

**Developing Soft and Parallel Programming
Skills Using Project- Based Learning**

SPRING 2019

ARM Strong

Group Members:

Ailany Icassatti, Hashim Amin, Isaiah Smith,
Sivasubramaniyan Mourougassamy,
Thang Nguyen & Toan Le

○ Planning and Scheduling

- **Work Breakdown Structure**

Assignee Name	Email	Task	Duration	Dependency	Due Date	Notes
Ailany Icassatti	aicassatti1@student.gsu.edu	1. Picked up Raspberry Pi 2. Task #1 - group name and work structure table 3. Task #5 - put the final report together 4. Task #6 – made videos with group members	1. 20 minutes 2. 2 hours 3. 5 hours 4. 1 hours	2. Group voting on options provided and each member selecting tasks 3. Everyone completing their tasks to be added to the report 4. Group meeting had to happen	1. 02/28/19 2. 02/08/19 3. 02/08/19 (by 11:59 pm) 4. 02/05/19	1. I missed the original pickup date, picked it up on 02/04. 2. Gave group few options and we voted on Slack
Hashim Amin	hamin3@student.gsu.edu	1. Task #1 – wrote my tasks on the work structure table 2. Task #3 -reviewed rough draft and suggested any necessary edits 3. Task #5 -added screenshots to appendix 4. Task #4: Input on lab report for ARM Assembly Programming process 5. Task #6 – made videos with group members	1. 30 minutes 2. 30 minutes 3. 30 minutes 4. 2 hours 5. 1 hour	2. Task 3 rough draft (has to be done prior) 3. Slack, Github (have to be done prior) 4. Raspberry pi had to be up and running 5. Group meeting had to happen	1. 02/08/19 2. 02/06/19 3. 02/07/19 4. 02/08/19 5. 02/05/19	

Isaiah Smith	smith27@student.gsu.edu	1. Task #1 – wrote my tasks on the work structure table 2. Task #3 –Wrote the first draft and the final after everyone reviewed it 3. Task #6 – made videos with group members	1. 30 minutes 2. 5 hours 3. 1 hours	2. Given time to all group members to review and give their input into the first draft 3. Group meeting had to happen	1. 02/08/19 2. 02/07/19 3. 02/05/19	After finishing the first draft I emailed everyone a copy of the first draft. After getting everyone's input, I added task 3 to the report and on slack.
Sivasubramanian Mourougassamy	smourougassamy1@student.gsu.edu	1. Task #1 – wrote my tasks on the work structure table 2. Task #6 – a. Made videos with group members b. Compiled the video footages and edited, uploaded to Youtube	1. 30 minutes 2. Part a. 1 hour Part b. 5 hours editing, rendering, and uploading	Lightworks editing software (free version) 3. Group meeting had to happen	1. 02/08/19 2. Part a. 02/05/19 Part b. 02/07/19	Built in windows video editor didn't have many capabilities so had to install lightworks free version and work

Thang Nguyen	tnguyen469@student.gsu.edu	<p>1. Task #4 - Raspberry PI installation and assisted with ARM programming</p> <p>2. Task #6 – made videos with group members</p>	<p>1. 6 hours</p> <p>2. 1 hour</p>	<p>1. Getting the PI in working condition and become familiar with it. Buying a new SD card</p> <p>2. Group meeting had to happen</p>	<p>1. 02/06/19</p> <p>2. 02/05/19</p>	We had problems with our original Sd card
Toan Le	tle96@student.gsu.edu	<p>1. Task #1 – wrote my tasks on the work structure table</p> <p>2. Task #2 –</p> <p>a. Created Slack account, sent invitations, took screenshots.</p> <p>b. Created Github account, the project, the file Readme and took the screenshot.</p> <p>3. Task #6 – Part a. made videos with group members</p> <p>Part b. created the YouTube channel</p>	<p>1. 30 minutes</p> <p>2. 2 hours</p> <p>3. 2 hours</p>	<p>2. Members' response from Slack's invites</p> <p>3. Group meeting had to happen</p>	<p>1. 02/08/19</p> <p>2. 02/04/19</p> <p>3. Part a. 02/05/19</p> <p>Part b. 02/07/19</p>	

○ Teamwork basics

- **Learning Teamwork Basics**

Q1: What to do to get the task accomplished and the team members' satisfaction high?

