cross-shaped design was placed on the NES controller – and has been one of the biggest innovations in the home console controller since.

The directional pad is only capable of resolving four directions of motion. However, because the thumb of the player rests right over it, subtle twitches of the thumb are quickly interpreted and response time is even better than the large Intellivision wheel or Atari's joystick. The directional pad was small and easily fit under a person's thumb, making it so that a player had to only tilt their thumb to get a response. This, combined with the indentations on the cross shape, kept the player from having to continually reposition as they had to with the Intellivision. Nintendo capitalized on their success by patenting the cross design. This did not deter others, though, as they created directional pads that were identical in concept, if just different in form.

The 1989 **Sega Genesis** took the idea and did what any self-respecting company would do – copy the design and modify only a small amount. Interestingly enough, it's still plagiarism, but it worked. The Genesis placed Nintendo's cross design and placed it on

top of a circle, not unlike the Intellivision wheel. However, because of its smaller size and the new cross sticking out of it, it was a lot more manageable.

The **Sony PlayStation** took a slightly different approach in its release in 1994. While not strictly a directional pad, I'm counting the four buttons on the left of the controller that worked in the same fashion. The player would rest their left thumb over all four buttons and press the direction that they wished to move in, including combinations of buttons.

The original **Duke** controller for the **Xbox**, released in 2001, also featured a differently shaped directional pad. It was a single piece of plastic that was molded so that the four directional corners – up, down, left, and right – were raised above the rest of the perimeter of the disc. While this works well as directional control, the Xbox made extensive use of a second analog joystick on the left side, relegating the directional pad to be four buttons for different uses, such as *Jade Empire's* skill selection. This new directional pad didn't work well for these applications, and as feedback came in and less games were designed to use the directional pad, it was changed in the redesign of the Xbox controller, the **Controller S**, which featured a more traditional cross-on-wheel application.

There was one more innovation in directional orientation that has since been accepted into the mainstream, taking cues from why directional pads had become so popular and working them into some of the earlier designs.

*The Analog Joystick (or "Thumbstick")*

The **Nintendo 64** in 1996 controller was the first one to include an analog joystick. However, Nintendo was unsure as to how viable it would be in the upcoming generation of 3D games, and therefore stuck it on a separate handle, leaving the normal handle with the patented cross-shaped directional pad.

The joystick itself was used by a number of games. The top had a number of concentric rings that helped the player's thumb grip the joystick, a cue taken from the success of the cross design with the NES. This design of the thumb belonging on top of the joystick really paved the way for joysticks to come back into the home console market after the Vectrex had difficulty taking off and the novelty of the NES Advantage had worn off. No longer did the player have to grab the joystick with a full hand and use the other hand to counterbalance the movement – things were back to a simple thumb twitch.

The joystick moved very easily, perhaps too easily, not providing enough resistance and making fine control difficult, nullifying many of the advantages that the analog joystick had in the first place. However, further controllers gave it more resistance and a better feel of the analog qualities of the joystick.

The **PlayStation Dual Analog** controller in 1997 took the idea of the analog joystick and felt, if something's worth doing, it's worth overdoing, and so put two in to keep the controller's symmetry. The joysticks were made of a textured plastic that was concave to help keep the thumb from slipping off, a problem that the N64 controller still experienced at times. The Dual Analog was quickly replaced with the **DualShock** controller (1998),

which added a vibration function and reshaped the thumbsticks, as they came to be called, into a textured convex dome. Apparently, the lip of the concave thumbsticks had been overly uncomfortable, and feedback from the public had prompted the change.

Though the analog sticks were available on PlayStation controllers for much of its cycle, they were treated as a novelty and there was little programmed for them. It wasn't until the **PlayStation 2** that developers really used the analog sticks, which at that point were shaped exactly the same as the Dual Shock's (in fact, the controller was called the **DualShock 2**).

