CS 231 – Lab 6 – Integer Representation

Today, you will use the bitwise operators in MIPS to complete a program that displays the various binary representations of an integer.

Create a new folder called lab6 on your USB drive or account, and do all of today's work in there. From the class Web site, you should see a folder called lab6. Download the file integer.s. You will modify this program.

In class we discussed how integers may be represented in binary. The standard format is 2's complement. We will practice creating the other four.

You might want to print out a copy of the unfinished program integer.s. Look carefully at the structure of the program. Run the program so that you see what it can do so far. At the moment, this program obtains an input number from the user, and then prints the 2's complement representation. The program seems prepared to print all 5 representations, but the current implementation essentially prints the same 2's complement representation 5 times.

You need to fix the bits so that each of the other representations can be printed correctly as well. Here is a convenient approach: Use a different register to hold the each desired binary representation. For example, you may wish to use $s1 to hold the one's complement representation, and $s2 for unsigned, etc. Note that the bitprint procedure at the end of the program assumes that the number to be printed is in $a0 (the usual place for a function parameter), so you will need to move your value into $a0 before each "jal bitprint".

I think it will be easier if you implement the representations in the following order as they appear in the code. It may be a good idea to test that one representation has been implemented correctly before proceeding to the next one. Otherwise, errors may propagate. As you test, try one positive and one negative number. You should be able to work out the correct answers by hand.

The representations are:

1. one's complement
2. unsigned
3. sign-magnitude
4. biased 2^{31} √