ANALYSIS OF DUALSHOCK 4 AS A MUSICAL INSTRUMENT

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Purpose

Sony’s DualShock 4 can be used as an affordable and readily-available musical instrument that may not require an additional software to establish a connection with the computer.

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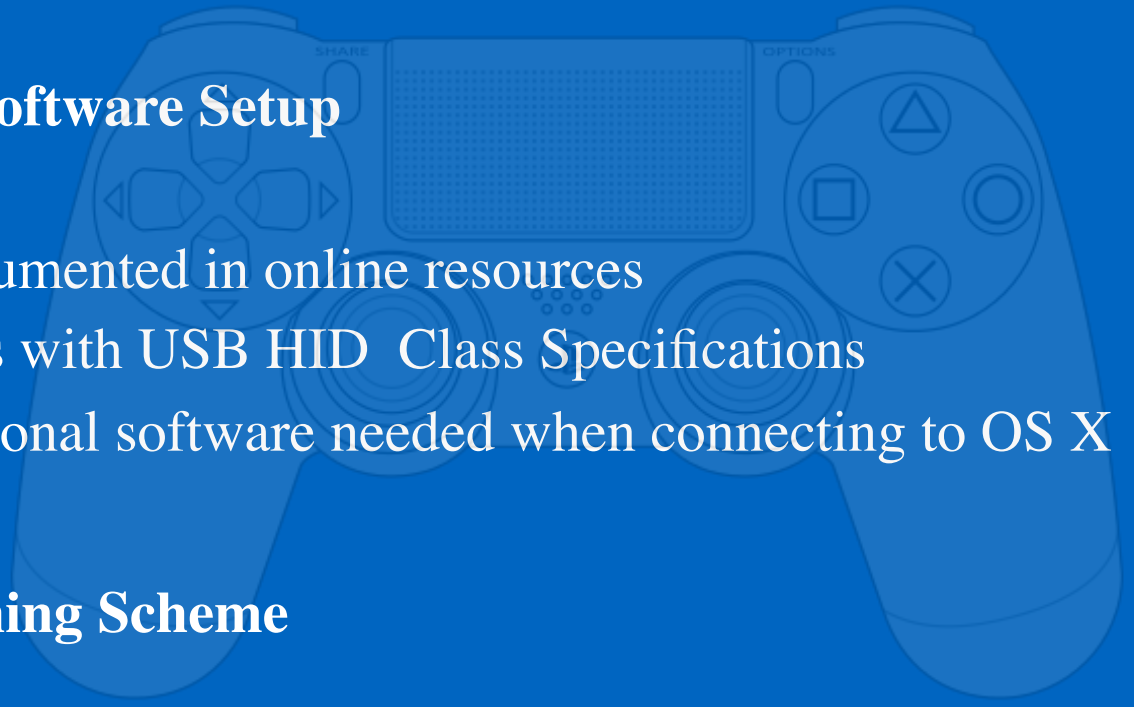
Despite the effortless connectivity via Bluetooth (wireless) or USB (wired), DualShock 4's number of functioning inputs varies depending on the applications and the communication method.

Purpose

This is a comprehensive documentation of the control parameters for Max and SuperCollider. The article lists the range and type of *Elements* I found and analyzed in DualShock 4.



Hardware/Software Setup

- Well documented in online resources
- Complies with USB HID Class Specifications
- No additional software needed when connecting to OS X

Data Streaming Scheme

- Tested App #1: SuperCollider - *HID* UGen
- Tested App #2: Max7 - *hi* Object
- Each physical input (buttons, joysticks) data are streamed via specific *Elements*

Elements

- An equivalent to MIDI CC#
- Range: 0-255
- Sampling rate may vary from one control surface to another
- Bluetooth mode (wireless) and USB mode (wired) has different *Element* assignment
- Bluetooth mode available in SuperCollider

Digital vs “Analog” Control Surface

- Discrete/Quantized data : buttons send either 0 or 1
- Continuous data : joysticks, L2/R2, trackpad, SIXAXIS send 0-255