A: Working with a good team. Team members need to know their assigned work and due date. They also need to communicate with each other regarding the progress or any issues regarding their tasks, so the team can tackle problems quickly. Everyone should be on the same page at each states of the project. Everyone can have their own ideas, but everyone must agree on the goal.

Q2: Answer all the questions in the Work Norms, Facilitator Norms, Communication Norms using your own words and your own context.

A: Work Norms: Each person will be given a chance to “call dibs” on a particular task that they want, and any tasks will be distributed out in order to balance out the work load. If someone cannot follow the deadline, they must contact the team coordinator quickly. The coordinator will assign another member to help that member finish the task on time. everyone will post their finished tasks on Slack, so everyone can review. If there is a differing opinion, they can show those in the group why they think their approach is more suitable. The coordinator has final say on decisions. While everyone has different work habits, as long as everyone hits the deadline, there will be no issue. Though it is a good idea to leave some buffer for due dates in case something is not done on time. If problems arise, the coordinator needs to get into touch with the group member.

Facilitator Norms: The team coordinator is the ideal candidate for team facilitator as the duties of both roles coincide well with each other. If the team coordinator does not want to be the facilitator then it will go to someone who volunteers. If no one volunteers for the position of facilitator, we will more than likely pass it down to the next person on the team list. The role of the facilitator is to keep the group on track. Not necessarily lead it. This includes keeping the group focusing on the task at hand, ensuring everyone participates, keeping everyone on the agreed time frame, suggesting alternative procedures or ideas when the team runs into a problem, helping team members confront problems, summarizing and clarifying team decisions.

Communication Norms: Generally, the team will try to meet up at least once every week after class to make team decisions as well as make sure everyone is on the same page. The group will try to communicate through email and through Slack primarily. It is also crucial that the team has multiple ways of getting into contact with each other in case problems arise.

Consideration Norm: eating or drinking is fine during meetings as long as members can keep everything clean and tidy during and after meetings. Members should not smoke during meetings because other members may feel uncomfortable. Norms can be changed if the majority of the team is not comfortable. New rules will be set based on collecting members' idea and leader's decision.

Q3: As a team, select two cases out of the four mentioned in Handling Difficult Behavior. (use your own words and your own context)

Difficult Behavior	How to Handle it
Too Quiet	If a person is being very quiet, it is a good idea to talk to the person and make them feel more welcoming to the group and get them to open up more. The coordinator should make sure that everyone knows that his/her ideas and opinions are valued.
Argues	If the person or people in question are just frustrated, just give them time to cool off. They'll be more amenable in the future. If the person continues to argue, someone should talk to them privately so they can get their feelings across in a non-destructive/distractive manner. If they continue to argue contact the instructor to see if they can help solve the problem. Constructive arguments are welcome, and the coordinator will ensure arguments don't get personal.

Q4: When making decisions, if the team is having trouble reaching consensus, what should you do? (Use your own words and your own context)

A: The first thing to do is to let everyone have their chance to give their piece in order to have the chance of convincing everyone else. If not, everyone takes a quick break to think about their position and comes back to vote or debate again. We repeat this process until a solution is decided upon. If a solution is not agreed upon, then the team facilitator will be the one to make the final decision.

Q5: What should you do if person may reach a decision more quickly than others and pressure people to move on before it is a good idea to do so?

A: Some people tend to make their decisions quickly while others tend to take their time. Politely remind the person that this is a group project and that everyone has a say in how the group is run and how decisions are made. If it continues to be a problem the facilitator, coordinator, or a group member should talk to them privately.

Q6: What happens if most people on the team want to get an "A" on the assignment, but another person decides that a "B" will be acceptable?

