جامعة أم القرى
UMM AL-QURA UNIVERSITY

الكلية الجامعية بالجموم
Al Jumum University College

Project Scanner

23163109-3 class:1

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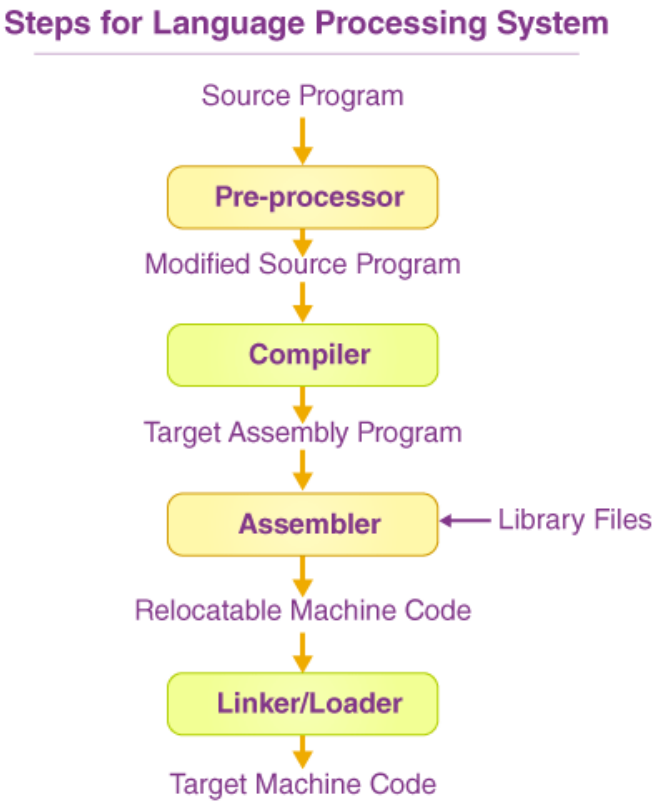
Introduction:

compiler : A compiler is one component in a tool chain of programs used to create executables from source code. Typically, when you invoke a single command to compile a program, a whole sequence of programs are invoked in the background.



Fun fact:

What do you call a compiler that can't find any errors in your code? A wishful compiler.

Programming language:

Key words of our language

If, else, elseif, for, while, int,
char, double, string.

we built lexical analysis which identifies **our unique language defined down below:**

Operations mathematical:

- / - + =

RE for Number:

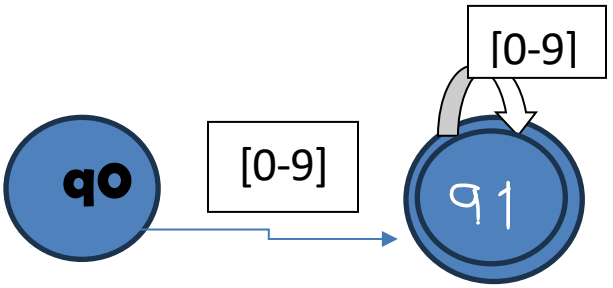
digit = "[#][0-9]+ "

RE for identifier = "[?][a-zA-Z]+ ";