Digital Controls

Control Surface	Element # in SC	Element # in Max	Range
Square	0	2	0 or 1
X	1	3	0 or 1
O	2	4	0 or 1
Triangle	3	5	0 or 1
L1	4	6	0 or 1
R1	5	7	0 or 1
L2	6	8	0 or 1
R2	7	9	0 or 1
Share	8	10	0 or 1
Option	9	11	0 or 1
L3	10	12	0 or 1
R3	11	13	0 or 1
PS	12	14	0 or 1
Trackpad	13	15	0 or 1

Analog Controls : Directional Pad

Control Surface	Element # in SC	Element # in Max	Range
up	18	20	0
up+right	18	20	1
right	18	20	2
right+down	18	20	3
down	18	20	4
down+left	18	20	5
left	18	20	6
left+up	18	20	7
release	18	20	8

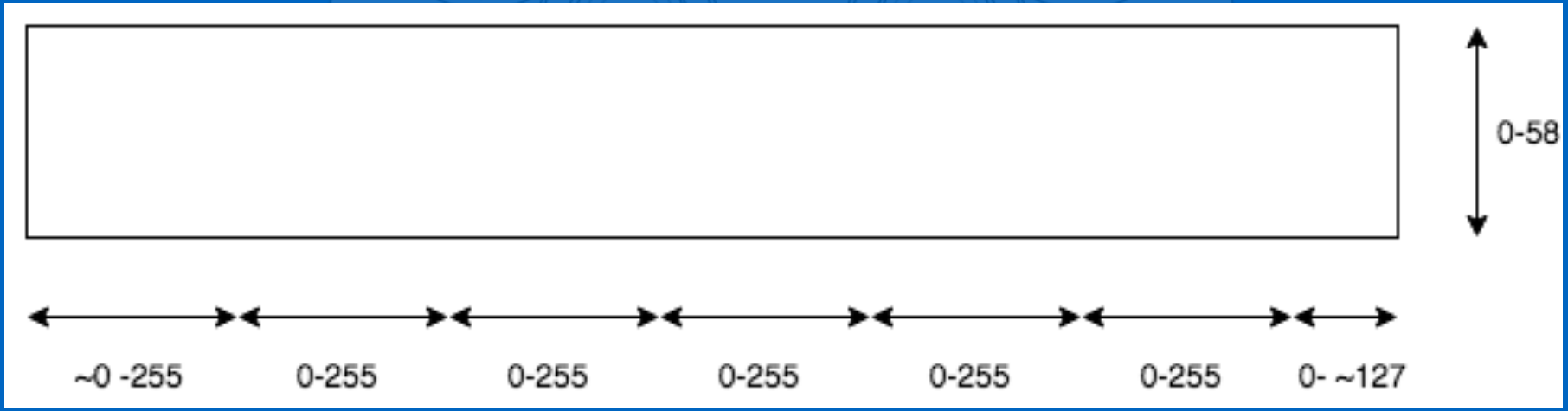
Analog Controls : Joysticks

Control Surface	Element # in SC	Element # in Max	Range
L3 x-axis	14	16	0 (left) - 255 (right)
L3 y-axis	15	17	0 (top) - 255 (bottom)
R3 x-axis	16	18	0 (left) - 255 (right)
R3 y-axis	17	19	0 (top) - 255 (bottom)
L2	20 (USB) 19 (Bluetooth)	22 (no wireless option)	0 (release) -255 (push)
R2	21 (USB) 20 (Bluetooth)	23 (no wireless option)	0 (release) -255 (push)

Trackpad: one finger

Control Surface	Element # in SC	Element # in Max	Range
timer	48	49	0-255 wrapped & continuous
on/off counter	49	50	0-127 (on) 128-255 (off)
horizontal coordinate	50	51	~7.5 repetition of 0-255
horizontal direction	51	52	0 to 255 : left 255 to 0 : right (only in SC)
vertical coordinate	52	53	0 (top) - 58 (bottom)

