User Manual for Two-Pass Assembler GUI

Introduction

The **Two-Pass Assembler GUI** is a Java application designed to assemble assembly language programs into machine code. It reads a source assembly program, processes it in two passes, and generates intermediate code, symbol tables, and the final object code. This user-friendly interface allows users to load assembly files and opcode tables, view intermediate results, and generate object code in an intuitive and modern interface.

System Requirements

- **Operating System**: Windows, macOS, or Linux with a Java Runtime Environment (JRE).
- **Java Version**: Java 8 or higher.
- **Memory**: 512MB of RAM minimum.
- **Files Required**:
    - Assembly input file (source code).
    - Opcode table (optab) file for the instruction set.

Installation and Setup

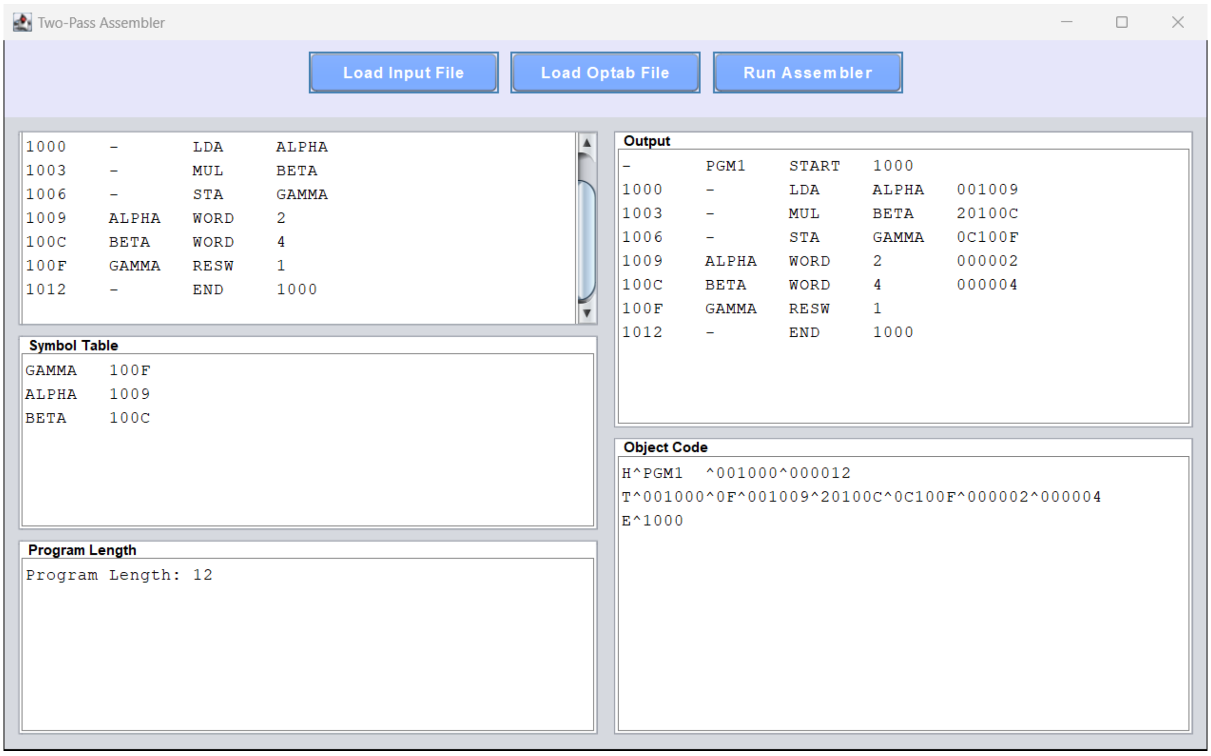
1. **Download and Install Java**:
    - If Java is not installed, download and install the latest version of the JDK (Java Development Kit)
2. **Download the Program**:
    - Ensure that you have the TwoPassAssemblerGUI.java file in your working directory.
3. **Compile the Program**:
    - Open the terminal or command prompt in the directory where the Java file is located.
    - Run the following command to compile the program:

```
javac TwoPassAssemblerGUI.java
```

4. **Run the Program**:
    - Once compiled, execute the program with the following command:

```
java TwoPassAssemblerGUI
```

Application Layout



```
1000    -       LDA     ALPHA
1003    -       MUL     BETA
1006    -       STA     GAMMA
1009    ALPHA   WORD    2
100C    BETA    WORD    4
100F    GAMMA   RESW    1
1012    -       END     1000
```