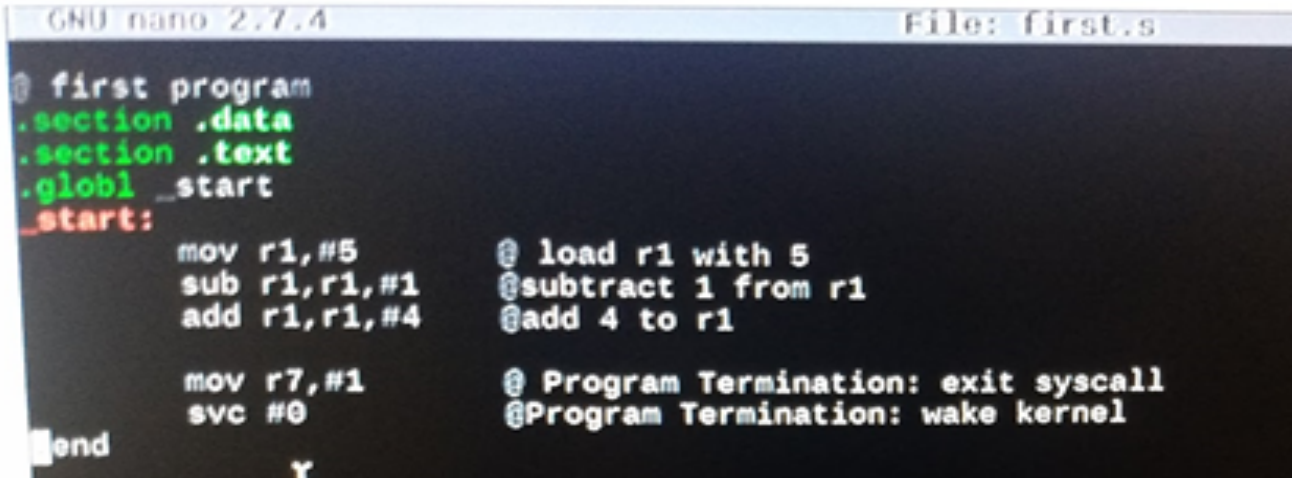
A: First, explain the person why they should work harder for a better grade then ask the person to work harder to improve their grade as well as the grade of everyone in the group. If that doesn't work, have

someone pick up the slack and privately talk to the instructor about the how the person thinks a B is acceptable so the instructor grades accordingly.

○ Raspberry PI Installation and ARM Assembly Programming

- **Part 1 Lab Report**

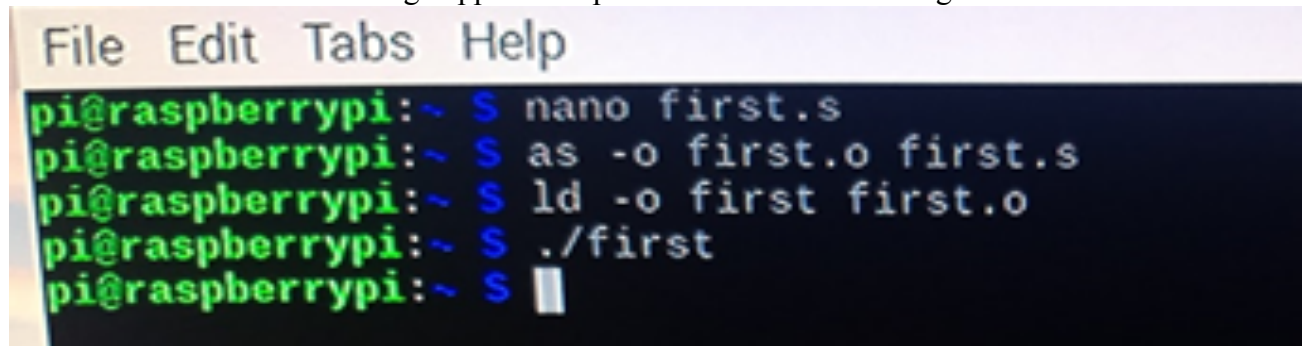
Pic #1 - The sample code was written using nano.



```
GNU nano 2.7.4 File: first.s
@ first program
.section .data
.section .text
.globl __start
__start:
    mov r1,#5           @ load r1 with 5
    sub r1,r1,#1        @subtract 1 from r1
    add r1,r1,#4        @add 4 to r1

    mov r7,#1           @ Program Termination: exit syscall
    svc #0              @Program Termination: wake kernel
end
```

