

COSE222 Computer Architecture

Final Project: 1st Milestone (10% credit)

Follow the [synthesis & simulation tutorial](#) linked on the class web. The example code in the tutorial will display a number 5 on the HEX0 7 Segment of DE0 Board.

The MIPS System design on the class web implements only a few MIPS instructions: `add`, `addu`, `addi`, `addiu`, `sub`, `subu`, `and`, `or`, `ori`, `slt`, `lui`, `lw`, `sw`, `beq` and `j`. Check out the Verilog source code (`/MIPS_System/MIPS_CPU/mips.v`) to figure out its supported instructions. (Hint: look at the `main_dec` and `aludec` modules). So, **you are allowed to use those instructions in your program.**

The MIPS System has a peripheral device called GPIO (General-purpose Input/Output). GPIO has several memory-mapped registers. LEDs, Switches, and 7 Segments on DE0 board are connected to our MIPS System via GPIO. Check out the GPIO source at `/MIPS_System/GPIO/GPIO.v` and decoder (memory-map) source code at `/MIPS_System/Decoder/Addr_Decoder.v`. As you may have figured out, our MIPS system has the following memory map shown in Table 1.

Table 1 Memory Map of Our Computer System

Components	Size	Base (Start) Address	End Address
Reserved			
GPIO	4KB	0xFFFF_2000	0xFFFF_2FFF
Reserved			
Timer Counter	4KB	0xFFFF_0000	0xFFFF_0FFF
Reserved			
Memory	8KB	0x0000_0000	0x0000_1FFF

Table 2 shows the GPIO registers and its addresses in memory map. To display a number on HEX0, for example, you should write data to `0xFFFF_200C` using `sw` instruction.

Table 2. GPIO Registers

Registers	offset	Absolute Address	Note
Button Status	0x0	0xFFFF_2000	Button 0 ~ 2
Switch Status	0x4	0xFFFF_2004	Switch 0 ~ 9
Green LEDs	0x8	0xFFFF_2008	
HEX0	0xC	0xFFFF_200C	7 Segment
HEX1	0x10	0xFFFF_2010	7 Segment
HEX2	0x14	0xFFFF_2014	7 Segment
HEX3	0x18	0xFFFF_2018	7 Segment

Using the instructions supported in the MIPS System design, display the last 4 digits of your student ID (학번) on 7 segments of DE0 board. Note that if you use C-language, make sure that the compiler-generated machine code is supported in the provided MIPS design (You can check it with dump file).

What and How to submit:

- Create a 1-min mpeg video clip (with your smartphone or any other convenient means), showing
 - Your smiling face to camera
 - 7 segment output on DE0 board
- AND explaining the followings:
- Your C source code
 - What you have done to display your ID on 7 segments
- Upload the video clip (mpg) to Blackboard

Note: This is an individual assignment. You are welcome to discuss, but DO NOT COPY solutions. If you are found to copy solutions from others or slightly modify the solutions from others, both of you will be given 0 credits.