Faculty of computers and Artificial Intelligence
Cairo University

CS213: Object Oriented Programming

Course Instructor:

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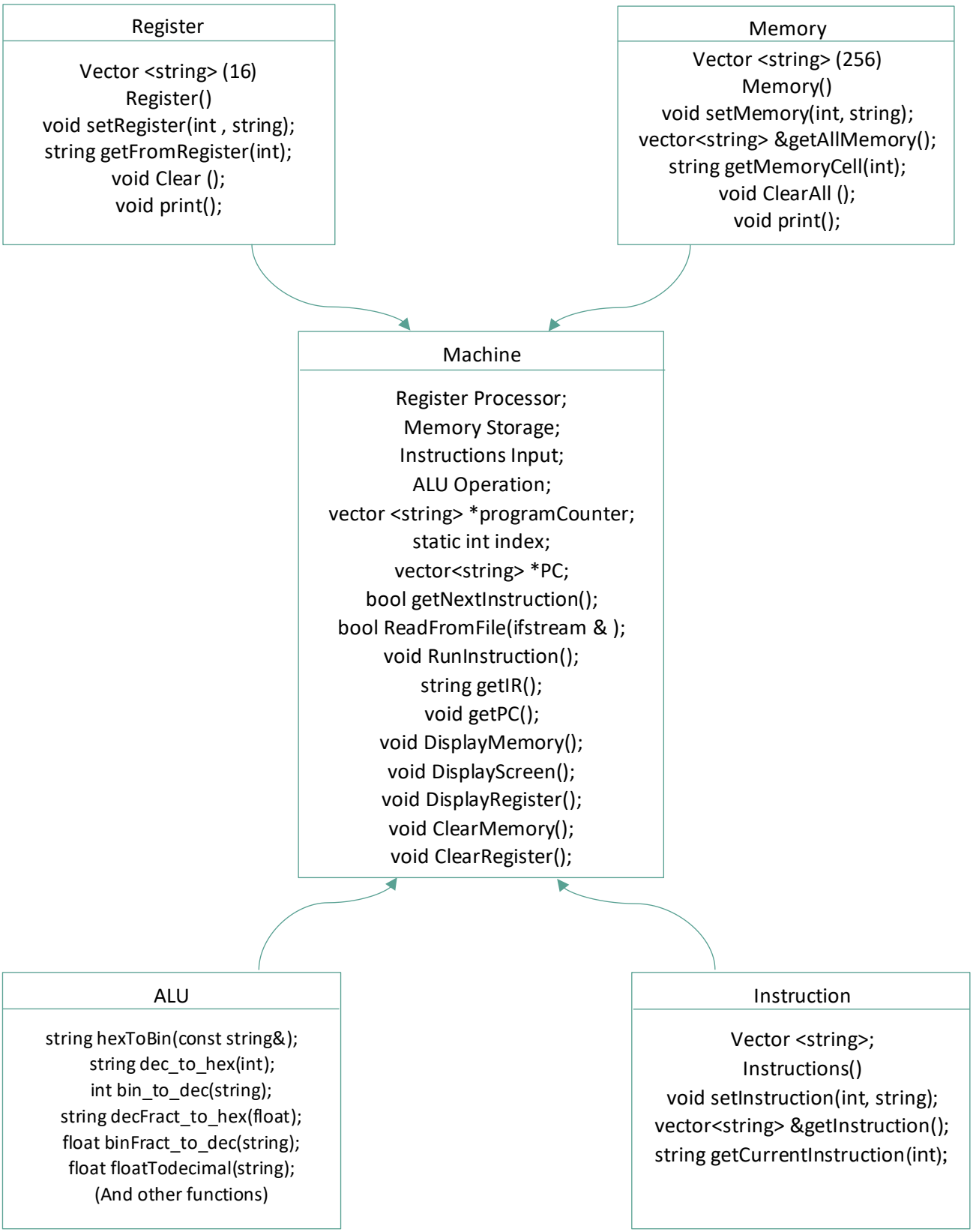
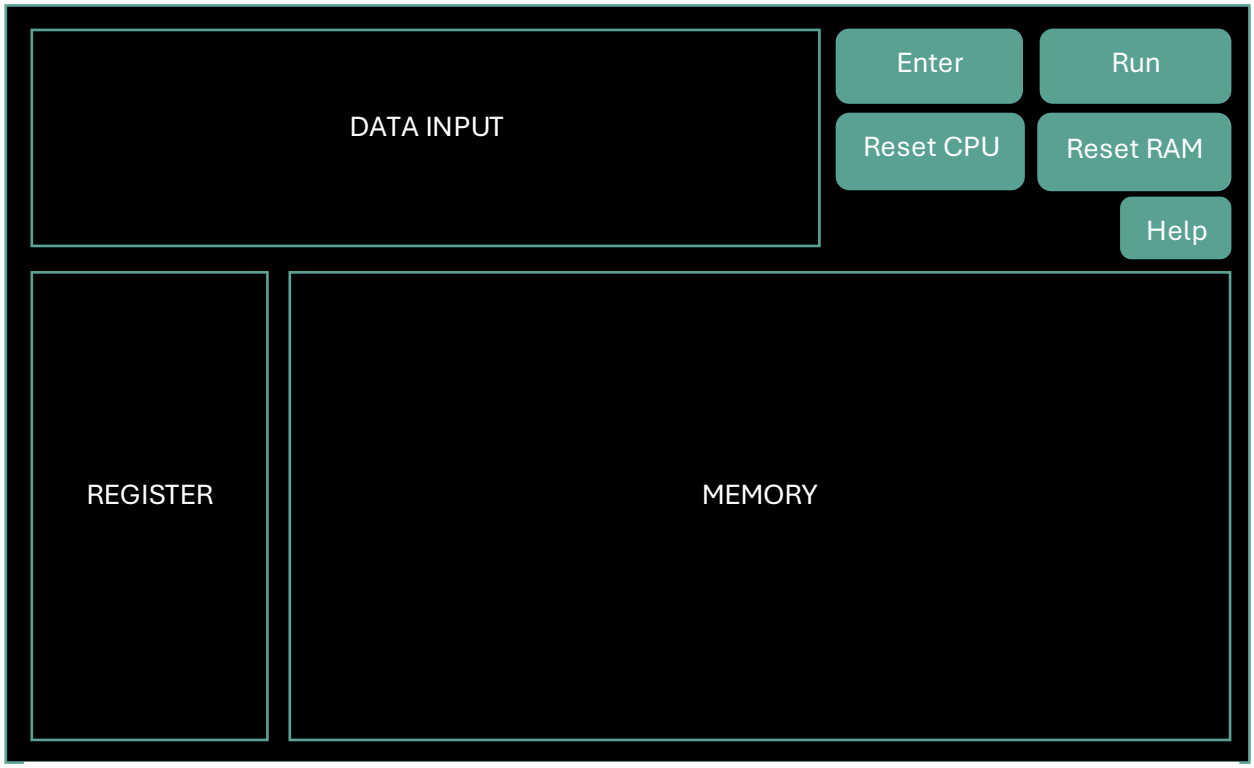
GUI => Team Work			

