CS 218

Homework, Asst. #6

Purpose: Become familiar with data conversion, addressing modes, and assembly language macro's.

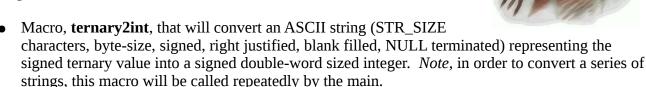
Due: Wednesday (6/14)

Points: 75

Assignment:

As we know from television and movies, an alien invasion imminent. Based on a number of tabloid reports, the aliens have three fingers (see eyewitness sketch on right). As such, it is assumed they will use a base-3, or ternary¹, numbering system.

Write an assembly language program using macros to convert a ternary string into an integer, add the values, and convert the resulting integer to a ternary string and output the result. Specifically, write the following simple assembly language macros:



• Macro, **int2ternary**, that will convert a signed double-word sized integer into an ASCII string representing the ternary value. The macro must store the result into an ASCII string (10 characters, byte-size, signed, right justified, blank filled, NULL terminated).

Use the provided main, which will invoke the macros. You may assume valid/correct data. As such, no error checking is required. For example, given the following initial test data set:

The string would be converted to integer, doubled, and converted to string for display. The result, as displayed to the screen, would as following:

Answer: +101101

The other data sets are added (instead of doubling).

The ASCII strings are STR_SIZE (provided constant) characters long including the NULL. All data must be treated as *signed* integers. As such, the IMUL and IDIV instructions should be used (not the DIV or MUL). The provided program template includes a macro that prints the ASCII lists to the screen. No changes to the parameter lists are allowed. You may declare additional variables as needed. Do **not** change the data types (double-words or bytes) as defined. *Note*, since the program displays the results to the screen, typing ./ast06 will execute the program (assuming *ast06* is the program name). You can refer to a web based on-line based converter to check results.

¹ Ternary is a base-3 numeral system. For more information, see: http://en.wikipedia.org/wiki/Ternary_numeral_system

Debugging:

The code for a macro will not be displayed in the source window. In order to see the macro code, display the machine code window ($View \rightarrow Machine Code Window$). In the window, the machine code for the instructions are displayed. The step and next instructions will execute the entire macro. In order to execute the macro instructions, the **stepi** and **nexti** commands must be used.

Submission:

When complete, submit:

• A copy of the source file via the class web page.
Assignments received after the start time of class will not be accepted.

Example Output:

The results, as displayed to the screen, would be as follows:

Assignment #6 - Data

```
; -----; Assignment #6 Provided Data

tlet0 db " +12012", NULL
ans0 dd 0

tlet1 db " +12002", NULL
db " +101212", NULL
db " +1020201", NULL
db " -1201", NULL
db " -102022", NULL
len1 dd 5
ans1 dd 0

[...data listing truncated due to space...]
```

Note, the ".bss" section is for uninitialized data. The "resd" is for reserve double words and "resb" is for reserve bytes. See provided main for the rest of the data declarations.