Pic #2 - We assembled the source code to the object files and linked the object files into executable file and ran it. We observed nothing happened or printed when it was running.



```
File Edit Tabs Help
pi@raspberrypi:~ $ nano first.s
pi@raspberrypi:~ $ as -o first.o first.s
pi@raspberrypi:~ $ ld -o first first.o
pi@raspberrypi:~ $ ./first
pi@raspberrypi:~ $
```

Pic #3 - We assembled the source code with -g to the object file, linked the object files into an executable file again and ran it in debugger mode. We used the 'list' command, to show the code. The breakpoint, set at line 11, and command 'run' is used.

```
File Edit Tabs Help
pi@raspberrypi:~$ as -g -o first.o first.s
pi@raspberrypi:~$ ld -o first first.o
pi@raspberrypi:~$ gdb first
GNU gdb (Raspbian 7.12-6) 7.12.0.20161007-git
Copyright (C) 2016 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law. Type "show copying"
and "show warranty" for details.
This GDB was configured as "arm-linux-gnueabi".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.
For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from first...done.
(gdb) list
1      @ first program
2      .section .data
3      .section .text
4      .globl _start
5      _start:
6          mov r1,#5          @ load r1 with 5
7          sub r1,r1,#1       @subtract 1 from r1
8          add r1,r1,#4       @add 4 to r1
9
10         mov r7,#1          @ Program Termination: exit syscall
(gdb) b 11
Breakpoint 1 at 0x10064: file first.s, line 11.
(gdb) run
Starting program: /home/pi/first
Breakpoint 1, _start () at first.s:11
```

Pic #4 - We used the 'info register' to show all the registers. We observed register 1 contains 8 and register 7 contains 1. This is because:

- r1 will have value of 5 after line 6. (mov r1,#5)
- r1 value is 4 after line 7, because $5 - 1 = 4$ then stored in r1. (sub r1,r1#1)
- r1 value is 8 after line 8, because $4 + 4 = 8$ then stored in r1. (add r1,,r1#4)
- R7 will have value 1 after line 10. (mov r7,#1)

We found this out by using the debugger mode and stepping through the code.

```
File Edit Tabs Help
2      .section .data
3      .section .text
4      .globl _start
5      _start:
6          mov r1,#5          @ load r1 with 5
7          sub r1,r1,#1       @subtract 1 from r1
8          add r1,r1,#4       @add 4 to r1
9
10         mov r7,#1          @ Program Termination: exit syscall
(gdb) b 11
Breakpoint 1 at 0x10064: file first.s, line 11.
(gdb) run
Starting program: /home/pi/first
Breakpoint 1, _start () at first.s:11
11         svc #0             @Program Termination: wake kernel
(gdb) info registers
r0          0x00000000
r1          0x00000008
r2          0x00000000
r3          0x00000000
r4          0x00000000
r5          0x00000000
r6          0x00000000
r7          0x00000001
r8          0x00000000
r9          0x00000000
r10         0x00000000
r11         0x00000000
r12         0x00000000
sp          0x7efff070
lr          0x00000000
pc          0x10064 <_start+16>
cpsr       0x10000016
(gdb)
```


Pic #5 - For example after line 6 at breakpoint line 7, r1 did indeed contain value 5.

```
(gdb) b 6
Breakpoint 1 at 0x10058: file first.s, line 6.
(gdb) run
Starting program: /home/pi/first
Breakpoint 1, _start () at first.s:7
7      sub r1,r1,#1      @subtract 1 from r1
(gdb) info registers
r0          0x0          0
r1          0x5          5
r2          0x0          0
r3          0x0          0
r4          0x0          0
r5          0x0          0
r6          0x0          0
r7          0x0          0
r8          0x0          0
r9          0x0          0
r10         0x0          0
r11         0x0          0
r12         0x0          0
```

