

Practical no: 2

Problem Statement: Implement Pass-II of two pass assembler for pseudo-machine in Java using object-oriented features. The output of assignment-1 (intermediate file and symbol table) should be input for this assignment

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Assignment A-2

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Aim: To design data structure for Pass-II Assembler.

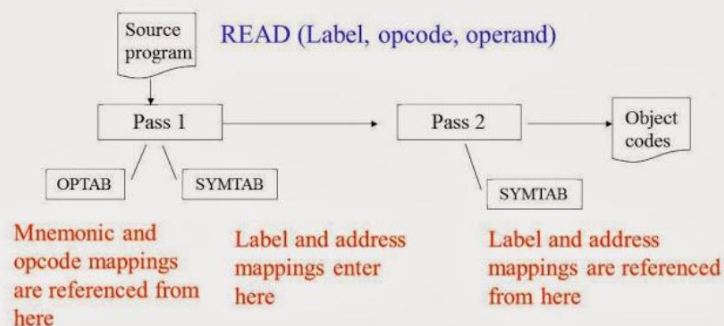
Theory: Two-pass Assembler.

The two-pass assembler performs two passes over the source program. In the first pass, it reads the entire source program, looking only for label definitions. All labels are collected, assigned address, and placed in the symbol table in this pass, no instructions are assembled at the end the symbol table should contain all labels defined in program. To assign address, to labels LC is maintained.

Data Structures:

- Location Counter (LC) points to the next location where the code will be placed.
- Op-code translation table contains symbolic instructions, their lengths & their op-codes.
- Symbol table contains labels & their values.
- String Storage Buffer- contains ASCII characters for the string.
- Forward Reference Table (FRT) contains pointer to the string in SSB offset where its value will be inserted in the object code.

A Simple Two Pass Assembler Implementation



Algorithm,

begin

if starting address is given

LOCCTR = starting address;

else

LOCCTR = 0;

while OPCODE != END do

begin

read a line from the code

if there is a label

if this label is in SYMTAB, then error

else insert (label, LOCCTR) into SYMTAB

Search OPTAB for the op code

if found

LOCCTR += N

else if this is an assembly directive

update LOCCTR as directed

else error

write line to intermediate file

end

program size = LOCCTR - starting address;

end.

Conclusion: Thus we have generated machine code for source program.

