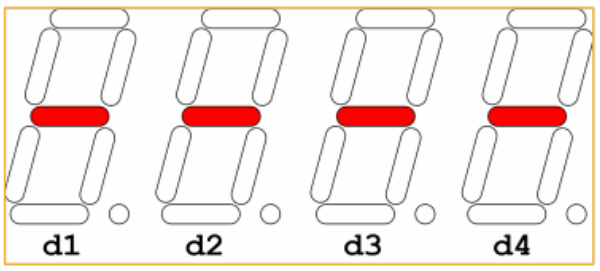
Rock-Paper-Scissors Game Machine

1) Purpose: Based on the fundamental techniques covered during the semester (combinational circuits, sequential circuits, shift register, table lookup with memory devices, display devices), **a rock-paper-scissors game machine** will be created using a key matrix and dot matrix display/7-segment display, according to the given conditions.

2) Given condition:

{1} Common condition:

- **Design the implementation using a schematic-only approach**, utilizing symbols from the ISE library without using HDL.
- **Document and explain the structure and operation of all user-defined symbols** in the report.
- **Mount the Cmod S6 and the 7-segment display/dot matrix display side by side on the provided breadboard,** and connect the two display components and the key matrix to arbitrary FPGA pins.
- **Use the myDAQ for verification** during design and implementation, particularly for debugging purposes.
- **Use resistors only for connecting the 4-digit 7-segment display.**
- **Assign five arbitrary keys in the key matrix.** Debouncing is required and must be implemented using only the FPGA, without adding any external components.



{2} Function of each button:
-Reset: Whenever pressed, this button resets the implemented circuit. During the reset state, the 7-segment display (referred to as "7seg") will display a specific pattern (as shown above), and the dot matrix display (referred to as "dot") will be turned off.

-Start: This button initiates the operation according to the required scenario at each level. When pressed, all dots on the dot matrix display will turn off. On the 7seg display, digit d1 will show the number of iterations, while digits d3 and d4 will display "00". Digit d2 will remain off. (Digits d2 to d4 are reserved for recording the cumulative score, considering the sign. Digit d2 indicates a negative score with a '-' symbol. Scores are displayed in decimal format.)

-R(rock), P(paper), S(scissors): These buttons serve as individual input switches corresponding to the rock-paper-scissors operation.

{3} Condition for Level 0:
0.Design each pattern symbolizing scissors (S), rock (R), paper (P), and a question mark (?) on the dot. (design them as large as possible).
1.Press Start (In Level 0, 7seg's d2-d4 are not used).
2.If R, P, or S is pressed:

- Display the corresponding pattern on the dot until the next key is pressed.
- If a key other than R, P, or S is pressed, display ? on the dot.
- Decrease 7seg's d1 by 1.

3. Repeat the above process the number of times set in d1 at the beginning. Ignore all keys except Reset and Start and maintain the last state.
4. Press Start to return to step 1.

{4} Condition for Level 1: (skipped)

{5} Condition for Level 2: **Rock-Paper-Scissors game**
0. Use the four patterns from Level 0.
1. Press Start to begin the game.
2. Internally, randomly select one of R, P, S, and save it as X.
3. Display the patterns corresponding to R, P, and S on the dot sequentially with a time interval set by the designer while the player inputs keys during the display (the key that the player pressed last during the display will be used for the game).
4. After the display time for the three patterns has passed, briefly turn off all dots and then display the pattern corresponding to X on the dot. Determine the win/draw/loss based on the comparison between the input key and X, and reflect +3, 0, or -3 in the score accordingly.

- If no key is pressed within the time limit, subtract -2 from the score.
- If a key other than R, P, or S is pressed, display ? on the dot instead of X and subtract -1 from the score.

5. Repeat the above process the number of times set in d1 at the beginning. Ignore all keys except Reset and Start, and maintain the last state.
6. Press Start to return to step 1.

{6} Information to be included in the report/demonstration:
-How to set patterns randomly
-How to set the time limit
-How to determine win/draw/loss
-How to reflect scores based on the outcome of the game.

3) Files or Links:

- The whole file package created for the project: file_package_for_upload.zip
- Short video of part of the game: https://youtu.be/2dr-xFhZgp0