Trackpad: Horizontal/Vertical Coordinate Mapping Method



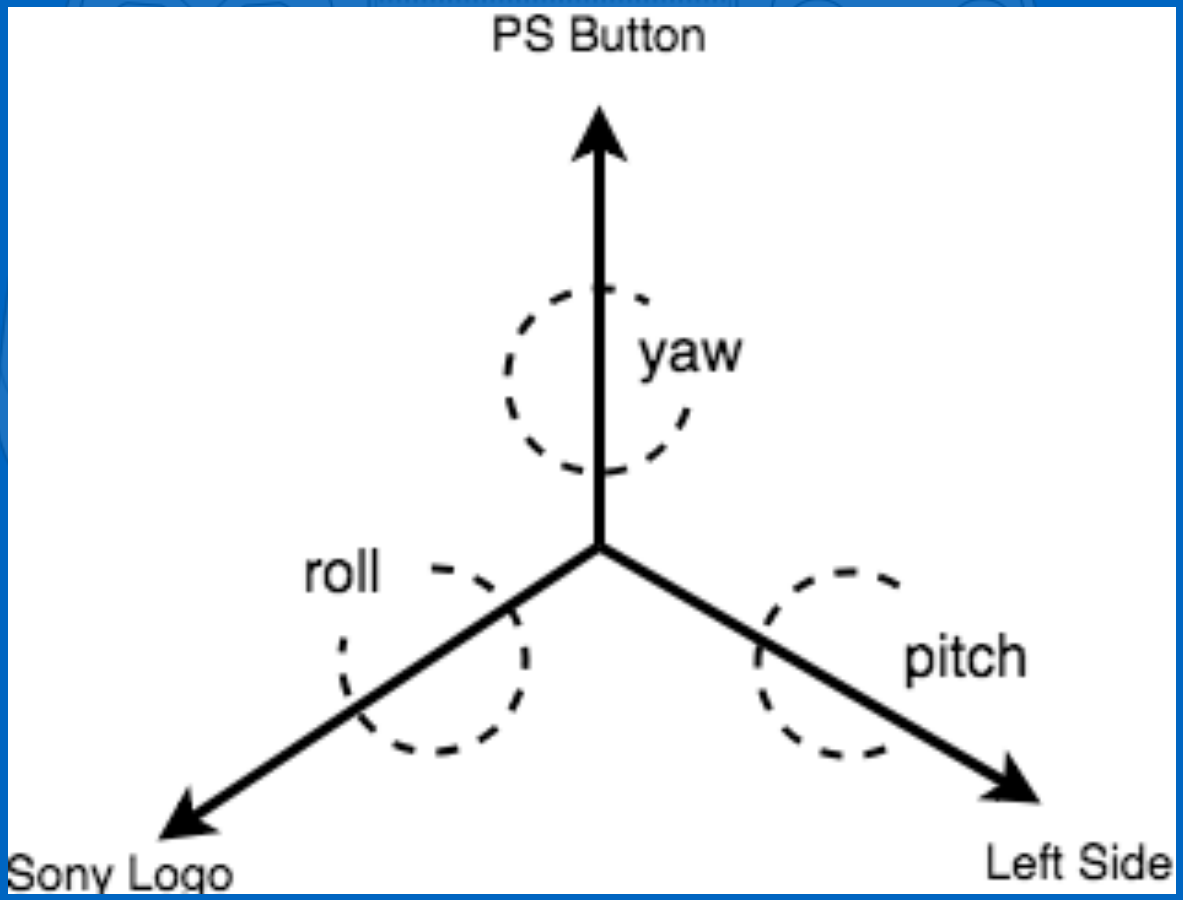
Trackpad: two fingers

Control Surface	Element # in SC	Element # in Max	Range
on/off counter	53	54	0-127 (on) 128-255 (off)
horizontal coordinate	54	55	~7.5 repetition of 0-255
horizontal direction	55	56	0 to 255 : down 255 to 0 : up (only in SC)
vertical coordinate	56	57	0 (top) - 58 (bottom)

