Epsilon(Lexical Analyser)

Submitted by

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BONAFIDE CERTIFICATE

Certified that this Course Project Report titled **" Epsilon(Lexical Analyzer)"** is the bonafide work done by **Dhruv Wadhera [RA2011026010071], Parth Madan [RA2011026010114]** who carried out under my supervision. Certified further, that to the best of my knowledge the work reported herein does notform part of any other work.

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ABSTRACT

The Lexical Analyzer with Tkinter GUI and PostgreSQL Integration project presents a user-friendly graphical interface for performing lexical analysis on C programming code. The project utilizes the Tkinter library for GUI development and integrates with a PostgreSQL database using the psycopg2 library.

The application allows users to select a C code file, which is then analyzed by the lexical analyzer. The lexical analysis phase involves breaking down the code into a sequence of tokens and removing extra spaces and comments. The analysis results are displayed in a tabular format, showing the token type and corresponding lexeme.

The Tkinter GUI provides an intuitive interface with features such as a file dialog for selecting code files and buttons for initiating the analysis. The user can browse for a C code file, and upon analysis, the results are presented in a text area within the GUI.

To support data persistence and management, the project integrates with a PostgreSQL database through the psycopg2 library. The application establishes a connection to the database and creates a table to store the analyzed code information. Users can submit their analysis results to the database, and the application also retrieves and displays the most recent entries.

The Lexical Analyzer with Tkinter GUI and PostgreSQL Integration project provides an efficient and user-friendly tool for performing lexical analysis on C code. The integration with PostgreSQL enables data storage and retrieval, ensuring the persistence of analysis results. The project showcases the capabilities of Tkinter for GUI development and demonstrates the seamless integration of a popular relational database with Python.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The Lexical Analyzer is an essential component of a compiler that performs the task of breaking down the source code into meaningful tokens or lexemes. It acts as the first phase of the compilation process and serves as the foundation for subsequent stages such as parsing and semantic analysis. In this project, we have developed a Lexical Analyzer using the Tkinter GUI and the database postgres SQL and excessing it with administration tool PG ADMIN4,

The purpose of our Lexical Analyzer project is to demonstrate the implementation of lexical analysis techniques using the Tkinter. It offers a user-friendly interface where users can input their source code, and the analyzer will process it, generating a list of tokens along with their corresponding lexeme types. The project utilizes the Tkinter capabilities to ensure efficient lexeme processing and seamless interaction with the application.

Throughout the project, we focus on achieving the following objectives:

1. **Tokenization:** The lexical analyzer breaks down the source code into tokens, which are meaningful units such as keywords, identifiers, operators, and literals. It scans the source code character by character and identifies these tokens, associating them with their corresponding lexeme types.
2. **Lexeme Validation:** The analyzer validates the lexemes based on the language's grammar and rules. It ensures that the tokens generated from the source code conform to the language's syntax and semantic requirements.

3. **Error Handling:** The project incorporates error handling mechanisms to detect and report lexical errors, such as invalid characters or unrecognised tokens. The analyzer provides meaningful error messages to assist users in identifying and resolving these issues.
4. **User-Friendly Interface:** The project offers an intuitive and responsive user interface where users can input their source code, view the generated tokens, and analyze the lexeme information. Tkinter enables the creation of an interactive interface that enhancesthe user experience and facilitates easy code examination.

In conclusion, our Lexical Analyzer project is built using the Tkinter GUI that demonstrates the implementation of lexical analysis techniques for simple code .

1.2 PROBLEM STATEMENT

The problem being addressed by this project is the need for a robust and efficient solution for identifying tokens in a stream of input text. Traditional approaches to tokenization often involve the use of regular expressions, which can be brittle and prone to error when applied to complexor irregular input text. Moreover, existing solutions for tokenization often lack user-friendly interfaces, making them difficult to use for non-expert users.

The problem at hand is the lack of an efficient and user-friendly solution for performing lexical analysis of C programming code. Manual identification and classification of tokens in a codebase can be a tedious and error-prone task, especially in larger projects. Existing tools may have limited features or complex interfaces, making them less accessible to programmers.

