
Game Controllers: A Critical Discussion of Input Devices in Game Design

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Abstract

Game design is a process with a focus primarily on creating an engaging game experience. However, in order for game design to advance further toward this goal, the design of input devices along with their connection to the interface also require critical discussion. This study compares two different controllers in order to evaluate the impact of their design on gameplay.

Keywords

Controller design, game design, interface analysis

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g.HCI): Miscellaneous. K4.0 Computers and Society: Miscellaneous

Introduction

Writer and game designer Jesse Schell posits that one of the four basic elements of video games, and therefore part of the art of game design, is technology [1]. Technology is the medium through which a video game is played [1]. Without technology, the genre of video games would not even exist. In the critical

discourse of game design, the discussion of technology is particularly focused on software.

Placing a significant amount of focus on the software of a game is justifiable. The essence of any video game is software. However, as game designer Chris Crawford points out, while graphics animation and sound are all essential elements of a game, the real strength comes from interaction [2].

Interaction is facilitated through the game interface, software, but also through the chosen input device, hardware. The game controller is where player and game meet. If a smooth and natural discourse is created between the interface of the game and the controller, the player should associate button presses with action [3].

Stephen N. Griffin argues that the button, and by extension the controller, is a key feature in the history of video games [4]. After all, the game controller is the input device for the majority of historical and current game systems. Despite Griffin's notable observation, current game design methodology relies on software to develop rich interaction and ignores the significance of input devices [4].

Unfortunately, this approach limits game-play opportunities and controller development [4]. The purpose of this paper is to take a critical look at the effect of input devices on the gaming experience with an eye for design characteristics. To achieve this end, two game consoles with different controllers were chosen for analysis. The designs of these controllers were compared and evaluated. The chosen method between controller input and game action, or button

mapping, was also compared based on analysis through two separate first-person shooter video games.

The Alien Games

The First-person shooter has a long history within video games, and many follow the interface design first popularized by landmark game Doom. In order to ascertain the affects of controller design on gameplay alone FPS games were chosen due to this standardized design.

The movie *Alien* premiered in 1979 and quickly spawned numerous first-person shooter video games [12]. *Alien vs. Predator* was released on the Atari Jaguar in 1994 [7]. This game allowed the player to choose between three different character options: Alien, Predator, or Marine. For the purpose of this analysis we will focus on the controller design with regards to play for the marine.

In 1996 *Alien Trilogy* was released on the Sony PlayStation and was regarded as a fresh update to the popular first-person shooter Doom [9]. Gamers played as Lieutenant Ripley on another hunt to destroy an alien infestation.

Atari Jaguar

1993 saw the release of the Atari Jaguar [5]. Advertised as a 64-bit system, the Jaguar made its début ready to pounce on a market Atari claimed was chomping at the bit for an update from the wimpy 16-bit game systems of old [6].

In the history of video games the Jaguar is infamous for its cumbersome game controller. With a total of 17 individual buttons and directional pad, Atari boasted

that players would never have to kill their enemies the same way twice [6].

Excluding the pause and option buttons, the Jaguar has 15 individual buttons and the D-pad for gameplay. The design of the controller facilitates the use of the left thumb for the D-pad and right thumb for the action buttons. The numeric keypad is split between the two. This means at any given time only two of the gameplay buttons can be pressed at once.



figure 1. The Atari Jaguar controller

Controller and Interface Communication

Basic movement involved using the D-pad to control the direction of the character [7]. Pressing up propelled the character forward while pressing down moved the character backward. Pressing to the left caused the character to turn in a circle counterclockwise, and pressing to the right clockwise.

The action buttons controlled the ability to side step, open and close doors, and fire a weapon [7]. The C button was used together with the D-pad in order to side step. The B button fired the weapon being held up by the character. The A button was used to interact with computers in the game and open/close doors. It was also used in conjunction with the D-pad to move up or down lifts.

CONTROL CONFIGURATION

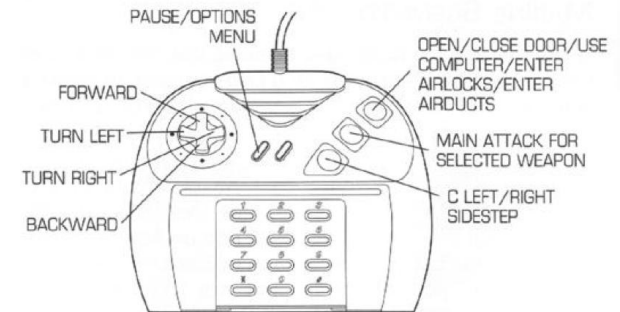


figure 2. The Atari Jaguar controller configuration for Alien vs. Predator [7]

The numeric keypad had a plastic overlay corresponding to the particular character being played. The overlay used images to associate a particular button with parts of the characters inventory. This included a Shotgun, M41A Pulse Rifle, Flame Thrower Smart Gun, Map, additional buttons to side step, and reset buttons [7].