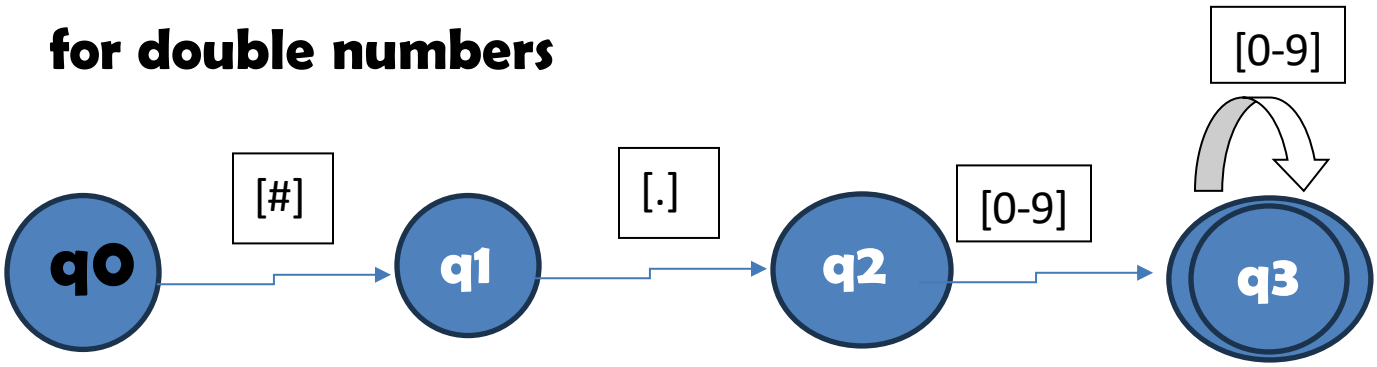
RE for comments = [$][a-zA-Z@$#]+"

DFA In our project

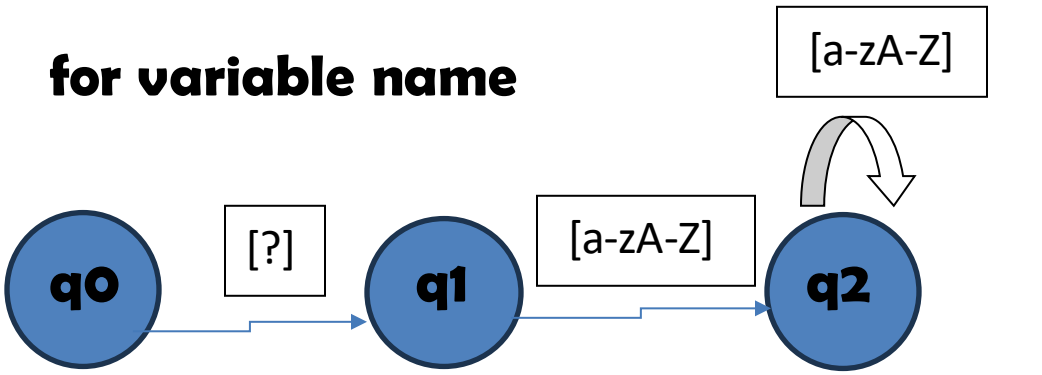
For an integer number:



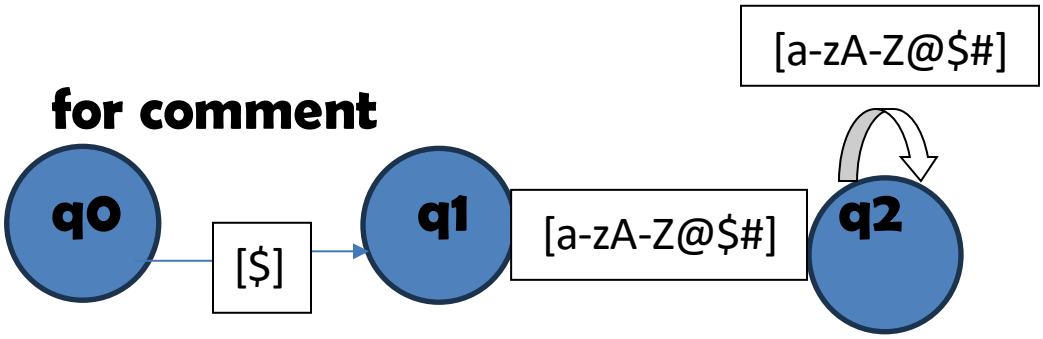
for double numbers



for variable name



for comment



Scanner construction:

We've used java language to form our Scanner

1-it will read the input from text file.

2.Determine RE for letter/digit then it provides tokens for it.

3-if it cant find the matched token for letter/digit it will match it with an Error token.