- Part 2

Pic #6 - Our program to solve the equation, $A = (A + B) - (C * D)$ where $A=10$, $B=11$, $C=7$, and $D=2$
NOTE: some "load r1.." should be load r2, r3, r4

```
@ arithmetic1 program
.section .data
.section .text
.globl _start
_start:
    mov r1,#10      @ load r1 with 10
    mov r2,#11      @ load r1 with 11
    mov r3,#7       @ load r1 with 7
    mov r4,#2       @ load r1 with 2

    add r1,r2       @add r2 to r1, store in r1
    mul r3,r4       @multiply r4 and r3, store in r3
    sub r1,r3       @subtract r3 from r1, store in r1

    svc #0         @Program Termination: wake kernel
.end
```

Pic #7 - At the top, we assembled the source code to Object file and Linked the Object files into Executable file and ran the program. Nothing happen again. Then we assembled with -g and Linked execute file and Ran the gdb Debugger. At the bottom we used the 'list' command in the code.

```

pi@raspberrypi:~$ as -o arithmetic1.o arithmetic1.s
pi@raspberrypi:~$ ld -o arithmetic1 arithmetic1.o
pi@raspberrypi:~$ ./first
pi@raspberrypi:~$ as -g -o arithmetic1.o arithmetic1.s
pi@raspberrypi:~$ ld -o arithmetic1 arithmetic1.o
pi@raspberrypi:~$ gdb arithmetic1
GNU gdb (Raspbian 7.12-6) 7.12.0.20161007-git
Copyright (C) 2016 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law. Type "show copying"
and "show warranty" for details.
This GDB was configured as "arm-linux-gnueabi".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.
For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from arithmetic1...done.
(gdb) list
1      @ arithmetic1 program
2      .section .data
3      .section .text
4      .globl _start
5      _start:
6          mov r1,#10      @ load r1 with 10
7          mov r2,#11      @ load r1 with 11
8          mov r3,#7       @ load r1 with 7
9          mov r4,#2       @ load r1 with 2
10
11         add r1,r2        @add r2 to r1, store in r1
12         mul r3,r4        @multiply r4 and r3, store in r3
13         sub r1,r3        @subtract r3 from r1, store in r1
14

```

Pic #8 - At the top break point inserted at line 11. Here r1 value is 10, r2 value is 11. R3 value is 7, and r4 value is 2 after line 10

```

14         sub r1,r3        @subtract r3 from r1, store in r1
15
16     .end      svc #0      @Program Termination: wake kernel
17
(gdb) b 11
Breakpoint 1 at 0x10064: file arithmetic1.s, line 11.
(gdb) run
Starting program: /home/pi/arithmetic1

Breakpoint 1, _start () at arithmetic1.s:11
11         add r1,r2        @add r2 to r1, store in r1
(gdb) info registers
r0                0x0      0
r1                0xa      10
r2                0xb      11
r3                0x7      7
r4                0x2      2
r5                0x0      0
r6                0x0      0
r7                0x0      0
r8                0x0      0
r9                0x0      0
r10               0x0      0
r11               0x0      0
r12               0x0      0
sp                0x7efff070 0x7efff070
lr                0x0      0
pc                0x10064 0x10064 <_start+16>
cpsr              0x10     16
(gdb)

