CS 200: Computer Organization

Project 7: Random Number Generator

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Due: Friday, April 4, 2014

Overview

Purpose

This project required us to write a program in MIPS assembly language that works as a random number generator. The program accepts a seed, a max value, a min value and the number of random numbers to be generated, and then displays the random numbers requested.

Approach

I studied about Linear Congruence and Linear Congruencial Generators in depth and broke the algorithm into steps. This helped me develop pseudocode and consequentially assembly code for the program. As I googled functions, I saw that there were numerous articles and books devoted to assembly programming that were very helpful. I had the flu this week and the week before, which lead to me having a hard time focusing on this project. I reached out to my friends for help and we coordinated on this project which made it a bit easier to complete as well. They told me that limits were a good idea for this project and I put them in but I am was not sure how big or small the seed was supposed to be. There were also many articles on Linear Congruence online which helped me understand the concept immensely as well. I started off programming using QtSpim but looked online to see if there were any alternatives because I did not like their interface (I am sure it looks better once the user gets used to it). I did find and use MARS (http://courses.missouristate.edu/KenVollmar/MARS/index.htm). It is an IDE developed by engineers at Missouri State University and I really enjoyed using it.

Solution

Sample Output

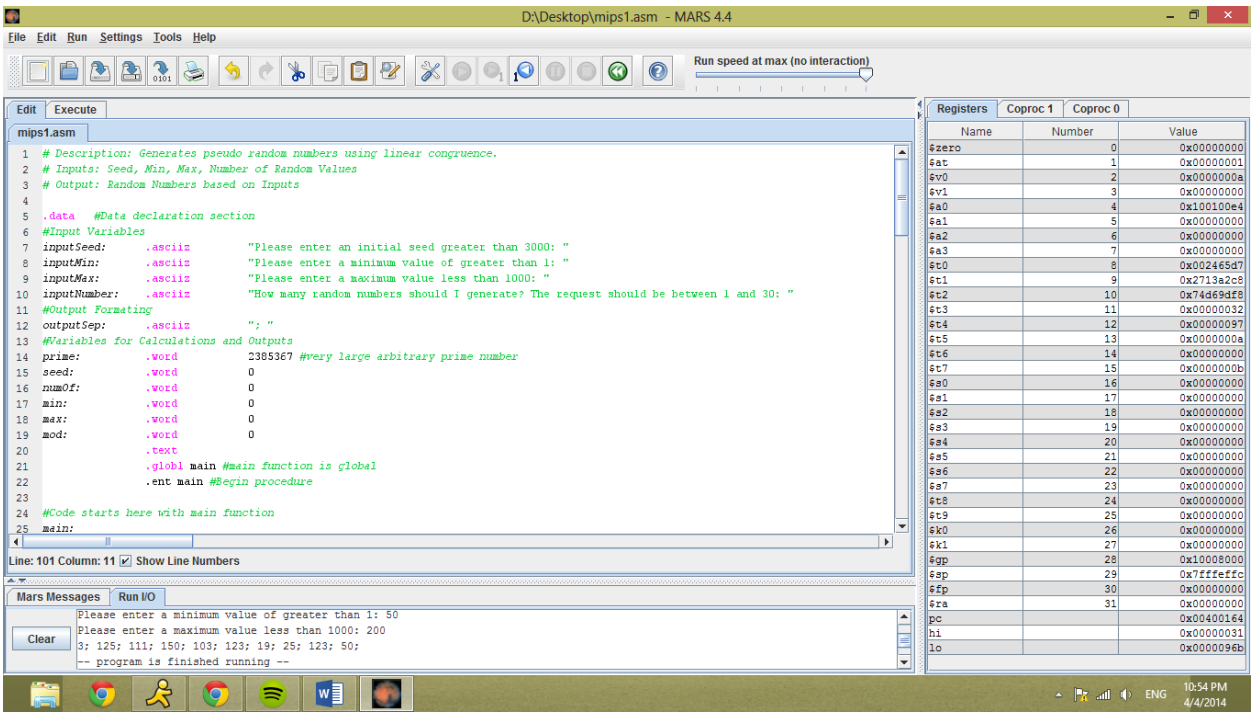

Figure 1: Sample Output

Conclusion

Being sick really caused me issues during this project and I was forced to work with classmates. It was a good exercise in teamwork and we used each other's strengths to get to the solution. One issue that I did not get fixed was that the RNG did not adhere to the minimum value entered by the user but the maximum value part worked great. I did really enjoy the MARS IDE for this assignment. It did not require installation and seems very easy to use. This was a good exercise in working on a problem I had never heard of before, finding the mathematical formula for solving it online, developing pseudocode

based on the formula, converting the pseudocode to code and debugging the program until it works. This process is very fulfilling for me and the skills I am developing now will be useful throughout my career in Computer Science (or even every day life).

References

A Minimalistic Introduction to MIPS Instruction

http://labs.cs.upt.ro/labs/so2/html/resources/nachos-doc/mipsf.html

Linear, Congruential Random Number Generators

http://lamar.colostate.edu/~grad511/lcg.pdf

MIPS Assembly Language Programmer's Guide

http://www.tik.ee.ethz.ch/education/lectures/TI1/materials/assemblylanguageprogdoc.pdf

Wikipedia – MIPS architecture

http://en.wikipedia.org/wiki/MIPS_architecture