Timer

Control Surface	Element # in SC	Element # in Max	Range
NA	19	NA	0-63 wrapped and continuous higher SR than #48
NA	25	NA	0-255 wrapped and continuous higher SR than #48

SIXAXIS



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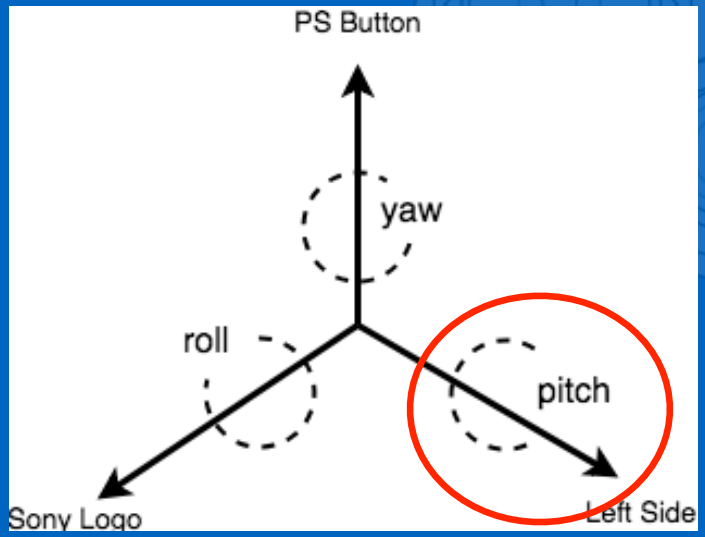
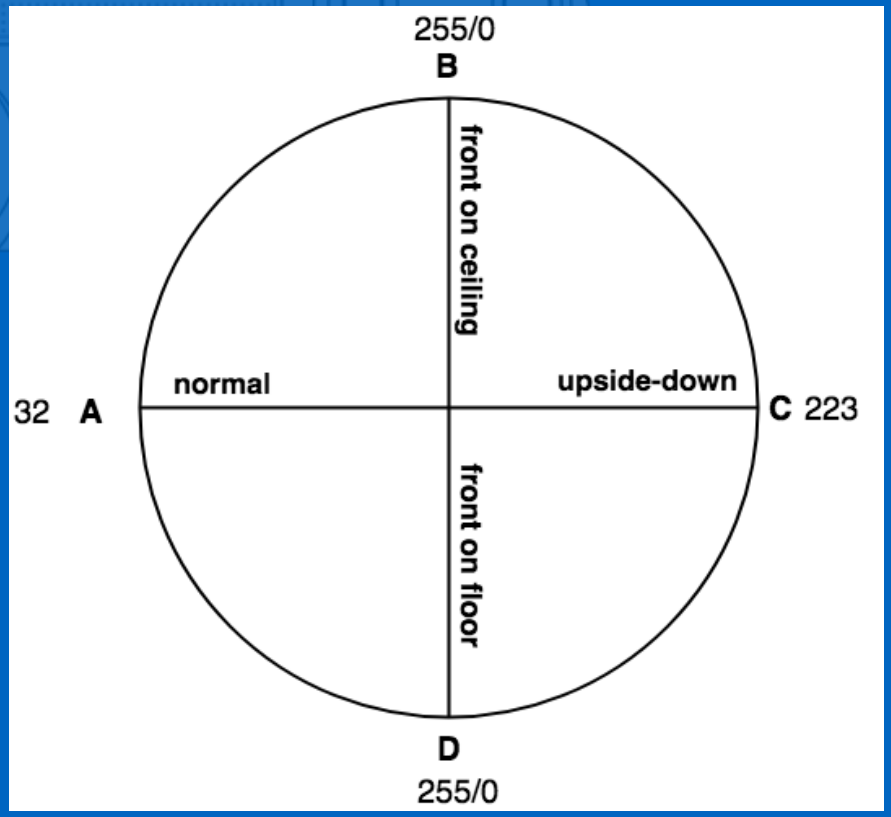
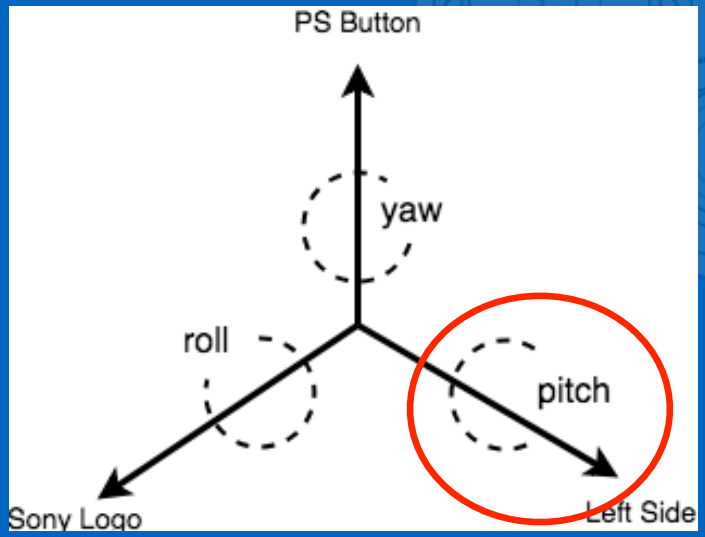
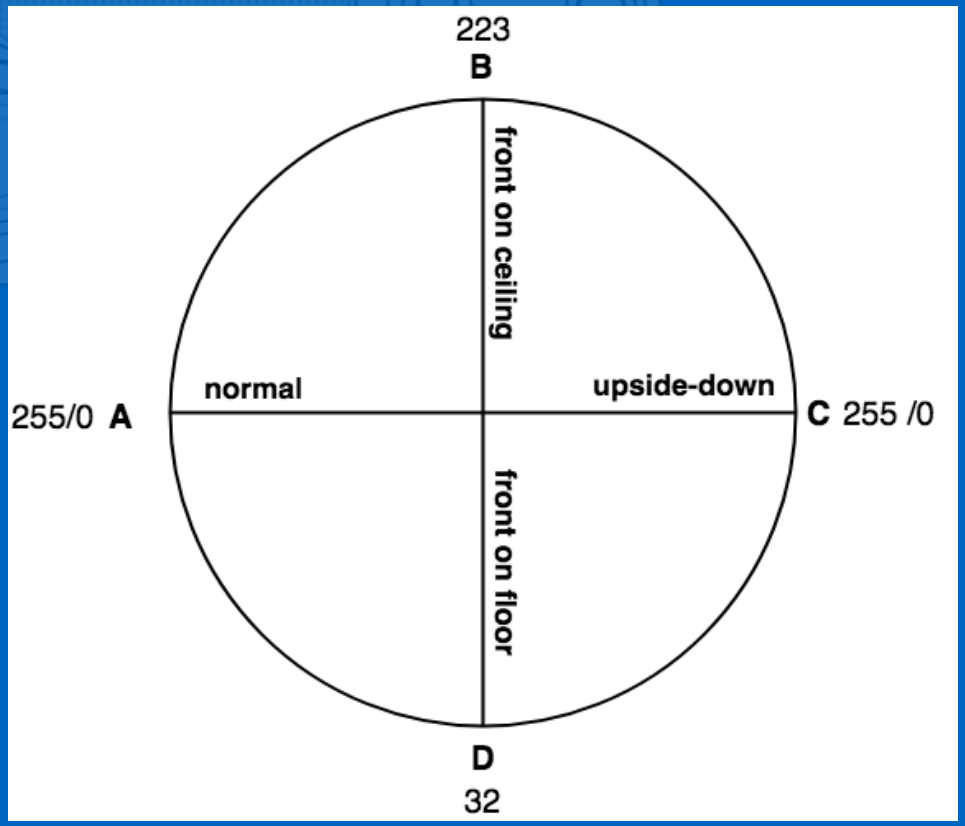




Pitch (Element #36)

