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Exploration of a Video Game Controllers Anatomy

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Why a Controller? (Summary)

It's not hard to see that in the past few years, video games have exploded in popularity, and companies like Microsoft and Sony have been pushing the market with their consoles. Microsoft's “Xbox” and Sony’s “Playstation” are most kids dream toy, and to be honest, it was mine too. Both of these “video game consoles” used controllers to help make the gaming experience as enjoyable as possible. To see what impact a controller has on the overall video game experience I decided to use a “Xbox One S Wireless Controller” to uncover the technology inside that boosts the consoles functionality and makes gaming more enjoyable. This journey aims to decode the engineering brilliance behind modern controllers and their role in shaping the evolving world of video games.

The Console (Xbox one S)

This is the Xbox One S, Microsoft's next console after the Xbox One. This console was announced along with a Premium, more capable console called the Xbox One X on June 13, 2016. Since then microsoft has sold over 21 million units worldwide making it the 15th best selling console of all time. At the time, the Xbox could not only play games, but browse the web and stream television, all while being able to run top notch games at a consistent 60 FPS frame rate.

The Controller itself

The Controller that comes with the console has 2 movable sticks called “Joysticks” that you can move around and also push down. It has 2 “Bumpers” on the back and 2 “Triggers” The controller also consists of a DPAD and 4 Face buttons. In most games, all 14 buttons are utilized. To break through the upper layer, I need to use a thin tool and just pry it off.

Dismantling :

Breaking:

Step 1:

Pry off handles

Step 2:

Unscrewing

Step 3:

Removing parts

Parts :

Handles/Frame:The handles and frame are crucial to the comfortability to a controller.

Joystick: The joysticks are important because they give a 3d element to any game and allow for smoother movement.

DPAD/Face buttons: Simple buttons that give the player 8 extra functions.

Triggers: Give a exact display for the amount you push the trigger down

MCU: A part on the controller that receives all the input from the rest of the functions. Essentially brings the whole controller together

LETS START THE TEARDOWN!!

Stage 1: Breaking

Level 1: The handles

How I broke past it:

I used a thin flathead screwdriver and I pried the two side pieces off.

The next step:

Remove the sticker and use a screwdriver to remove 5 screws (circled in red)

Significance to the controller:

Provides better grip to the controller and allows players to hold it easier.

Level 2: Past the shell

How I broke past it:

Unscrewed 5 screws and slide both of the pieces off

The next step:

Pull joysticks off,

Then DPAD off

Significance to the controller:

Gives controller a shell so that it won't get dirty.

Stage 2: The parts

Level 1: Joysticks

Significance to the controller:

Allows players to move in most games and also look around.

How it works:

Swivels on a base and communicates its direction and angle to the controlling device. Using an electronic switch, Hall Effect, strain gauge, or potentiometers, it determines the stick's direction.

Level 2: DPAD

Significance to the controller:

Provides players with 4 extra buttons.

How it works:

using four internal push-buttons (arrayed at 90° angles), the vast majority of D-pads provide discrete, rather than continuous, directional options—typically limited to up, down, left, and right, and sometimes offering intermediate diagonals by means of two-button combinations.