- **Task 4.1:**

Vole machine Design:



Vole Machine Gui design:



Explanation of Vole Machine Code

This provides a detailed explanation of the VOLE Machine s code, which is structured into multiple classes, each responsible for different functionalities of the machine. These classes include Register, ALU (Arithmetic Logic Unit), Memory, Instructions, and Machine. Each class encapsulates specific operations and data, creating a modular and organized virtual machine for executing instructions.

1. Class Register

The Register class is responsible for handling the machine s registers, storing values, and managing individual register operations. The class provides methods to set and get register values, clear registers, and print them.

Key members and methods include:

- Registers: A private vector of 16 registers initialized to "00".
- setRegister(int, string): Sets a specific register to a given value.
- getFromRegister(int): Retrieves the value stored in a specific register.
- Clear(): Clears all register values.
- print(): Prints the current values of all registers.

2. Class ALU (Arithmetic Logic Unit)

The ALU class performs arithmetic and bitwise operations. It also handles conversions between hexadecimal, binary, and decimal values, essential for various machine instructions.

Key methods include:

- hexToBin(const string&): Converts a hexadecimal string to an 8-bit binary string.
- dec_to_hex(int): Converts a decimal number to a hexadecimal string.
- bin_to_dec(string): Converts a binary string to a decimal number.
- addTwoFloat(string, string): Adds two hexadecimal float values.

3. Class Memory

The Memory class represents the machine s memory, containing 256 memory cells initialized to "00". The class provides methods to set and retrieve specific memory cells, as well as to clear and display the memory.

Key members and methods include:

- Mem: A private vector representing memory cells.
- setMemory(int, string): Sets the value of a specific memory cell.
- getAllMemory(): Returns a reference to the entire memory vector.
- getMemoryCell(int): Retrieves the value of a specific memory cell.
- ClearAll(): Clears all memory cells.
- print(): Prints all memory cells.