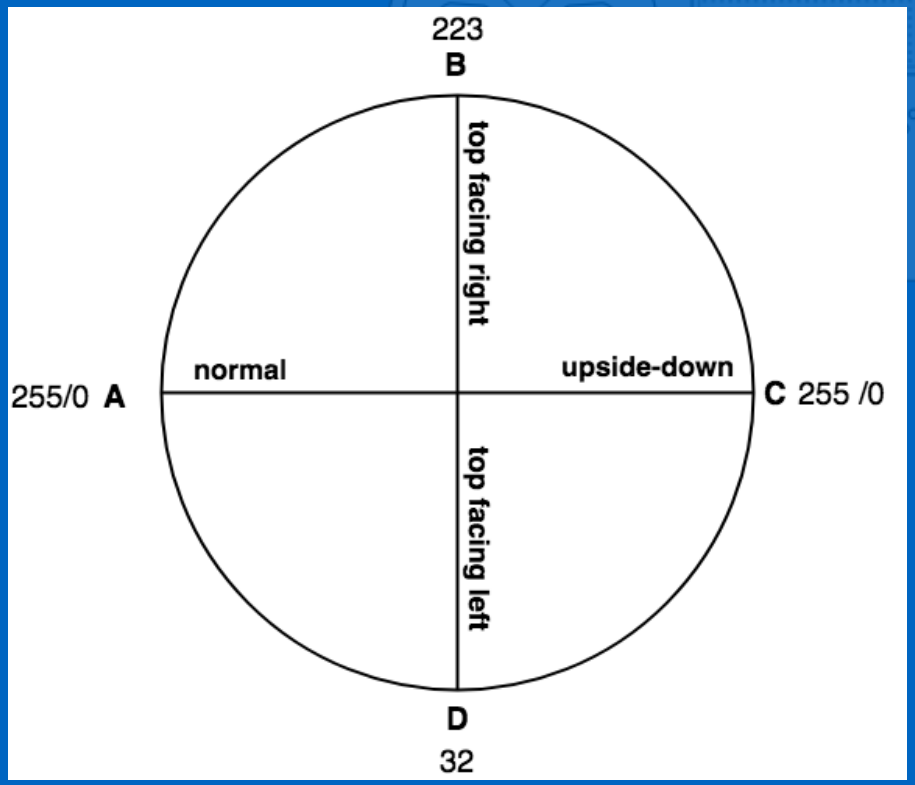
SIXAXIS

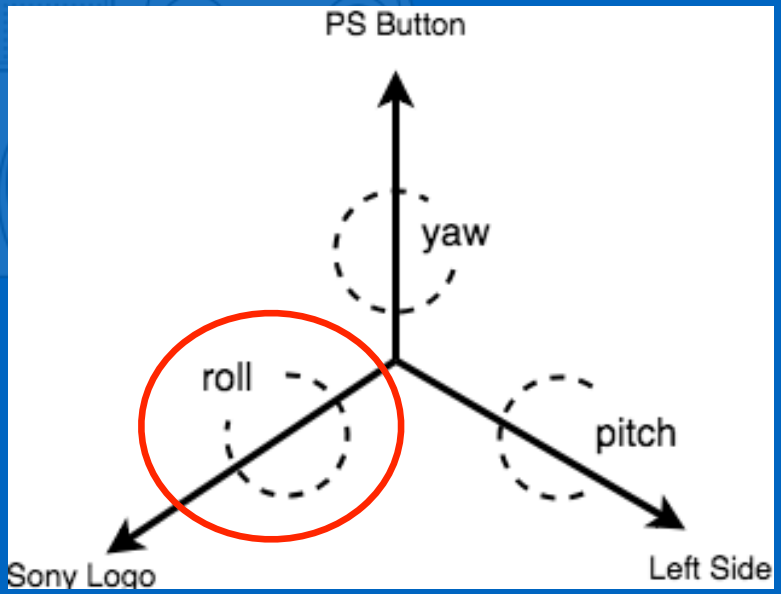




Pitch (Element #38)

SIXAXIS





Roll (Element #34)

