University of North Florida

School of Computing

Introduction to Software

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**Assembler in Java**

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**How to use it**

1. Have the SIC/XE code in the same folder where the Assembler in Java program is located.
2. Run the program
3. A .lst and .obj files will be created and stored in the same folder
   1. the listing file is the one having the .lst extension.
   2. the object file is the one having the .obj extension. It contains a complete object program for your SIC/XE code.

**Restrictions**

1. EQU, USE, and CSECT directives are not implemented. An error message will be indicated in the .lst file if one of those directives were found in the SIC/XE code.
2. Floating points, literals and division are not supported by the program. An error message will be indicated in the .lst file if they were found in the SIC/XE code.
3. HIO, LPS, SSL, STI, STSW, SVC, SIO, and TIO instruction are not supported by the program. An error message will be indicated in the .lst file if they were found in the SIC/XE code.

**\***The Assembler in Java program will continue to run even if one of the restriction is found.

**Data Structures**

* Source file: file that contains SIC/XE code and is provided by user.
* OPTAB: hash-table that contains mnemonics and related information.
* SYMTAB: hash-table that contains symbols.
* Intermediate file: file that contains information obtained from source file.
* .lst file: listing file.
* .obj file: object program.

**Implementation**

In our assembler, we implemented two hash-tables, OPTAB and SYMTAB. The OPTAB is a static table that stores mnemonics (used as the key) and their corresponding machine language. On the other hand, the SYMTAB table stores addresses assigned to labels. In order to get labels, mnemonics, addresses, and opcode, the file is read line by line. Each line is split based on the number of variables (length) and comments and whitespaces are ignored when using the splitter method.

In *Pass 1*, the Assembler in Java program read line by line the entire source program and all information is collected. As the requirement mentioned, a variable LOCCTR is created to store addresses, and it is initialized to the value of the “START”. A “IF” statement is implemented in order to know if the OPTAB table contains any “WORD, “RESW”, and “RESB”. In case yes, addresses are obtained according to them. During Pass 1, an intermediate file is also created; it stores everything that was read from the source file, and it is used as input for Pass 2.

In *Pass 2,* the intermediate file is used as input, and instructions are assembled using the SYMTAB table. During this pass, Assembler in Java reads line by line the intermediate file and generate a machine code for each instruction this is done in SIC format first, then values for N, I, X, B, P, E are change and Program Counter or Base Relative calculations are implanted to produce the SIC/XE version of the OPCODE. At the same time the “.lst” and “.obj” files are written.