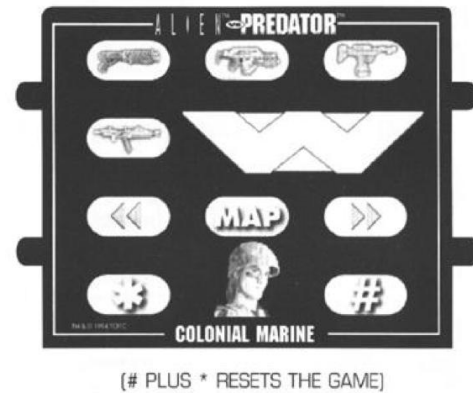


figure 3. Marine overlay for the numeric keypad []

Sony PlayStation



The Sony PlayStation was released in 1994 and quickly became a leading force in the video game industry [5]. The PlayStation received praise for a compact design and sleek appearance [8]. Unlike other controllers of its day, Sony adapted many of the standard button designs and is now a standard in game controller construction [11]. The action buttons were labeled with geometric shapes instead of letters, the base of the controller was elongated on both sides for the hands to rest on, and four shoulder buttons were included in the design instead of two.





The controller design for the PlayStation creates a clear division among the 12 gameplay buttons. The directional buttons are controlled with the left thumb, the action buttons with the right. The left and right index fingers control the left and right shoulder buttons respectively. This separation allows for up to four buttons to be pressed at once.



figure 4. The PlayStation controller.

Controller and Interface Communication

The directional buttons and shoulder buttons facilitate movement throughout the game [10]. Pressing the up, down, left, and right buttons move the character forward, backward, left, and right respectively. The shoulder buttons R1 and L1 are used to side step right and left. The L2 button causes the character to run. When used in conjunction with the  button or the  button, the R2 button adjusts where the character is looking.

The action buttons are used to interact with weapons and the environment [10]. The  toggles between weapons collected by the player throughout the game and the  fires the characters currently held weapon. Grenades are thrown using the  button. The  is used to interact with parts of the environment including opening doors and activating control panels.

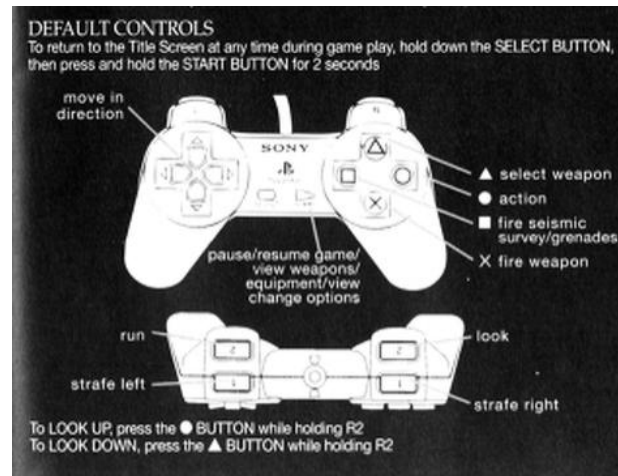


figure 5. The Sony PlayStation controller configuration for Alien Trilogy [10]

Controller Affects on Gameplay




In a first-person shooter, smooth maneuverability, accurate aim, and weapon accessibility are three elements whose implementation strongly affect gameplay. Determining how to map these actions to an input device and the overall design contributes to the game's level of difficulty.

With the limited number of buttons that can be pressed simultaneously, the Atari Jaguar controller creates a higher level of difficulty by inhibiting natural human dexterity. Movement and aim are controlled through a combination of the D-pad and side step buttons. The main strategy to destroy enemies is to back away, line up with the enemy, and shoot. However these three distinct steps cannot be accomplished at once using this controller design. In order to back away the D-pad

must be used. Unless the enemy is directly in front of the character, the player must side step for better aim. This requires using the side step buttons on the numeric keypad or pressing C then pressing left or right on the D-pad. In either scenario the player has now eliminated their ability to fire until they have stopped moving.

The PlayStation controller eliminates this problem by mapping the ability to side step onto the shoulder buttons. This design fits within the hand, allowing the player to move backward with the directional button using the left thumb, side step with the index fingers, and fire with the right thumb.

Weapon selection is also more difficult on the Jaguar controller. Each weapon is given a different key on the numeric keypad. Switching between weapons requires using either the left or right thumb, which means losing the ability to maneuver or losing the ability to fire until the weapon has been selected.

The PlayStation controller uses just one button  to toggle between the weapons. The close proximity between the  and  buttons reduces the lag time between weapons selection and firing. This design also reduces the learning curve for the player. Instead of memorizing which of the four buttons corresponds to a certain weapon on the Jaguar, the PlayStation requires remembering use of only one particular button.

Conclusion

The development of a game requires numerous steps in order to create an engaging experience for the player. Part of that process requires a critical examination of hardware design.

Taking a detailed look at controller design and the button-mapping scheme reveals several connections between gameplay and input design. For the two different controllers analyzed in this paper, two underlying issues revealed were unintended controller/interface affects and ergonomic affects on gameplay.

By mapping similar implements to the same button, the PlayStation controller reduces the amount of time devoted to learning about how the interface responds to the controller. This makes a game accessible to a variety of gamers with varied experience. An interface that allows for simultaneous multiple inputs and utilizes natural human movement also promotes a simpler and immersive game.

Conversely, mapping designs for controllers like the Jaguar increases the level of difficulty by including additional controller/interface interactions for the player to learn and compounding that with a design that does not support human dexterity.

Games undergo numerous changes before the final release. Many original design ideas are dropped, and many are added. However all of these steps are toward creating a certain experience for the player. By taking into account controller design and the affects it has on gameplay, designers can better impart their vision onto the gamer.

Acknowledgements

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