Assembly Programming Using Simple Lego Mindstorms
RCX Robots

Wen Hsin
Park University
Outline

- Introduction
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Introduction

- Spring 2007
- Computer Architecture Course
- 8 students
- Students learned RCX assembly
- Students worked on “Simon Say” Projects
- Students worked on their own projects using simple RCX robots
Project Motivation

- Mindstorms RCX kits readily available
- Attended NSF-funded Summer Faculty workshop
- Generated touchable result using RCX robots
- Concrete examples in CISC so as to compare it with RISC
Student Background

- No prior assembly programming experience
- Taken Java in CS1 and CS2
- Junior standing
Simon Say Project

- Project material provided in LMICSE, an NSF funded project:
  - http://www.mcs.alma.edu/LMICSE

- Using Simple RCX robot:
  - one RCX brick
  - 3 touch sensors
  - 3 LED lights
  - 3 wires
Simple RCX Robot
Student Projects

- **Memory Games:**
  - A robot displays a series of numbers in random order. A player needs to memorize the number sequence and repeat the same sequence to win the game.
  - A robot displays a sequence of random lights in increasing difficulty (i.e., length 1, length 2, ...)

- **Slot Machine:**
  - A player pushes a button and Robot displays a set of numbers. The player wins the game if the numbers match certain pattern (e.g., all the numbers are the same, etc.)
  - A player selects a set of numbers, and the robot selects a set of numbers. If these two sets of numbers match, then the user wins the game.
Summary and Conclusion

- Students learned RCX assembly and control environment.
- Students had concrete experience in using CISC assembly. This helps them understand the difference between CISC and RISC.