

Lab 3
COMPENG 3DQ5

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In our implementation, we initialize an array called 'countarr' with 6 indexes (for keys 0 to 5) where each index is 8 bits. The purpose of this array is to be able to keep track of the count of any key pressed. In our case statement, we use the variable 'PS2_Code' which has the PS2 code of the key pressed and further have 6 different cases (for keys 0 to 5) and within each case, the counter in the count array at the corresponding keys index is incremented. For example if the PS2 code for key 4 is detected, the count array at index 4 will be incremented. Within each incrementation block, there is also a check to see if the 4 least significant bits are equal to 9 and if so, the last 4 bits will get reset to 0 and 4 most significant bits will be incremented by 1 (this implements BCD counting). Note also that incrementation can only occur if the 'flag' variable has been triggered (set to 1) and this is done as soon as a PS2 code is read. The reason for this is that otherwise, the counter would keep incrementing itself non-stop as the value in the 'PS2_Code' variable is still the same, so it would keep going to that case block for the respective key. Finally, there are two for loops that iterate 5 times to compare the value of the current key with the most occurrences to the other keys to determine if there is another key that has been pressed more than the current one. This is done for both the 'max' and 'lastmax' which hold the indexes for the most and second most pressed keys respectively. Note that the counter at the index of the second most pressed key (lastmax) is not checked in the first for loop (where we check for the most pressed key) to avoid the issue of max and lastmax holding the same value. The same applies for the second for loop but with max. At the end, a simple check is done to ensure the values are swapped correctly if need be. Finally, there is a combinational block that checks the value of 'max' and 'lastmax' and based on the stored value, the corresponding value is retrieved from the count array and its 4 most significant bits and 4 least significant bits are assigned to a variable which will be used when printing the BCD count value of the keys.

After reviewing the compilation report, it was noted that a total of 151 logic registers were used in the design from the report. 27 were used in the PS2_Controller module, 46 in the VGA_Controller module and 78 in the actual experiment 4 design module. Only registers that are used with non blocking assignment are counted in the register count within quartus. After manually counting all the registers used in the design (declared in one section at the top of the page) that were also used with non blocking assignment somewhere in the code, the number of registers counted was a total of 151 with 27 from the PS2 module, 46 from the VGA module and the remaining 78 from the experiment design.