The **Xbox** controller (2001) also had two thumbsticks. Placement was shifted so that the left thumbstick was the prominent directional control as opposed to the PlayStation's "directional pad". The thumbsticks also had a small indentation on the top, making them partially concave, though not to the extent of the PlayStation's controllers.

The **Wii** (2006) seems like it wouldn't need a joystick. After all, it has the familiar cross shape on top of a motion sensitive controller. So Nintendo left it off, but instead of throwing it out, put it on a separate controller that plugs into the main controller, the **Nunchuk**. With one concentric ring, it bears a resemblance to the N64 joystick, but it moves a lot more smoothly, making it more intuitive from an analog sense and easier to exert fine control. This is especially evident in the game *Metroid Prime 3: Corruption*, where the joystick moves the player and the Wiimote aims.

Now that we've looked at directional control for various controllers, let's look at another big aspect of controllers – their buttons.

## Buttons

The **Atari 2600** (1977) controller featured one button. That's it, just one. This is understandable – when the player's left hand is busy just holding onto the controller, the fingers can't do too many complicated moves, so a button was placed in the thumb's natural resting place. Games were designed around this quite well, and the console never felt like it was lacking any buttons. What it felt like it was lacking was functionality, and it was when other companies began adding functionality that they realized that more buttons would be needed.

The flat wheel wasn't the only thing that set the **Intellivision** apart from other consoles of its time. Its button layout was very expansive. It featured twelve buttons arrayed on the front face, labeled 1 through 0 and with two additional buttons, "Clear" and "Enter". In addition, there were four buttons on the sides, two on each side, which added additional functionality. The buttons weren't all under the constant use that current consoles see; instead, a couple buttons would be used extensively, and often the face buttons would be used only sparingly. For example, *Utopia* used the disc to move a cursor around, while the buttons were for placing individual units, like first, farms, and factories. This placement worked rather well for the occasional use, preventing the need for context menus as one might find in the PC game of the same genre today.

The buttons stuck out easily under the overlays that were created for games (for example, making it easy to tell which button created a fort), but this was changed with the **Intellivision II** was released (really, an Intellivision made on the cheap). The cheaper construction made it harder to navigate the buttons by feel, making many games more difficult to play. This lesson was learned well by the industry, and buttons soon went back to being easy to navigate by touch and intuitive to use.

The **Nintendo Entertainment System** decided that the Intellivision was doing far too much, and that there was just far too much going on in that controller. They also felt that the Atari 2600 was too simple. And so, the NES was released with two buttons. These were placed opposite of the directional pad, making hand placement intuitive and comfortable. The **Super Nintendo Entertainment System**, available in North America in 1991, added two more buttons on the right for a total of four surrounding the natural resting place of the thumb and two shoulder buttons that made the player use more than just their thumbs. The added functionality brought on by using more than just thumbs was welcome, and these have since taken off greatly. With the exception of the **Sega Saturn** controllers starting in 1995, which had six buttons, consoles have for the most part agreed that four main buttons on the right opposite of the directional pad is ideal. Too many buttons given equal prominence tended to confuse the consumers, even when there were no functions assigned to a couple of them. Ironically, it is Nintendo that strayed from this the most, making two main buttons and four smaller buttons on the N64 controller and the one main button, one secondary button, and two oddly shaped tertiary buttons on the **Nintendo GameCube** controller.

The odd button layout isn't the only distinctive button feature of 1996's **Nintendo 64**. What is very noticeable is the trigger that is under the central handle. While it was largely ignored by many players and some developers, the **Xbox** would bring triggers into the mainstream use five years later with its own controller, actually forgoing shoulder buttons altogether until it included both triggers and shoulder buttons in the controller for the **Xbox 360** in 2005. All of these consoles featured triggers which were very responsive in a fully analog fashion, making them very intuitive to use.

Joystick, directional pad, and button layout on controllers contribute a lot to how well they are able to be used by the average gamer. However, the biggest part of this is of course the ergonomics, not only in joystick, directional pad, and button placement, but the *shape* of the controller that they are placed on.