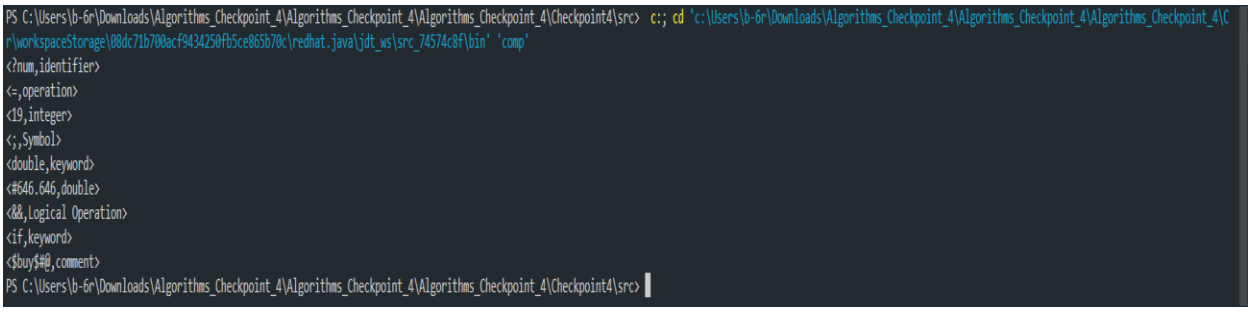
4.Loop this until of file.

Implementation:

We will run our code using to input files:

First example read file called "test.txt" that will have correct input:

Output:



Second example read file “text.txt” that has incorrect inputs:

Output:

```
PS C:\Users\b-6r\Downloads\Algorithms_Checkpoint_4\Algorithms_Checkpoint_4\Algorithms_Checkpoint_4\Checkpoint4\src> c:; cd 'c:\Users\b-6r\Downloads\Algorithms_Checkpoint_4\Algorithms_Checkpoint_4\Algorithms_Checkpoint_4\Checkpoint4\src'; & 'C:\Program Files\Eclipse Adoptium\jdk-17.0.8.101-hotspot\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\b-6r\AppData\Roaming\Code\User\workspaceStorage\08dc71b700acf9434250fb5ce865b70c\redhat.java\jdt_ws\src_74574c8f\bin' 'comp'
<num,error in token !!! >
<=,operation>
<#19,error in token !!! >
<;,Symbol>
<&,Symbol>
<if,keyword>
<9.99,error in token !!! >
<comment$,error in token !!! >
PS C:\Users\b-6r\Downloads\Algorithms_Checkpoint_4\Algorithms_Checkpoint_4\Algorithms_Checkpoint_4\Checkpoint4\src>
```