Symbol Table

```
GAMMA   100F
ALPHA   1009
BETA    100C
```

Program Length

```
Program Length: 12
```

Output

```
-       PGM1    START   1000
1000    -       LDA     ALPHA   001009
1003    -       MUL     BETA    20100C
1006    -       STA     GAMMA   0C100F
1009    ALPHA   WORD    2       000002
100C    BETA    WORD    4       000004
100F    GAMMA   RESW    1
1012    -       END     1000
```

Object Code

```
H^PGM1  ^001000^000012
T^001000^0F^001009^20100C^0C100F^000002^000004
E^1000
```

The Two-Pass Assembler GUI consists of several sections to help you interact with the assembler.

1. Main Window

- The main window contains the following components:
  - **Input/Optab Buttons**: Buttons to load the input assembly program and the opcode table.
  - **Run Assembler Button**: Executes the assembler, running **Pass 1** and **Pass 2**.
  - **Text Areas**: Five sections display intermediate, symbol table, program length, output, and object code.

2. Text Areas:

- **Intermediate Area**: Displays the intermediate code generated after **Pass 1**.
- **Symbol Table (Symtab) Area**: Shows the symbol table with labels and their corresponding addresses.
- **Program Length**: Displays the total length of the program in hexadecimal.
- **Output Area**: Displays the assembled program, including addresses, opcodes, and labels.
- **Object Code Area**: Displays the final object code, formatted for loading into a machine or simulator.

Step-by-Step Guide

1. Loading the Assembly Input File

- Click on the **Load Input File** button at the top of the window.
- A file chooser window will appear. Navigate to the folder containing your assembly source file and select the file.
- The file is now loaded into the assembler and ready for processing.

2. Loading the Opcode Table (Optab)

- Click on the **Load Optab File** button.
- A file chooser will appear. Select your optab file, which contains the opcode-instruction mappings.
- Once loaded, the assembler will use this table to generate the object code in **Pass 2**.

3. Running the Assembler

- After loading both the input file and the opcode table, click on the **Run Assembler** button.
- The assembler will perform **Pass 1** and **Pass 2** of the assembly process:
    - **Pass 1**: Generates the intermediate code and builds the symbol table.
    - **Pass 2**: Generates the final object code using the symbol and opcode tables.
- The results will be displayed in the text areas:
    - **Intermediate Area**: Shows the intermediate code, including addresses and parsed instructions.
    - **Symtab Area**: Displays the symbol table with label names and their respective addresses.
    - **Program Length**: Displays the total length of the program.
    - **Output Area**: Displays the fully assembled code with labels, addresses, and object code.
    - **Object Code Area**: Displays the final object code in a format suitable for use in loaders or simulators.

Understanding the Output

1. **Intermediate File**:
    - Displays each instruction with its address, label, opcode, and operand.
    - Example:

```
1000   LOOP   LDA    VALUE

1003   -      STA    RESULT
```

2. **Symbol Table**:
    - Displays labels (symbol names) with their corresponding addresses.
    - Example:

```
LOOP    1000
VALUE   1050
```

3. **Program Length**:
    - Shows the total length of the program in hexadecimal.
    - Example:

```
Program Length: 0066
```

4. **Output**:
    - Shows the address, label, opcode, operand, and the corresponding machine code (object code).
    - Example:

```
1000    LOOP    LDA     VALUE    032050
1003    -       STA     RESULT   0F2000
```

5. **Object Code**:
    - Displays the final object code in standard format with headers, text records, and an end record.
    - Example:

```
H^COPY  ^001000^000045
T^001000^1E^141033^481039^000036
E^001000
```

Files Format

1. Input Assembly File:

The assembly file is a simple text file with one instruction per line, consisting of a label (optional), opcode, and operand. Example:

```
COPY    START   1000
        LDA     ALPHA
        ADD     BETA
        STA     GAMMA
```

```
    END
```

2. Opcode Table (Optab) File:

The opcode table file is a text file where each line consists of an opcode and its corresponding machine code, separated by spaces. Example:

r

Copy code

LDA 00

ADD 18

STA 0F

Contact and Support

If you encounter any issues, need further assistance, or would like to report a bug, please contact the developer at:

- **GitHub**: https://github.com/amanyunus74177/two_pass_assembler.git

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This user manual provides detailed instructions on how to effectively use the Two-Pass Assembler GUI to assemble your assembly language programs. If you follow the steps closely, you'll be able to generate intermediate files, symbol tables, and final object code successfully.