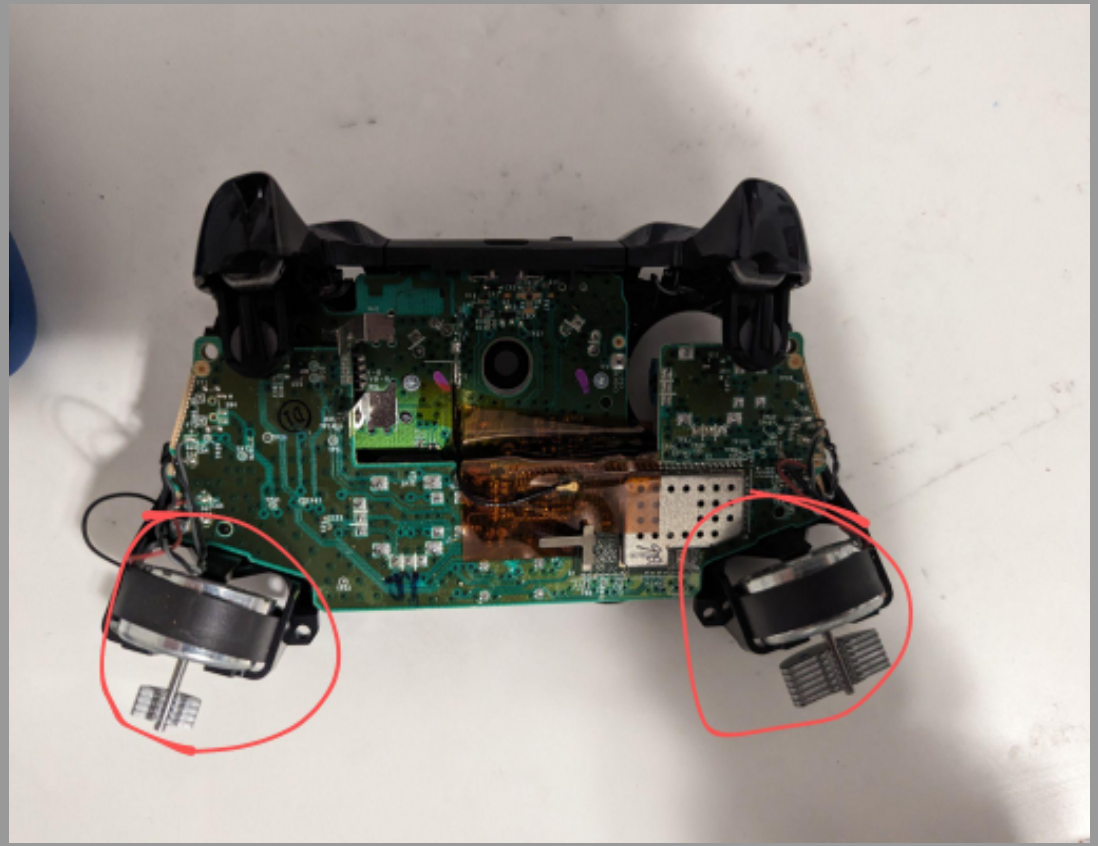
Level 3: Rumble motors

Significance to the controller:

Provides haptic feedback when something in game happens.

How it works:

The motors spin heavy metal pieces that cause the controller to vibrate/ ”Rumble” to give players the haptic feedback they get in game.



Level 4: Triggers

Significance to the controller:

Two more buttons to use in game. Also, triggers can see how far you push it down.

How it works:

hall effect sensors, which are made up of a hall sensor on the board and a magnet in the trigger. The hall sensor generates positional data that is utilized for X and/or Y coordinates. After this the Xbox console reads these coordinates and does the task accordingly.

Level 5: Face buttons.

Significance to the controller:

The main buttons in game. Signature of the Xbox brand

How it works:

Pressure is placed on the button or actuator, resulting in the lowering of the internal spring and contacts and the touching of stable contacts at the bottom of the switch. This process will either close or open the electrical circuit

Level 6: MCU (microcontroller)

Significance to the controller:

An MCU is an intelligent semiconductor IC that consists of a processor unit, memory modules, communication interfaces and peripherals. It basically computes buttons pressed into data the Xbox can use

How it works:

When an MCU gets input from buttons, switches, sensors, and other similar components, it uses a preset program to determine what to do and how to respond before controlling peripheral circuits like motors and displays.

Stage 3: Lessons Learned

As a gamer...

As a gamer this experience has taught me a lot. Like for example, how rumble motors work, how triggers find out exactly how much you pushed it down and what a MCU even is. The location of the two analog triggers, two analog sticks (Joysticks), a DPAD, and 4 8-bit analog action buttons (A/Green, B/Red, X/Blue, Y/Yellow), and two vibration motors is near perfect. I read on a article that “Project leads J Allard and Cam Ferrari aimed for a controller with every feature the team liked from preceding ones: slots from the Dreamcast controller, two sticks from the PlayStation's original DualShock and six frontal buttons from the revised Sega Genesis controller” and it really shows. All the generational improvements really came together on this piece of art, that allows gamers to have the perfect ergonomics, and functionality. And now this piece of art is known by all as the Xbox Controller. Thank you.

Thank You