## Shape

The **Atari 2600** was very simple. There was a box with a stick coming out of it. No more. The left hand held onto the box while the right hand moved the stick. As previously mentioned, this could get very uncomfortable during long play sessions. This is not only because of having to counteract the torque of the hand on the stick, it comes from the simple box shape. If more care had been put into how the left hand gripped this controller, it may have been easier for people to play for a longer time, and the joystick may have stayed. But alas, it did not. Fortunately for Atari, its competition was the **Intellivision**, which by its own ideals was more of a television controller. The side

buttons were difficult to push, often leaving fingers aching (though this may just be my experience with the more cheaply made **Intellivision II**), and again the controller was a box that was difficult to hold and easily operate.

It wasn't until the **NES** that ergonomics really started to play in. Granted, it was another box, but this one was smaller and fit easily into two hands, with neither hand having to counteract force coming from the other. This was later modified for the **SNES** by rounding off the sides a bit more and generally making it easier to hold, especially with the rounded off corners near the top allowing the player's index fingers to rest along the top of the controller, paving the way for those shoulder buttons.

All of a sudden, ergonomics was the rage. Developers began experimenting with different innovations to make the controllers comfortable to hold. The **PlayStation** introduced handles into the controllers, giving a place for the lower fingers of the hand to rest and even grip as things got tense in-game. The **Dual Analog** made the handles larger, but immediate feedback from the public led to them being shrunk back down to their original size for the **DualShock**.

Nintendo, who had introduced such innovations as the directional pad, the four buttons on the right side, and had introduced the importance of ergonomics, refused to be beaten at their own game and added a third handle to the **Nintendo 64**. This was to allow for the analog joystick, but in reality, the third handle was just confusing. Some games required the directional pad on the left handle, while some required use of the joystick in the center. Many people, myself included, held the controller in the wrong configuration upon first picking it up. The Dual Analog controller for the PlayStation moved the analog joysticks to the sides of the controller, and there they have remained (with the notable exception of the **Wii Nunchuck**), thereby eliminating the superfluous third handle.

The **Sega Dreamcast**, released in 1999 in North America, took a chance with creating a large controller that fit in the palms of the player's hands instead of being held in the fingers. This was continued with the **Xbox Duke** controller in 2001. These controllers, while preferred by people with larger hands, were criticized by those who were unable to hold them well enough to reach all of the buttons, leading in part to the failure of the Dreamcast and the redesign of the Xbox controller for Japanese markets, then for the rest of the world.

The **Wii Remote** (Wiimote) is a special case. It is essentially a stick that is held that has a directional pad and a single button accessible by the thumb and a trigger accessible by the index finger. Coupled with the **Nunchuk**, it is very versatile, and the controller is easy to hold onto. The longevity of the design, however, still remains to be seen. I suppose that we will only know how successful it will be when the next generation of consoles comes out with the lessons learned from the Wii.

## Conclusion

Video game console controllers come out on a fairly regular basis, each of them different from anything that has come before it, at least to some degree. With each innovation come new lessons, and like a simulation of Charles Darwin's survival of the fittest, only the innovations that are favored stay to move on to the next generation. The general public leaves its feedback, and controllers are changed. Experiments are made by companies, and the public responds. The relationship is closer than many realize. And I, for one, can not wait to see what this generation's feedback will produce five years down the line.

## References

Sock Master (October 2004, updated regularly). *Video Game Controller Family Tree*. Retrieved November 26, 2007 from <http://www.axess.com/twilight/console/>.

This source was the basis of my paper. I looked at every controller here and, combined with my personal experience, was able to form conjectures as to what innovations worked and what didn't, as well as conjecture why they did and did not work. The visual links between controllers established by the website were crucial to forming the basis and backbone of this paper.

The Wikimedia Foundation. *Wikipedia*. Retrieved November 26, 2007 from <http://en.wikipedia.org>.

Wikipedia was used to double check the release dates of every console mentioned. Unless otherwise stated, all release dates are for the North American market.