4. Class Instructions

The Instructions class stores instructions for the machine to execute. This class provides methods for setting instructions at specific positions, retrieving instructions, and accessing the current instruction.

Key members and methods include:

- instruction: A private vector holding up to 128 instructions.
- setInstruction(int, string): Sets a specific instruction.
- getInstruction(): Returns all instructions.
- getCurrentInstruction(int): Retrieves the current instruction based on index.

5. Class Machine

The Machine class integrates all other components (Register, Memory, Instructions, and ALU) to form a virtual machine capable of processing and executing instructions. It manages the program counter, executes instructions, and interacts with memory and registers.

Key members and methods include:

- Processor: An instance of the Register class.
- Storage: An instance of the Memory class.
- Input: An instance of the Instructions class.

- Operation: An instance of the ALU class.
- getNextInstruction(): Advances to the next instruction.
- ReadFromFile(ifstream&): Reads instructions from a file.
- RunInstruction(): Executes the current and next instructions.
- DisplayMemory(), DisplayScreen(), DisplayRegister(): Display various states of the machine.

GUI Videos Link:

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https://drive.google.com/drive/folders/18VLQA5y8BhYs8A8PBDdM4CyVz0PXgZ4S?usp=drive_link

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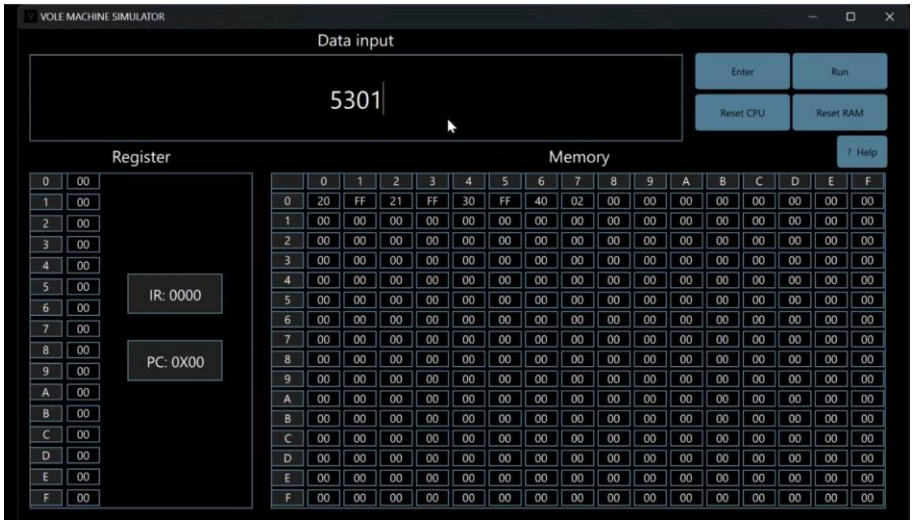
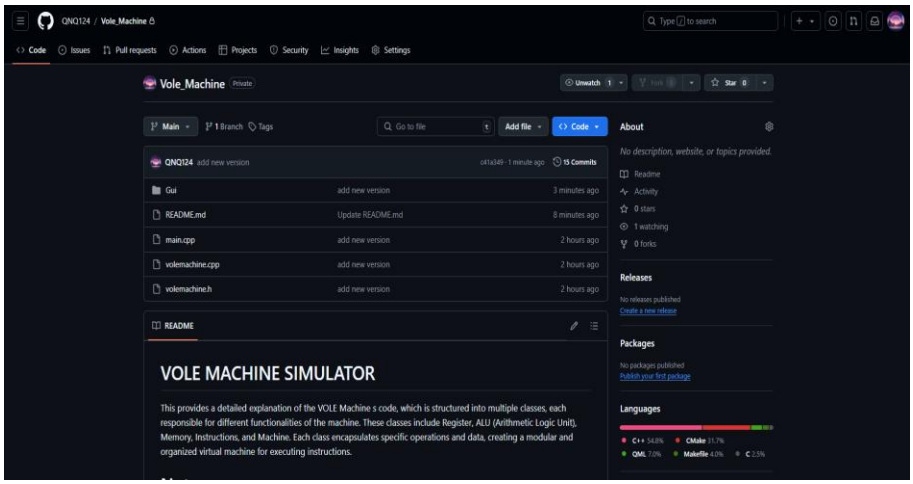
Snapshots, GitHub link:





GitHub Link: https://github.com/QNQ124/Vole_Machine