Faculty of Science, Engineering and Technology

Computer Systems

Assignment 2

Overview

This assignment requires a knowledge of ARM assembly (v7) for bare metal programming of the Raspberry Pi.

Purpose: Assessing your knowledge of ARM assembly and ability to develop non-trivial programs using it

Task: Provide a summary of ARM assembly instructions used this semester, with examples of their use, and then demonstrate your abilities by designing and implementing a custom project of your own choosing.

Time: All submissions must be received on Canvas ***by Monday October 28th (midnight)***. Part B demonstrations will occur in your lab in Week 12.

You must demonstrate in your lab to get any marks for Part B.

Assessment: This assignment is worth 15% of your assessment for this unit.

Resources:

- Lecture slides and recordings - weeks 7-10
- Video tutorials:
  - The GPIO registers and header pins
  - Connecting up a simple LED circuit

SWINBURNE UNIVERSITY OF TECHNOLOGY

Introduction

The assignment is in two parts, as outlined below.

Part A - 30%

Write a manual covering every ASM command we have used this semester. You must include:

- The command syntax
- What it does (incl. what registers it changes)
- Example code
- Special instructions on using the operation (e.g. must use an even register)
- 3 or four lines of text will be sufficient for most ASM operations.

Part B - 70%

Demonstrate your understanding of the Raspberry Pi and ARM assembly by developing some new code / feature / product using the Raspberry Pi and ARM assembly.

- You must develop code which will run on the Raspberry Pi and that be demonstrated to work.
- You may use extra hardware (within reason).
- Your contribution / product / code / feature must be demonstrated to your lab demonstrator and explained in an accompanying report.

Part B notes:

- You can work in pairs on different aspects of a larger project, but your individual components will be marked separately.
- You can work within an OS, and link with other languages like C, however only the ARM assembly component of your work will be considered for assessment (so make this the main bit).

Part B Suggestions:

Suggestions for Part B:

1. Extend the COS10004 labs by writing code for some new feature.

2. Use ARM assembly to control some hardware/plug-inboard/peripheral (such as additional LEDs, external relays, ADC, or other output devices).

3. Use ARM assembly to read some hardware/plug-inboard/peripheral (such as switches, sensors, ADC, camera, mouse or other input devices).

4. Combine an input device and the display to produce a simple GUI or user-controlled application such as a Paint program.

5. Write Pong.

6. Implement your favourite sorting algorithm and use LED flashes to show output.

Submission Instructions

Your completed submission must be made through Canvas **by Monday October 28th (midnight)**

Everyday day late will incur a *5% deduction*.

Each submission should be zip file containing:

1. your ARM assembly instruction manual for Part A
2. All source code for your Part B
3. a report (Word doc or PDF) containing:
    1. Your name, student number, unit code and lab session
    2. A brief description of your Part B - what is it doing ?
    3. An outline of your design (describe the functions you have implemented, and ARM assembly features employed. Include code snippets for key aspects of the your project.
    4. Any assumptions you have made
    5. Any unresolved problems with your design
    6. Include images showing system in action (if applicable).

Assessment

• Part A will be marked out of 30 based on completeness and the quality of information. 3 or four lines of text will be sufficient for most ASM operations.

Part B will be marked out of 70 based on level of difficulty, level of completion, your ability to explain what you have done and answer questions, and the amount of original contribution made by the student. Simple extensions of labs will attract, at most, 30 of the 70 marks available. You can discuss your idea with your tutor or lecturer if you want to gain advice

Marks will be moderated by the convenor and tutors after the labs, and will be published within 2 weeks from the end of the semester.

MAKE IT READABLE!

If we cannot follow your code, we will deduct marks. Use comments, indentation, multiple files and well chosen labels. Same goes for your report - it must be of good quality and cover what is required.