

EECS355 Mini-project : PS/2 Keyboard

Description:

Keyboards are normally encoded by placing the key switches in a matrix of rows and columns. All rows and columns are periodically checked by an encoder or "scanned" at a high rate to find any key state changes. Key data is passed serially to the FPGA from the keyboard using what is known as a scan code. Each keyboard key has a unique scan code based on the key switch matrix row and column address to identify the key pressed.

The keyboard scan codes consist of 'Make' and 'Break' codes. One make code is sent every time a key is pressed. When a key is released, a break code is sent. For most keys, the break code is a data stream of F0 followed by the make code for the key. For example, in the case the space bar is pressed once, the scan code sequence that occurs would be "29 F0 29."

In the included ps2 project, note that the outputs hist3, hist2, hist1, and hist0 outputs scan codes. For example, if space was pressed twice (thus, the previous key was also space), hist3 = 29, hist2 = 29, hist1 = F0, and hist0 = 29.

Things to do:

Using the included zipped project, you should do the following:

- 1) Modify the top-level ps2.vhd to display the scan codes on the leds.
- 2) Verify that the make and break codes for the keys that you want to use are correct. Do NOT use the keys that have "XX" on the figure below. If your keyboard is not working properly, try another one, and let a TA know which keyboard was malfunctioning.

IMPORTANT NOTE: MAKE SURE TO HAVE THE VGA AND KEYBOARD PLUGGED INTO THE ALTERA DE2 BOARD BEFORE YOU POWER IT UP. DO NOT UNPLUG OR PLUG IN THE PERIPHERALS WHILE THE BOARD IS ON. NOT DOING SO MAY RESULT IN DAMAGE TO THE BOARD.

The following are the make codes for different keys on the keyboard. Break codes are "F0" followed by the make code again.

MAKE CODES																							
0E	16	1E	26	25	2E	36	3D	3E	46	45	4E	55	66	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
0D	15	1D	24	2D	2C	35	3C	43	44	4D	54	5B	5D	XX	XX	6C	75	7D	XX	XX	XX	XX	XX
5B	1C	1B	23	2B	34	33	3B	42	4B	4C	52	5A	XX	XX	XX	6B	73	74	XX	XX	XX	XX	XX
12	1A	22	21	2A	32	31	3A	41	49	4A	59	XX	XX	XX	XX	69	72	7A	XX	XX	XX	XX	XX
14	XX	11	29	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	70	71	XX	XX	XX	XX	XX	XX

Key	Make Codes
`	0E
1	16
2	1E
3	26
4	25

5	2E
6	36
7	3D
8	3E
9	46
0	45
-	4E
=	55
Backspace	66
Tab	0D
Q	15
W	1D
E	24
R	2D
T	2C
Y	35
U	3C
I	43
O	44
P	4D
[54
]	5B
\	5D
Caps lock	58
A	1C
S	1B
D	23
F	2B
G	34
H	33
J	3B
K	42
L	4B
;	4C
'	52
Enter	5A
Left shift	12
Z	1A
X	22

C	21
V	2A
B	32
N	31
M	3A
,	41
.	49
/	4A
Right shift	59
Left ctl	14
Left alt	11
Space bar	29
0 (num pad)	70
. (num pad)	71
1 (num pad)	69
2 (num pad)	72
3 (num pad)	7A
4 (num pad)	6B
5 (num pad)	73
6 (num pad)	74
7 (num pad)	6C
8 (num pad)	75
9 (num pad)	7D