Architecture, réseaux et système I
Homework

Deadline 31 October 2008

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PS2 Keyboard Interface

Problem statement

Design the architecture for a PS2 Keyboard interface having the black-box model shown in Figure 1.

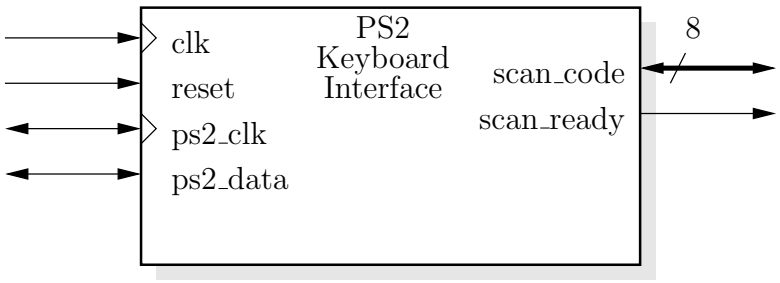

Figure 1: Top level blackbox view of the final circuit

Problem Analysis

General information about the **PS2 keyboard** can be found here:

- http://www.computer-engineering.org/ps2keyboard/
  See sections from: *[General Description]* to *[Make Codes, Break Codes, and Typematic Repeat]*.

Information on the **PS2 Keyboard Protocol**:

- http://www.computer-engineering.org/ps2protocol/
- http://www.beyondlogic.org/keyboard/keybrd.htm

Describe the FSM using transition graphs (see course). The actual architecture in not requested. Use a black-box for the described FSM when drawing the architecture.

[0]For more information and resources visit http://perso.ens-lyon.fr/bogdan.pasca/teaching.html or email Bogdan.Pasca@ens-lyon.fr

Requests

1. Draw the architecture and design the automaton which is able to receive data from a PS2 keyboard. The output of the architecture is composed of:

   (a) the scan-code for the last key pressed

   (b) a scan_ready line which indicates if the parity check on the data bits is correct. The scan_ready line goes back to zero immeditely after receiving the **stop-bit**.

   See figure 2 for a top-level schematic of the architecture. Explain your decisions.

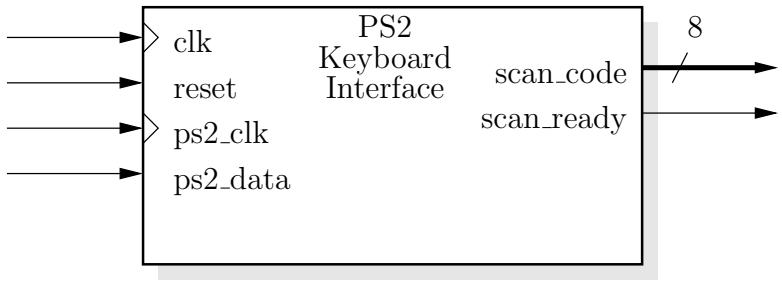

Figure 2: Top level blackbox view of the requested circuit

2. In the provious architecture, when pressing one key, the FSM should detect both the MAKE and the second part of the BRAKE code of a character resulting in the scan_ready line having two transistions from 0 to 1. Modify the above architecture so that only the MAKE codes of the keys are detected. Draw the corresponding automaton. Explain your decisions.

3. At this point we have the architecture for a primitive keyboard interface which outputs a 8-bit character code with a validation signal. What is the solution to connect this architecture with the previous text-mode VGA driver which you have designed in the previous homework in order to simulate a typewriter? Draw the architecture. *[Think of mapping scan-codes to character-codes. Also consider in incrementation of the screen counter.]*

4. Modify the above architecture in order to permit both lower and upper-case letters to be displayed. Draw the architecture and explain your decisions. *[Think that upper case letters are those between the MAKE and the BRAKE codes of the SHIFT key.]*

5. Augment the architecture in order to enable the functionaliy of CAPS-LOCK key. When pressing once the CAPS-LOOK key the led on the keyboard should **light** and when pressing CAPS-LOCK again it should **turn off**. *[Notice that the PS2 protocol is bidirectional.]* Draw the automaton for describing these events. Explain your decisions. *[Think of what happens when CAPS-LOCK is on and SHIFT key is pressed for a character. For lighting the CAPS-LOCK led the host should send commands to the keyboard.]*