

# 2021 Spring CPSC 240

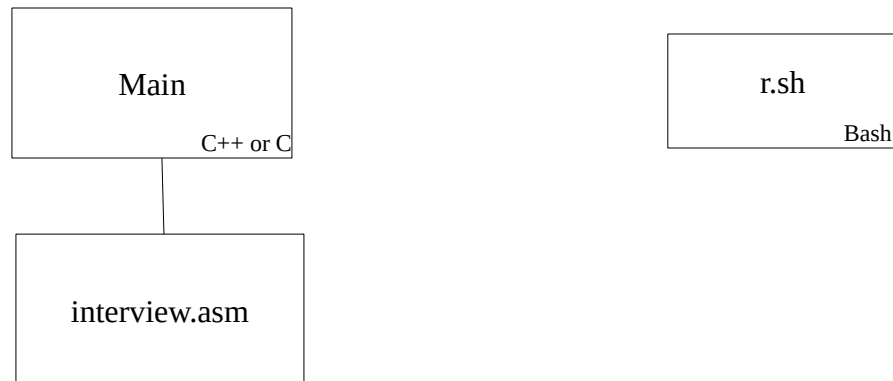
## Assignment 4 King of Assembly

### New technology found in this program.

How to input a string with embedded white space  
Practice in use of gdb commands  
How to input a char  
How to use an input data file.

### Structural design

This is going to be easy. You only need two modules.



However, this is a rare case. This is the only time the driver (main) gets involved with the solution. You may need two bash files, one named r.sh and the other named rg.sh.

### Three kinds of programmers

Your software has to accommodate all three kinds: social science majors, CS majors, and assembly programmer types.

# Part 1

Build a program that handles all three kinds of job applicants shown in the following dialogs.

If the person applying for a job at your company is a CS major type then the dialog goes like this:

```
Welcome to Software Analysis by Paramount Programmers, Inc.  
Please enter your first and last names and press enter: Joey Brown  
Thank you Joey Brown. Our records show that you applied for employment her  
with our agency a week ago.  
Please enter your expected annual salary when employed at Paramount: 500500.50  
Your interview with Ms Linda Fenster, Personnel Manager, will begin shortly.  
Hello Joey Brown. I am Ms Fenster. The interview will begin now.  
Wow! $500500.50 That's a lot of cash. Who do you think you are, Chris  
Sawyer (y or n)?n  
Alright. Now we will work on your electricity.  
Please enter the resistance of circuit #1 in ohms: 2.0  
What is the resistance of circuit #2 in ohms: 3.0  
The total resistance is 1.2000000000000000 Ohms.  
Were you a computer science major (y or n)?y  
Thank you. Please follow the exit signs to the front desk.  
Hello Joey Brown I am the receptionist.  
This envelope contains your job offer with starting salary 88000.88. Please  
check back on Monday morning at 8am.  
Bye
```

Color code: The part in yellow is produced by the interview module. The remainder comes from the driver.

The floating point number 88000.88 is returned to front desk whenever a CS major completes the interview and answers correctly the technical question about Ohms.

If the person applying for a job at your company is Chris Sawyer then the dialog goes like this.

Welcome to Software Analysis by Paramount Programmers, Inc.

Please enter your first and last names and press enter: Chris Sawyer

Thank you Chris Sawyer. Our records show that you applied for employment here with our agency a week ago.

Please enter your expected annual salary when employed at Paramount: 500500.50

Your interview with Ms Linda Fenster, Personnel Manager, will begin shortly.

Hello Chris Sawyer. I am Ms Fenster. The interview will begin now.

Wow! \$500500.50 That's a lot of cash. Who do you think you are, Chris Sawyer (y or n)?y

Thank you. Please follow the exit signs to the front desk.

Hello Mr Sawyer. I am the receptionist.

This envelope has your job offer starting at 1 million annual. Please start any time you like. In the meantime our CEO wishes to have dinner with you.

Have very nice evening Mr Sawyer.

If Chris applies for a job then Ms Fenster sends the code number 1 000 000.00 to the front desk.

If the person applying for a job at your company is a social major then the dialog goes like this.

Welcome to Software Analysis by Paramount Programmers, Inc.

Please enter your first and last names and press enter: Joey Brown

Thank you Joey Brown. Our records show that you applied for employment her with our agency a week ago.

Please enter your expected annual salary when employed at Paramount: 500500.50

Your interview with Ms Linda Fenster, Personnel Manager, will begin shortly.

Hello Joey Brown. I am Ms Fenster. The interview will begin now.

Wow! \$500500.50 That's a lot of cash. Who do you think you are, Chris Sawyer (y or n)?n

Alright. Now we will work on your electricity.

Please enter the resistance of circuit #1 in ohms: 5.3

What is the resistance of circuit #2 in ohms: 7.5

The total resistance is 4.976 Ohms.

Were you a computer science major (y or n)?n

Thank you. Please follow the exit signs to the front desk.

Hello Joey Brown I am the receptionist

We have an opening for you in the company cafeteria for \$1200.12 annually.

Take your time to let use know your decision.

Bye

If the philosophy major applies for the job then Ms Fenster sends 1200.12 to the front desk in a private envelope.

## Part 2

Create a bash file that will run the program in GDB mode. Find the gdb commands that will implement the following actions.

Before the program run set breaks at main, interview and at "Wow".

Show all the existing breaks

Use the command to start execution

After "Enter your expected"

- Show rbp

- Show rsp

- Show the current AR (all the quadwords between rsp and rbp) in order of increasing addresses

- Show the expected salary in the AR

- Show the data in the register holding the expected salary

After "Wow" has executed perform these commands

- Show rbp and rsp //This will confirm you are in a new AR

- Show the quadword in hex in the quadword immediately preceding rbp

- Show the answer to the yes-no question. First find where it is stored.

After the line "This envelope has" carry out these commands

- Show the value that was returned to the driver. Is it still in the passing register?

- Show the value in the rsp and rbp in hex.. This will the fact that the old AR has disappeared.

After the "Bye"

- Show the value in rip in hex.

Next, research the gdb commands you need for this part 2. Ask in discord. Lots of people will have ideas to share.

Run the program in interactive mode. That means a human has to respond to request for keyboard input. When that is successful move to part 3.

## Part 3

Create a text (ascii) file containing all the keyboard inputs. Do this three times. Make an input file csmajor.txt, which contains all the inputs for a complete run for a CS major applying for a job.

Make a text file chris.txt contain all the keyboard inputs for a complete run for Chris applying for a job.

Make a text file social.txt containing all the keyboard inputs for a complete run for a social major applying for a job.

Test your files by entering commands like these into the bash window.

```
gdb ./interview.out < csmajor.txt
```

```
gdb ./interview.out < chris.txt
```

```
gdb ./interview.out < social.txt
```

Check your results for accuracy.

## Part 4

Deliver the project. Send to the professor, acting as customer, the project. That means send these file to the usual place:

```
main.cpp  
interview.asm  
r.sh  
rg.sh  
chris.txt  
csmajor.txt  
social.txt
```

Send seven files as seven attachments. Do not zip them.

**Submission window:** 5:00am of April 25 to 5:00am of April 26. [24 hours]

It is still 24 hours, but the start and stop hours have shifted due to day light pacific time zone.