Enhancing and Extending the rPeANUt Illustrative Computer Simulator

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19th May 2015
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Introduction

- What is the Illustrative Computer Simulator?
  
  A simulation of real computer systems with illustration.

- What is the rPeANUt?
  
  The rPeANUt Computer is a simple microprocessor which was created for teaching computer systems at the ANU. There is a Java implementation of a simulator along with an assembler.
Introduction

- 16 bit addresses
- 32 bit register
- Memories that is addressable in words of 32 bits
Purposes

- Important facilities as an assembler.
- Important facilities as a simulator.
- More facilities that help students understand.
Goals

- Improvement the #include facility
- Implement a #define facility
- Enable the display of a memory cell in decimal
- Display a complete decoding of assembled instructions
- Enable multiple cores
Goals

- Implement simulated hard disk that backs onto a file
```c
#define _FRAMEBUF 0x7C40
#define WORDSZ 32
#define xOffs -2 ; // stack offsets
#define yOffs -1   ; // registers holding parameters and locals
#define y R1
#define pixA R2

void setpixel(int x, int y) {
  load SP xOffs x;
  load SP yOffs y;
  load _FRAMEBUF pixA;
  int *pixAddr = (int *)__FRAMEBUF;
  load #6 R3;
  load #6 pixA pixA;
  load WORDSZ R4;
  add R3 pixA pixA;
  div x R4 R4;
  add R4 pixA pixA;
  load pixA R3;
  *pixAddr |= (1 << (x % WORDSZ));
  load #32 R4;
  mod x R4 R4;
  rotate R4 ONE R4;
  or R3 R4 R3;
  store R3 pixA;
}
```
Design & Implementation

- Java
- `#include` and the environment variable `RP_INC_PATH`
- `#define` and `HashMap`
- Decimal display with `JPopupMenu`
- Multi-core (2 cores due to the limitation of the size of UI)
- Hard disk onto a file
Summary

- #include and #define have been used in comp2300.
- Decimal data display and detail description may be used in the future.
- Multi-core builds a better understanding on the behaviour of real machines.
- Simulated hard disk will been done soon.
What Gained in the Project

- Valuable experiences on Java programming.
- A better understanding on assembler.
- A good experience to enhance a simulator.
Thanks!

Questions?