Our code:

```
import java.nio.file.Files;

import java.nio.file.Path;

import java.nio.file.Paths;

import java.io.IOException;

import java.util.ArrayList;

import java.util.List;

import java.util.regex.Pattern;


public class comp {

   // Regular expressions for token categories

   private static String identifierRegularExpression = "[?][a-zA-Z]+";

   private static String integer = "[0-9]+";

   private static String doublenum = "[#][0-9]+.[0-9]+";

   private static String comment = "[$][a-zA-Z@$#]+";

   private static String output = "\'[a-zA-Z]+\'";
```

```
// Lists to hold keywords, symbols, operations, and logical operations
private static List<String> keywords = new ArrayList<>();
private static List<String> symbols = new ArrayList<>();
private static List<String> operations = new ArrayList<>();
private static List<String> logicalOps = new ArrayList<>();

// Additional variables
private static ArrayList<String> fileLines = new ArrayList<>();
private static ArrayList<String> operators = new ArrayList<>();
private static String endOfLine;
private static String endOfWord;
private static String filename = "C:\\Users\\b-6r\\OneDrive\\Desktop\\test.txt";

// DFA states
enum State { Q0, Q1, Q2, Q3, Q4, Q5, Q6, Q7, QE }

// Input source file and line counter
private static int line = 1;

static {
    // Initialize lists with keywords, symbols, operations, and logical operations
    keywords.add("if");
    keywords.add("else");
    keywords.add("elseif");
    keywords.add("for");
    keywords.add("while");
    keywords.add("int");
    keywords.add("char");
    keywords.add("double");
    keywords.add("string");
```

```
    symbols.add("!");
    symbols.add("&");
    symbols.add(";");

    operations.add("+");
    operations.add("-");
    operations.add("*");
    operations.add("/");
    operations.add("=");

    logicalOps.add("||");
    logicalOps.add("&&");
}

public static void main(String[] args) {
    // Code application logic here
    scan();
}

public static void scan() {
    int lineNumber = 1;
    try {
        Path filePath = Paths.get(filename);
        Files.lines(filePath).forEach(fileLines::add);

        for (String line : fileLines) {
            String[] lexemes = getLexemes(line);
            for (String lexeme : lexemes) {
                String tokenCategory = evaluate(lexeme);
```

```
                System.out.println("<" + lexeme + "," + tokenCategory + ">");
            }
            lineNumber++;
        }
    } catch (IOException e) {
        e.printStackTrace();
        System.out.println("File not found!");
    }
}

public static String[] getLexemes(String line) {
    return line.split(" ");
}

public static boolean isKeyword(String lex) {
    return keywords.contains(lex);
}

public static boolean isOperator(String lex) {
    return operations.contains(lex);
}

public static boolean isLetter(char entry) {
    return (entry >= 'a' && entry <= 'z') || (entry >= 'A' && entry <= 'Z');
}

public static State executeTransition(State currentState, char entry) {
    switch (currentState) {
        case Q0:
            if (isLetter(entry))
```

```
            return State.Q7;
        else if (entry == '0')
            return State.Q2;
        else if (entry >= '1' && entry <= '9')
            return State.Q1;
        else
            return State.QE;
    case Q1:
        if (entry == '.')
            return State.Q5;
        else if (Character.isDigit(entry))
            return State.Q1;
        else
            return State.QE;
    case Q2:
        if (entry == '.')
            return State.Q3;
        else
            return State.QE;
    case Q3:
        if (Character.isDigit(entry))
            return State.Q4;
        else
            return State.QE;
    case Q4:
        if (Character.isDigit(entry))
            return State.Q4;
        else
            return State.QE;
    case Q5:
```

```
            if (Character.isDigit(entry))
                return State.Q6;
            else
                return State.QE;
        case Q6:
            if (Character.isDigit(entry))
                return State.Q6;
            else
                return State.QE;
        default:
            return State.QE;
    }
}

public static String evaluate(String str) {
    if (isKeyword(str)) {
        return "keyword";
    } else if (symbols.contains(str)) {
        return "Symbol";
    } else if (isOperator(str)) {
        return "operation";
    } else if (logicalOps.contains(str)) {
        return "Logical Operation";
    }

    /*Here's the continuation of the modified code:*/

    else if (Pattern.matches(identifierRegularExpression, str)) {
        return "identifier";
```

```
    } else if (Pattern.matches(comment, str)) {
       return "comment";
    } else if (Pattern.matches(integer, str)) {
       return "integer";
    } else if (Pattern.matches(doublenum, str)) {
       return "double";
    } else if (Pattern.matches(output, str)) {
       return "Output to the user";
    } else {
       return "error in token !!! " ;
    }
  }
}
```

References:

1.java Documentation for RE.

2.Oracle Java Tutorials- Path and Files.

3.GeeksforGeeks – Introduction to Finite Automata (DFA).

Distribution of Tasks:

Abdullah	**Defined the keywords for the Compiler/Scanner.**
Tariq	**Wrote the code to ensure that letter/digit that belongs to the string of reserved letter/digit that make up our compiler/scanner**
Mohammed	**Defined the structure for the keywords will be stored**
Mohammed	**Wrote the code to be read in the user input from the text file and display the matching result**
Abdullah	**Wrote RE that are about how to write Identifier, integer, doublenum, comment and text within our Language.**
Tariq	**Wrote the code to check whether a letter or digit belongs or matches the RE that made up the Language we have defined.**

Thank you very much for reviewing our project hopefully we did great.