Program:

```
Pass2.java X
C:\Program Files\Java\jdk-10.0.1\bin > java -cp Pass2.jar Pass2.java
1 //Name: Aditi Hulay
2 Roll.No: 82
3 Div: A */
4
5 import java.io.BufferedReader;
6 import java.io.BufferedWriter;
7 import java.io.FileReader;
8 import java.io.FileWriter;
9 import java.io.IOException;
10 import java.lang.reflect.Array;
11 import java.util.ArrayList;
12 import java.util.HashMap;
13 import java.util.Map;
14
15 public class Pass2
16 {
17     public static void main(String[] args)
18     {
19         try
20         {
21             String f = "C:\\Program Files\\Java\\jdk-10.0.1\\bin\\OP.txt";
22             FileReader fr = new FileReader(f);
23             BufferedReader IC_file = new BufferedReader(fr);
24
25             String f1 = "C:\\Program Files\\Java\\jdk-10.0.1\\bin\\SYMTAB.txt";
26             FileReader fs = new FileReader(f1);
27             BufferedReader symtab_file = new BufferedReader(fs);
28             symtab_file.mark(500);
29
30             String f2 = "C:\\Program Files\\Java\\jdk-10.0.1\\bin\\LITTAB.txt";
31             FileReader fl = new FileReader(f2);
32             BufferedReader littab_file = new BufferedReader(fl);
33             littab_file.mark(500);
34
35             String littab[][] = new String[10][2];
36             HashMap<String, String> symtab = new HashMap<String, String>();
37             String str;
38             int z=0;
39             while ((str = littab_file.readLine()) != null)
40             {
```

```
Pass2.java - Visual Studio Code [Administrator]
C:\Program Files\Java\jdk-10.0.1\bin > Pass2.java

40 {
41
42     littab[z]=str.split("\\s+")[0];
43     littab[z][1]=str.split("\\s+")[1];
44     z++;
45 }
46
47 while ((str = symtab_file.readLine()) != null) {
48     symtab.put(str.split("\\s+")[0], str.split("\\s+")[1]);
49 }
50
51 String f3 = "C:\\Program Files\\Java\\jdk-10.0.1\\bin\\POOLTAB.txt";
52 FileReader fw3 = new FileReader(f3);
53 BufferedReader pooltab_file = new BufferedReader(fw3);
54 ArrayList<Integer> pooltab = new ArrayList<Integer>();
55 String t;
56 while ((t = pooltab_file.readLine()) != null)
57 {
58     pooltab.add(Integer.parseInt(t));
59 }
60
61 int pooltabptr = 1;
62 int temp1 = pooltab.get(0);
63 int temp2 = pooltab.get(1);
64
65 String sCurrentLine;
66 sCurrentLine = IC_file.readLine();
67 int locptr=0;
68 locptr=Integer.parseInt(sCurrentLine.split("\\t")[3]);
69
70 while ((sCurrentLine = IC_file.readLine()) != null)
71 {
72     System.out.print(locptr+"\\t");
73     String s0 = sCurrentLine.split("\\t")[0];
74     String s1 = sCurrentLine.split("\\t")[1];
75
76     if (s0.equals("IS"))
77     {
78         System.out.print(s1+"\\t");
79         if (sCurrentLine.split("\\t").length == 5)
80         {
81             System.out.print(sCurrentLine.split("\\t")[2] + "\\t");
82             if (sCurrentLine.split("\\t")[3].equals("L"))
83             {
84                 int add = Integer.parseInt(sCurrentLine.split("\\t")[4]);
85                 System.out.print(littab[add-1][1]);
86             }
87             if (sCurrentLine.split("\\t")[3].equals("S"))
88             {
89                 int add1 = Integer.parseInt(sCurrentLine.split("\\t")[4]);
90                 int i = 1;
91                 String l1;
92                 for (Map.Entry m : symtab.entrySet())
93                 {
94                     if (i == add1)
95                     {
96                         System.out.print((String) m.getValue());
97                     }
98                     i++;
99                 }
100             }
101             else
102             {
103                 System.out.print("\\t000");
104             }
105         }
106         if (s0.equals("AD"))
107         {
108             littab_file.reset();
109             if (s1.equals("05"))
110             {
111                 int j = 1;
112                 while (j < temp1)
113                 {
114                     littab_file.readLine();
115                 }
116                 while (temp1 < temp2)
117                 {
118                     System.out.print("\\t00\\t00" + littab_file.readLine().split("\\t")[1]);
119                 }
120             }
121         }
122     }
123 }
```

```
Pass2.java - Visual Studio Code [Administrator]
C:\Program Files\Java\jdk-10.0.1\bin > Pass2.java

79     if (sCurrentLine.split("\\t").length == 5)
80     {
81         System.out.print(sCurrentLine.split("\\t")[2] + "\\t");
82         if (sCurrentLine.split("\\t")[3].equals("L"))
83         {
84             int add = Integer.parseInt(sCurrentLine.split("\\t")[4]);
85             System.out.print(littab[add-1][1]);
86         }
87         if (sCurrentLine.split("\\t")[3].equals("S"))
88         {
89             int add1 = Integer.parseInt(sCurrentLine.split("\\t")[4]);
90             int i = 1;
91             String l1;
92             for (Map.Entry m : symtab.entrySet())
93             {
94                 if (i == add1)
95                 {
96                     System.out.print((String) m.getValue());
97                 }
98                 i++;
99             }
100         }
101         else
102         {
103             System.out.print("\\t000");
104         }
105     }
106     if (s0.equals("AD"))
107     {
108         littab_file.reset();
109         if (s1.equals("05"))
110         {
111             int j = 1;
112             while (j < temp1)
113             {
114                 littab_file.readLine();
115             }
116             while (temp1 < temp2)
117             {
118                 System.out.print("\\t00\\t00" + littab_file.readLine().split("\\t")[1]);
119             }
120         }
121     }
122 }
```

```
File Edit Selection View Go Run Terminal Help
Pass2.java - Visual Studio Code [Administrator]

C:\Program Files > Java > jdk-10.0.1 > bin > Pass2.java

118         System.out.print("\t\t\t\t\t" + littab_file.readLine().split(" ")[1]);
119         if(temp1 < (temp2-1))
120         {
121             locptr++;
122             System.out.println();
123             System.out.print(locptr+"\t");
124         }
125         temp1++;
126     }
127     temp1 = temp2;
128     pooltabptr++;
129     if (pooltabptr < pooltab.size())
130     {
131         temp2 = pooltab.get(pooltabptr);
132     }
133 }
134 int j = 1;
135 if (s1.equals("02"))
136 {
137     String s;
138     while ((s = littab_file.readLine()) != null)
139     {
140         if (j >= temp1)
141             System.out.print("\t\t\t\t\t" + s.split(" ")[1]);
142         j++;
143     }
144 }
145 if(s0.equals("0L") && s1.equals("01"))
146 {
147     System.out.print("\t\t\t\t\t" + sCurrentLine.split(" ")[1]);
148 }
149 locptr++;
150 System.out.println();
151 }
152 IC_file.close();
153 sytab_file.close();
154 littab_file.close();
155 pooltab_file.close();
156 }
157 }
```

```
File Edit Selection View Go Run Terminal Help
Pass2.java - Visual Studio Code [Administrator]

C:\Program Files > Java > jdk-10.0.1 > bin > Pass2.java

125         temp1++;
126     }
127     temp1 = temp2;
128     pooltabptr++;
129     if (pooltabptr < pooltab.size())
130     {
131         temp2 = pooltab.get(pooltabptr);
132     }
133 }
134 int j = 1;
135 if (s1.equals("02"))
136 {
137     String s;
138     while ((s = littab_file.readLine()) != null)
139     {
140         if (j >= temp1)
141             System.out.print("\t\t\t\t\t" + s.split(" ")[1]);
142         j++;
143     }
144 }
145 if(s0.equals("0L") && s1.equals("01"))
146 {
147     System.out.print("\t\t\t\t\t" + sCurrentLine.split(" ")[1]);
148 }
149 locptr++;
150 System.out.println();
151 }
152 IC_file.close();
153 sytab_file.close();
154 littab_file.close();
155 pooltab_file.close();
156 }
157 }
158 catch (IOException e)
159 {
160     e.printStackTrace();
161 }
162 }
163 }
164 }
```