CPSC-354 Report

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Abstract

Short summary of purpose and content. Must Do soon.

Contents

1 Introduction

Replace this entire Section 1 with your own short introduction.

1.1 General Remarks

First you need to download and install LaTeX.[1] For quick experimentation, you can use an online editor such as Overleaf. But to grade the report I will used the time-stamped pdf-files in your git repository.

[1] Links are typeset in blue, but you can change the layout and color of the links if you locate the `hypersetup` command.

LaTeX is a markup language (as is, for example, HTML). The source code is in a `.tex` file and needs to be compiled for viewing, usually to `.pdf`.

If you want to change the default layout, you need to type commands. For example, `\medskip` inserts a medium vertical space and `\noindent` starts a paragraph without indentation.

Mathematics is typeset between double dollars, for example

$$x + y = y + x.$$

1.2 LaTeX Resources

I start a new subsection, so that you can see how it appears in the table of contents.

1.2.1 Subsubsections

Sometimes it is good to have subsubsections.

1.2.2 Itemize and enumerate

- This is how you itemize in LaTeX.
- I think a good way to learn LaTeX is by starting from this template file and build it up step by step. Often stackoverflow will answer your questions. But here are a few resources:
  1. Learn LaTeX in 30 minutes
  2. LaTeX – A document preparation system

1.2.3 Typesetting Code

A typical project will involve code. For the example below I took the LaTeX code from stackoverflow and the Haskell code from my tutorial.

```
-- run the transition function on a word and a state
run :: (State -> Char -> State) -> State -> [Char] -> State
run delta q [] = q
run delta q (c:cs) = run delta (delta q c) cs
```

Short snippets such as `run :: (State -> Char -> State) -> State -> [Char] -> State` can also be directly fitted into text. There are several ways of doing this, for example, `run :: (State -> Char -> State) -> State ->` is slightly different in terms of spaces and linebreaking (and can lead to layout that is better avoided), as is

`run :: (State -> Char -> State) -> State -> [Char] -> State`

For more on the topic see Code-Presentations Example.

Generally speaking, the methods for displaying code discussed above work well only for short listings of code. For entire programs, it is better to have external links to, for example, Github or Replit (click on the "Run" button and/or the "Code" tab).

1.2.4 More Mathematics

We have already seen $x + y = y + x$ as an example of inline maths. We can also typeset mathematics in display mode, for example

$$\frac{x}{y} = \frac{xy}{y^2},$$

Here is an example of equational reasoning that spans several lines:

$$\begin{aligned} \text{fib}(3) &= \text{fib}(1) + \text{fib}(2) && \text{fib}(n+2) = \text{fib}(n) + \text{fib}(n+1) \\ &= \text{fib}(1) + \text{fib}(0) + \text{fib}(1) && \text{fib}(n+2) = \text{fib}(n) + \text{fib}(n+1) \\ &= 1 + 0 + 1 && \text{fib}(0) = 0, \text{fib}(1) = 1 \\ &= 2 && \text{arithmetic} \end{aligned}$$

1.2.5 Definitons, Examples, Theorems, Etc

Definition 1.1. This is a definition.

Example 1.2. This is an example.

Proposition 1.3. *This is a proposition.*

Theorem 1.4. *This is a theorem.*

You can also create your own environment, eg if you want to have Question, Notation, Conjecture, etc.

1.3 Plagiarism

To avoid plagiarism, make sure that in addition to [PL] you also cite all the external sources you use. Make sure you cite all your references in your text, not only at the end.

2 Homework

This section will contain your solutions to homework.

2.1 Week 1

Homework 1: Using Euclid's Elements Proposition 2 Algorithm on finding the Greatest Common Divisor amongst two numbers.

2.1.1 Python

In python, this algorithm can be written as:

```
a = 9
b = 33

while(a!=b):
    if(a>b):
         a = a-b
     else:
         b = b-a

print(a)
```

Using the sample given, 9 and 33, the Greatest Common Divisor is found in a simple way. Using the Euclid's Elements Proposition 2 Algorithm, we have two variables: **a** and **b**. To start, our samples are manually entered from the start of the program, and will begin the while loop. The while loop will continue until the **a** is the same value as **b**. The first line of code in the loop is an **if-statement**. This will compare **a**

and **b** values, and will continue inside the **if-statement** if **a** is a large value than **b**. The Euclid's Elements Algorithm says: If

$$a > b$$

then replace **a** by

$$a - b$$

This is what happens in this first **if-statement**, as the variable **a** is replaced with a - b

If the **if-statement** is not executed, then the else statement will be preformed. Since our while loop tells us that it will continue until **a** is the same value as **b**, then we know that this else statement is:

$$b > a$$

This is the second part of the Euclid's Elements Proposition 2 Algorithm. It says that when:

$$b > a$$

to replace **b** with

$$b - a$$

This is what happens in this line of python code. The variable **b** is clearly replaced with b - a.

This while loop will continue until the values of **a** and **b** are the same. Once they are, the program will print the value of **a**. In this particular example, the value **3** would be printed.

2.1.2 C++

In C++, the algorithm can be written as:

```
#include <iostream>

using namespace std;

int main(int charc, char** argv){
    int a = 9;
    int b = 33;

    while(a!=b){
        if(a>b){
            a = a-b;
        }
        else{
            b = b-a;
        }
    }
    cout << a << endl;
}
```

Very similar code to the code in 2.1.1. The same process is being used, with two variables being created before the while loop. The while loop will continue until the values of the two variables are the same. Then the two conditions of

$$a > b$$

and

$$b > a$$

, are evaluated using an **if-statement** and **else-statement**. Once the correct condition is identified, the corresponding calculation done of each variable takes place. This will continue until the Greatest Common Divisor is found, and is printed to the screen. In this place, 3 is again printed.

2.2 Week 2

...

3 Project

Introductory remarks ...

The following structure should be suitable for most practical projects.

3.1 Specification

3.2 Prototype

3.3 Documentation

3.4 Critical Appraisal

...

4 Conclusions

(approx 400 words)

In the conclusion, I want a critical reflection on the content of the course. Step back from the technical details. How does the course fit into the wider world of programming languages and software engineering?

References

[PL] Programming Languages 2022, Chapman University, 2022.