```

Pic #9 - At the top, break point inserted at line 12. Value in r1 is now 21 after line 11 (add r1,r2). This is because value in r1 used to be 10 and value in r2 is 11. $10 + 11 = 21$, stored in r1.

```

Breakpoint 1 at 0x10068: file arithmetic1.s, line 12.
(gdb) run
Starting program: /home/pi/arithmetic1

Breakpoint 1, _start () at arithmetic1.s:12
12      mul r3,r4      @multiply r4 and r3, store in r3
(gdb) info registers
r0      0x0           0
r1      0x15         21
r2      0xb          11
r3      0x7          7
r4      0x2          2
r5      0x0           0
r6      0x0           0
r7      0x0           0
r8      0x0           0
r9      0x0           0
r10     0x0           0
r11     0x0           0
r12     0x0           0
sp      0x7efff070    0x7efff070
lr      0x0           0
pc      0x10068      0x10068 <_start+20>
cpsr    0x10         16
(gdb)

```

Pic #10 - Break Point is inserted at line 13. Value in r3 now 14 after line 12 (mul r3,r4). This is because value in r3 used to be 7 and value in r4 is 2. $7 * 2 = 14$, stored in r3.

```

(gdb) b 13
Breakpoint 2 at 0x1006c: file arithmetic1.s, line 13.
(gdb) step

Breakpoint 2, _start () at arithmetic1.s:13
13      sub r1,r3      @subtract r3 from r1, store in r1
(gdb) info registers
r0      0x0           0
r1      0x15         21
r2      0xb          11
r3      0xe          14
r4      0x2          2
r5      0x0           0
r6      0x0           0
r7      0x0           0
r8      0x0           0
r9      0x0           0
r10     0x0           0
r11     0x0           0
r12     0x0           0
sp      0x7efff070    0x7efff070
lr      0x0           0
pc      0x1006c      0x1006c <_start+24>
cpsr    0x10         16
(gdb)

```


Pic #11 - Break Point is inserted at line 14. Value in r1 now 7 (sub r1,r3). Because value in r1 used to be 21 and value in r3 is 14. $21 - 14 = 7$, is the answer and it is stored in r1.

```
(gdb) b 14
Breakpoint 3 at 0x10070: file arithmetic1.s, line 14.
(gdb) step

Breakpoint 3, _start () at arithmetic1.s:15
15      svc #0                                @Program Termination: wake kernel
(gdb) info registers
Undefined command: "info". Try "help".
(gdb) info registers
r0          0x0          0
r1          0x7          7
r2          0xb          11
r3          0xe          14
r4          0x2          2
r5          0x0          0
r6          0x0          0
r7          0x0          0
r8          0x0          0
r9          0x0          0
r10         0x0          0
r11         0x0          0
r12         0x0          0
sp          0x7efff070    0x7efff070
lr          0x0          0
pc          0x10070      0x10070 <_start+28>
cpsr       0x10         16
```