SIXAXIS

Control Surface	Element # in SC	Element # in Max	Range
Pitch Accelerometer	28	29	0-127 & 128-255
Pitch Gyroscope	36	37	0-32 & 223-225
Pitch Gyroscope	38	39	0-32 & 223-225
Roll Accelerometer	32	33	0-127 & 128-255
Roll Gyroscope	32	33	0-32 & 223-225
Yaw Accelerometer	30	31	0-127 & 128-255

*could not find yaw gyro

Unmapped or Dangerous Elements

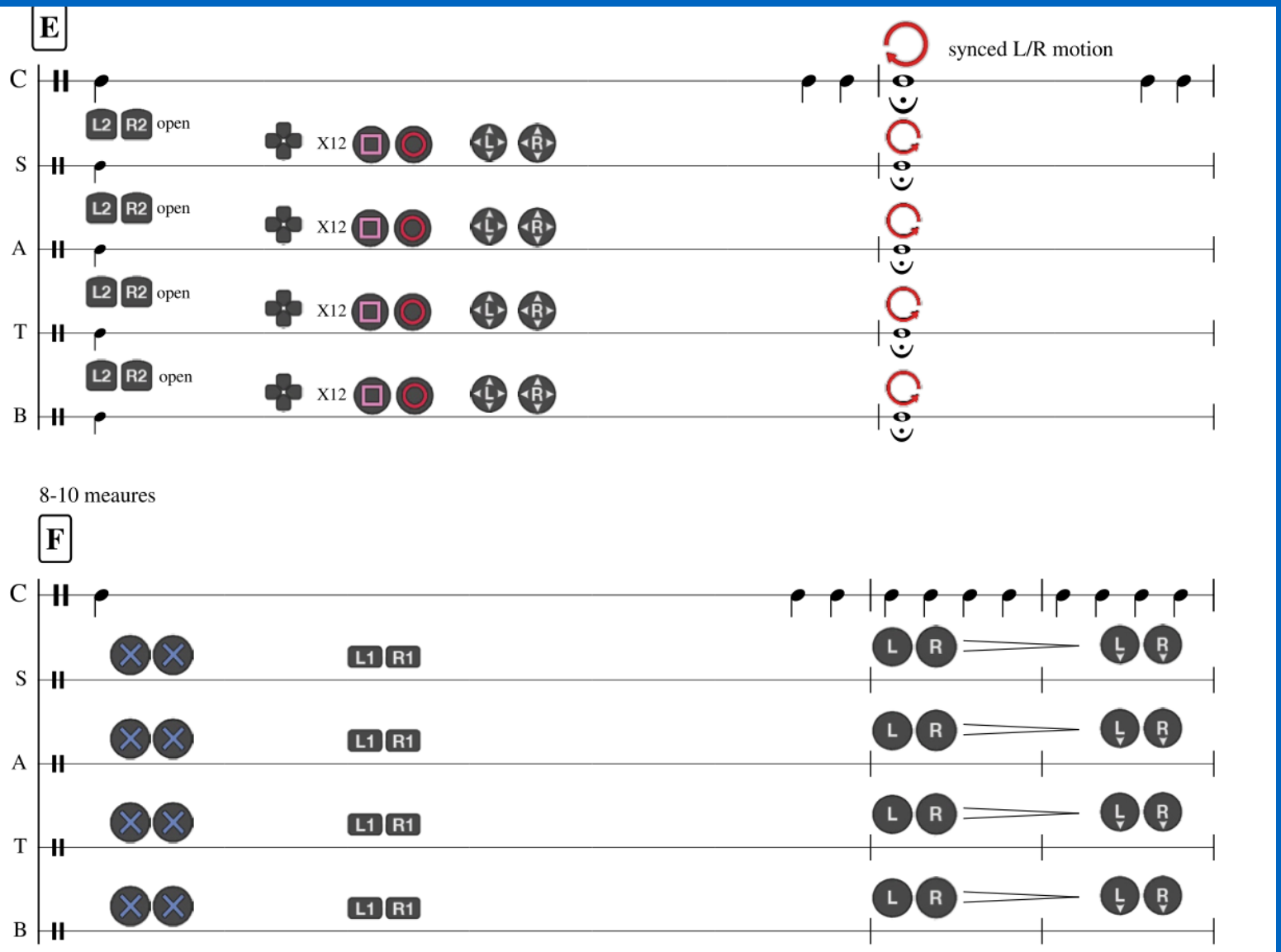
Control Surface	Element # in SC	Notes
Dangerous	24, 27, 29, 31, 33, 35, 37	high sampling rate crashes SC
Large Range	22, 23	range exceeds 0-255

