CSC 413 Project 2 Documentation

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Class Section:01

GitHub repository Link:

[csc413-SFSU-Souza/csc413-p2-RuxueJ: csc413-p2-RuxueJ created by GitHub Classroom](https://github.com/csc413-SFSU-Souza/csc413-p2-RuxueJ)

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# Introduction

## Project Overview

We are given a mock programming language X, and two programs computing Fibonacci and Factorial written in language X. This project serves as an interpreter/Virtual Machine for the mock language X. It processes byte code from source code (mock language X), and executes the code according to the logic, finally gives the right output.

## Technical Overview

This project stands between modern programming languages and machine language. It examines the mechanisms how programming works in functions and logics: 1) what data structures are needed to store the data in functions. 2) how to pass parameters, call a callee function, and return a value to the caller function. 3) how to resolve the address of each code before execution of the program, so that programming counter can set to the target address efficiently.

## Summary of Work Completed

Step 1: I iterate the source file by lines. Each line is a ByteCode command. I split the first token as ByteCode name, other tokens as arguments of the ByteCode. I create an instance of ByteCode according to the ByteCode name and its arguments. For each ByteCode, I create a class to design the function, total 17 classes.

Step 2: I have a List<ByteCode> in program class, which stores the ByteCode list from Step 1.

Step 3: After I get the List<ByteCode>, I resolve the address of each label ByteCode and put the jump code in HashMap with bytecode as key, target address as values.

Step 4: I created a RunTimeStack class to stores data: List<Integer> runtimeStack store variables, stack<Integer> framepointer stores the function scope.

Step 5: After all the preparation, I execute the program in virtual machine. Get each bytecode from program and execute. Each Bytecode execute invoke VM to execute, and the VM calls certain methods in data structure RunTimeStack.

# Development Environment

Java version: 17.0.6

IDE Used: IntelliJ IDEA 2022.3.2(Ultimate Edition)

# How to Build/Import your Project

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Click the green “Code” button on my repo’s home page. Then copy HTTPS.

In the terminal, cd to the folder you want to store the project.

Then type: git clone repo\_url\_you\_copied.

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Open IntelliJ, click File -> New-> Project from Existing Sources…

A screenshot of a computer

Description automatically generated

Select the root folder your store the project, click “CSC413\_Assignment2” package, and click OK.

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Keep the “Create project from existing resources” radio button selected.

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All default fields can be left alone here.

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Select a location to store the project.

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Click New Window.

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# How to Run your Project

Test with factorial.dump.cod:

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In the Interpreter class, click “Edit Configurations…”

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Type in factorial.dump.cod. Click Apply, and OK. Then run the program.input integer:6.

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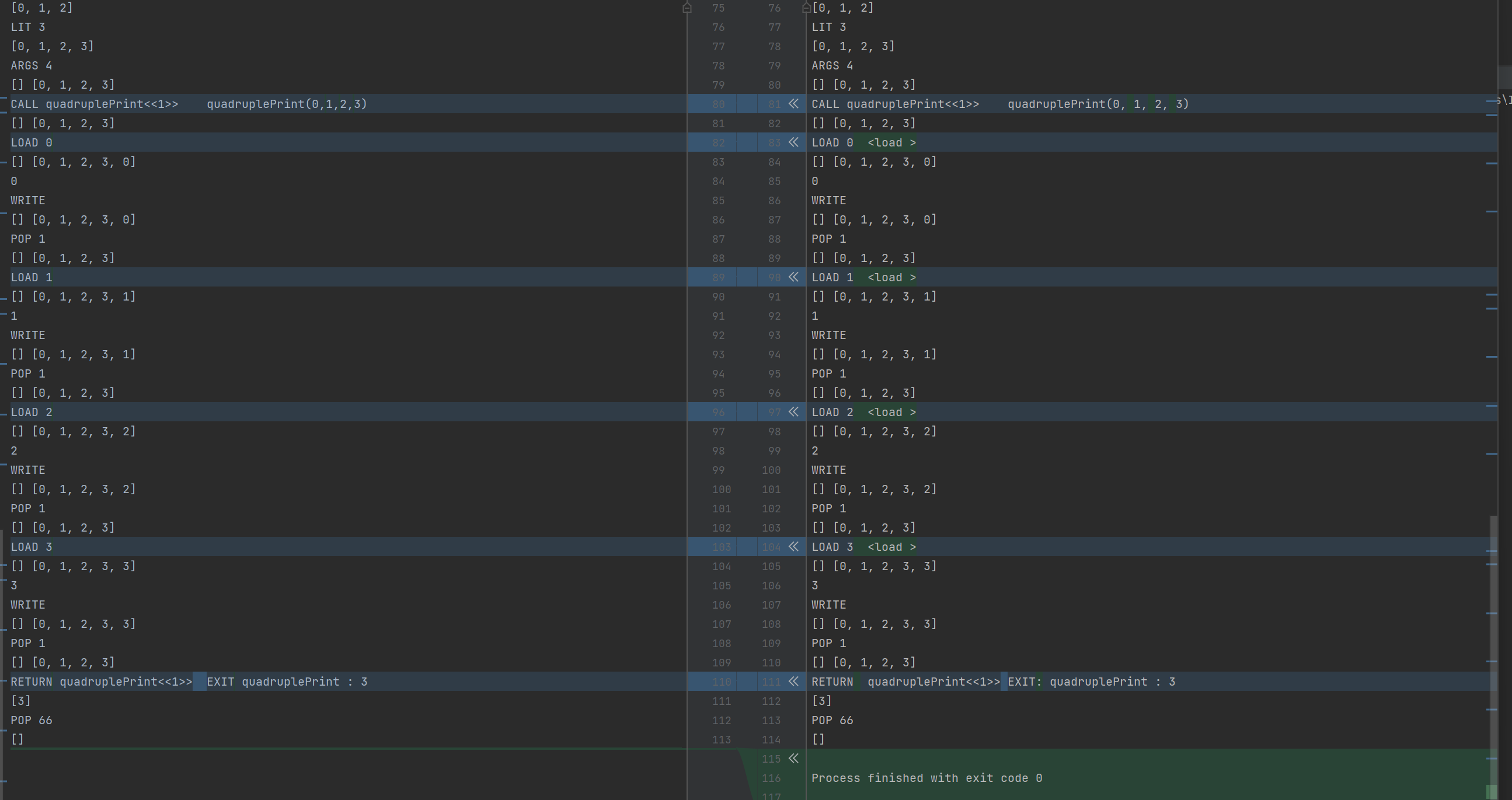
Test with fib.x.cod:

Same with the factorial.dump.cod, input integer:5.

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Test with FunctionArgsTest.cod



# Assumption Made

The ByteCode .cod file is correct.

The arguments are integers.

# Implementation Discussion

## Class Diagram

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# Project Reflection

For this assignment, I feel it goes smoothly than the last assignment. I watched the first lecture video twice and fully understand how the program works. I read documentations for each bytecode before writing code. For each function and class, I test the code so make sure it works. So, it was not bad.

The lesson I learned from this assignment is that: understanding the process of the program, understanding the requirement, understanding each function and class, are essential to programming.

Think before writing the code, test after writing the code.

# Project Conclusion/Results

The program works well!!