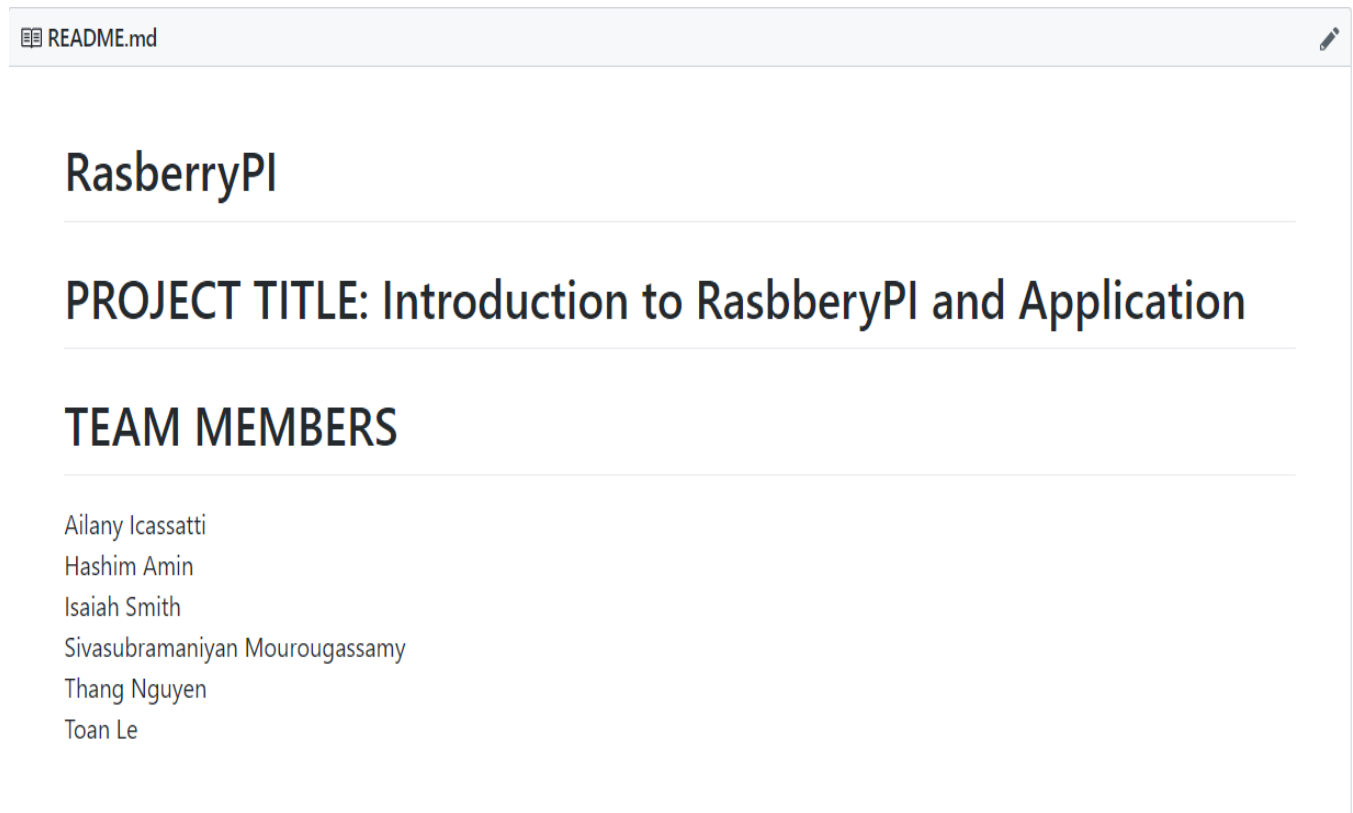
- Appendix: have the links (slack, GitHub and video links and screenshot)

Slack: <https://armstrongprojectteam.slack.com/messages/CFUT6BUJ1/>

GitHub: <https://github.com/ARMStrongTeam/RaspberryPI>

Introduction Video: <https://youtu.be/lf0eapJ95ho>

- **Github README:**



- **Github Project Tab:**

Search or jump to... Pull requests Issues Marketplace Explore

ARMStrongTeam / RaspberryPI Watch 0 Star 0 Fork 0

<> Code Issues 0 Pull requests 0 Projects 1 Wiki Insights Settings

CSC3210-ARMStrong Updated 3 days ago

Filter cards + Add cards Fullscreen Menu

To do + ...

In Progress + ...

Task #6 Compile video footage and edit, upload to Youtube.
Task #4b Help with ARM programming and lab report
Added by ARMStrongTeam

☒ Ailany Icassatti: ...
1. Picking up Raspberry Pi
2. Task #1 (Group Name and Work Structure Table)
3.Task #5 Putting the report together
Added by ARMStrongTeam

☒ Thang Nguyen
Pi installation and assist with proqraming
Added by ARMStrongTeam

☒ Hashim Amin: Task #5 Appendix Documentation

Done + ...