Summary

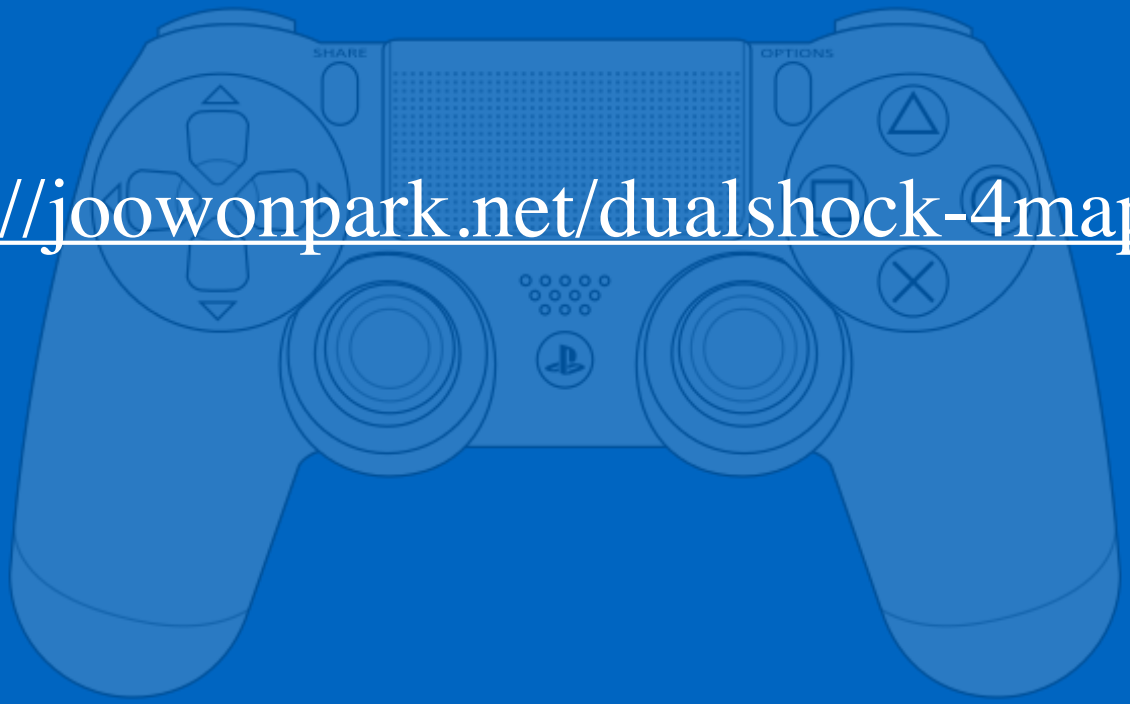
Using Max or SuperCollider's default objects and externals to connect the controller is not a secret (eg: zsy.ds4). But existing the easiness of usage comes with the limitation of the possibilities.

With this analysis of all working control surfaces, an initial technical investigation does not need to be redone every time a piece is composed for DualShocks

Example: PS Quartet No.1


E
synced L/R motion
C
S
A
T
B
L2 R2 open
X12
8-10 meaures
F
L1 R1
L
R

SC Codes with all discovered mappings (SC) & PDF of presentation



http://joowonpark.net/dualshock-4map/

Background image source: https://commons.wikimedia.org/wiki/File:Dualshock_4_Layout.svg