LAB 01: Introduction to MARS

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Agenda

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Introduction

- In this lab we will learn about 32-bit MIPS RISC (Reduced Instruction Set Computer) CPU.
- Popular Systems with MIPS CPU: Nintendo 64, Sony Playstation (Origianl), Sony PlayStation 2, and Sony PlayStation Portable (PSP).
- Common Uses for MIPS CPU: Embedded Systems, routers, and switches.

Sony Playstation 1

Sony Playstation 2

Introduction

- Assembly Language is the lowest level of programming for CPUs.
- In most cases, each assembly instruction maps to one specific operation.
- An Assembler is needed to convert the assembly code to binary (0 and 1).
- MIPS has 32 General Purpose Registers: $ 0 to $ 31.
- Some of these registers have specific functionality (e.g. $ sp stack pointer).

```
loop: lw   $t3, 0($t0)
      lw   $t4, 4($t0)
      add  $t2, $t3, $t4
      sw   $t2, 8($t0)
      addi $t0, $t0, 4
      addi $t1, $t1, -1
      bgtz $t1, loop
```

MIPS Sample Code

MARS Simulator

- MARS is a MIPS Assembly and Runtime Simulator.
- MARS is an integrated development environment (IDE) for programming in MIPS assembly language.
- MARS allows editing, assembling, debugging and simulating the execution of MIPS assembly language programs.
- MARS is written in Java, so it can be run on Windows, macOS, and Linux.
- There are two main windows in MARS: **Edit** Window and **Execute** Window.

Demo

Grade Distribution

Activity	Weight
Lab Tasks (8 Experiments)	12
Lab Quizzes (Best 3 out of 4)	3
Total	15

Lab Work Grade Distribution

Activity	Weight
Single Cycle CPU Design	8
Pipelined CPU Design	5
Report	2
Total	15

Lab Project Grade Distribution