☒ Toan Le: ...
• Create Slack, send invitations and screenshot
• Create Github, Readme File and screenshot
• Create Youtube channel
Added by ARMStrongTeam

+ Add column

Automated as To do Manage

- **Slack - Teammate Introductions:**

The screenshot displays a Slack interface for a workspace named 'ARM.Strong'. The active channel is '#assignment1'. The sidebar on the left shows navigation options: 'Jump to...', 'All Threads', 'Channels' (with '# assignment1' selected), 'Direct Messages' (listing 'slackbot' and several team members), and 'Apps'. The main content area shows the message history for '#assignment1'. The messages are as follows:

- Toan Le** (9:19 PM): My name is Toan Le. I like programming, music and video games. I am assigned to finish task 2: Communication and Collaboration. My expectations from this project is understanding and being able to create smart home DIY devices using the Raspberry Pi.
- Sivasubramaniyan Mourougassamy** (9:38 PM): joined #assignment1 along with 2 others.
- Isaiah Smith** (4:13 PM): My name is Isaiah Smith (edited).
- Isaiah Smith** (4:14 PM): My interests include: video games, playing the trombone, and studying history (edited). I am assigned to write the first draft of task 3 and edit it for the group. My expectation for this project is to get to understand my group members and see how well interact together as well as learning the potential application for ARM. (edited)
- Hashim Amin** (4:18 PM): My name is Hashim Amin. My interests are gaming and soccer. Assign tasks: review/edit task #3, writing part of task #5. My expectations for this project are to learn more in depth about Raspberry Pi's ARM and to better understand working with a group (edited)
- Sivasubramaniyan Mourougassamy** (4:24 PM): My name is Sivasubramaniyan Mourougassamy. My interests include playing video games and drawing. I am assigned with Task 6, I will compile the video footage and edit into a video to be uploaded to youtube. My expectations for this project are to learn the soft skills involved in the computer science world and learn to organize larger scale projects.
- Ailany** (4:27 PM): Name: Ailany Icassatti. Interests: My interests are traveling, skiing, wakeboarding, and computer science. I have visited and backpacked Brazil, Thailand, Canada, Peru, Japan, the Caribbean and most of the US. Also, I have a two years old daughter, who has become a BIG interest of mine! Tasks:

The bottom of the screen shows a message input field with a plus icon on the left and a send button on the right.

ARM.Strong

Isalah Smith

Jump to...

All Threads

Channels

assignment1

general

random

Direct Messages

slackbot

Isalah Smith (you)

Ailany

Hashim Amin

Sivasubramaniyan Mou...

Thang Nguyen

Toan Le

Invite people

Apps

#assignment1

6 | Add a topic

Search

Isalah Smith 4:13 PM

My name is Isalah Smith (edited)

My interests include: video games, playing the trombone, and studying history (edited)

I am assigned to write the first draft of task 3 and edit it for the group.

My expectation for this project is to get to understand my group members and see how well interact together as well as learning the potential application for ARM. (edited)

Hashim Amin 4:18 PM

My name is Hashim Amin.

My interests are gaming and soccer.

Assign tasks: review/edit task #3, writing part of task #5

My expectations for this project are to learn more in depth about Rasberry Pi's ARM and to better understand working with a group (edited)

Sivasubramaniyan Mourougassamy 4:24 PM

My name is Sivasubramaniyan Mourougassamy.

My interests include playing video games and drawing.

I am assigned with Task 6, I will compile the video footage and edit into a video to be uploaded to youtube.

My expectations for this project are to learn the soft skills involved in the computer science world and learn to organize larger scale projects.

Ailany 4:27 PM

Name: Ailany Icassatti

Interests: My interests are traveling, skiing, wakeboarding, and computer science. I have visited and backpacked Brazil, Thailand, Canada, Peru, Japan, the Carribean and most of the US. Also, I have a two years old daughter, who has become a BIG interest of mine!

Tasks:

- Picking up Rasberry Pi
- Task #1 - Chose Group Name: I have given my team some 'group's name' options, as well as, asked them for any other name options. We voted using Slack's Simple Poll and agreed on the name. I created the Work Structure Table and asked the team to write down their tasks' description.
- Task #5 - Putting the report together; Report will include everything our group worked on.

Expectation: I am excited to understand the computer architecture and learn more about ARM.

new messages

Thang Nguyen 4:33 PM

My name is Thang Nguyen and my interest include technology, cooking, and fishing. My assigned task is #4, install the PI and assist with programming it. I expect to cultivate my soft and interpersonal skills as well as technical programming skills. (edited)

+ Message #assignment1