Additionally, the absence of a comprehensive lexical analyzer hinders the understanding of code structure and can lead to inefficiencies in software development. Therefore, there is a need for a robust and user-friendly lexical analyzer tool that automates the process of token identification, classification, and improves the overall code comprehension for C programming.

The project aims to develop a custom algorithm for tokenization that is both accurate and efficient, and which can be easily adapted to different use cases. Furthermore, the solution should be extensively tested to ensure high performance and low error rates, and should be designed with scalability and maintainability in mind. Ultimately, the goal of this project is to provide a comprehensive solution for lexical analysis that can be used in a wide range of applications, from programming languages to natural language processing.

1.3 OBJECTIVES

Develop a custom algorithm for tokenization that is both accurate and efficient, and which can be easily adapted to different input text formats.

Implement an automated token identification and classification system that accurately recognizes keywords, identifiers, constants, string literals, operators, and punctuators in the provided C code.

Enhance the efficiency and productivity of software development by automating the process of lexical analysis, reducing the manual effort required for token identification and classification.

Improve code comprehension and facilitate software maintenance by providing clear and organized tokenized output, enabling programmers to identify and understand the structure of the C code more effectively.

The lexical analyzer project aims to provide a comprehensive tool for performing lexical analysis of C programming code. The tool will be designed to handle a wide range of C codebases, including small programs and large-scale software projects. It will support various features such as token identification, classification, and organized output of tokenized code. The project will be developed using Python and the Tkinter library, ensuring cross-platform compatibility.

1. **Software Development**: The lexical analyzer tool will be beneficial for software developers and programmers working with C programming language. It will assist in code comprehension, debugging, and identifying syntax errors.

2. **Education and Learning**: The project can be used as a learning tool for students studying C programming. It provides a visual representation of tokenized code, helping them understand the structure and organization of C programs.

3. **Code Review and Maintenance**: The lexical analyzer can be used by code reviewers and software maintainers to quickly analyze and review C code. It enables them to identify potential issues, optimize code, and enhance overall code quality.

4. **Automated Testing**: The tool can be integrated into automated testing frameworks to validate the lexical correctness of C code.

1.4 NEED FOR LEXICAL ANALYSER

The need for a lexical analyzer arises from the fact that natural languages and programming languages require different levels of abstraction, and therefore different ways of analyzing and processing text. In order to build a computer program or a natural language processing system that can understand and manipulate human language or programming language code, it is necessary to first break down the input text into its constituent parts, or tokens. This process is known as lexical analysis or tokenization.

A lexical analyzer is a software tool that performs this task of breaking down input text into tokens. It is an important component of a compiler or interpreter, which is responsible for translating human-readable code into machine-executable code. The lexical analyzer takes as input a stream of characters representing the input text, and generates a stream of tokens that can be processed by the subsequent stages of the compiler or interpreter.

The main benefit of using a lexical analyzer is that it simplifies the task of writing a compiler or interpreter by reducing the complexity of the input text. By breaking down the input text into tokens, the compiler or interpreter can focus on processing each token individually, rather than trying to analyze the text as a whole. This makes the process of parsing the input text much more efficient and less error-prone.

In addition, a lexical analyzer can help to ensure that the input text is well-formed and adheres to a particular syntax or grammar. By enforcing a set of rules for tokenization, the lexical analyzer can detect and report errors in the input text, which can then be corrected by the user or by the compiler or interpreter itself.

Overall, a lexical analyzer is a valuable tool for anyone working with natural language processing or programming languages. It simplifies the task of parsing input text and can help to ensure that the resulting code is well-formed and free of errors.

1.5 REQUIREMENT SPECIFICATION

Software Requirements Specification:

1. Operating System: The system should be compatible with major operating systems such as Windows, macOS, and Linux.

2. Programming Language: The project should be developed using Python programming language.

3. Libraries and Frameworks: The following libraries and frameworks are required:
   - Tkinter: For building the graphical user interface (GUI).
   - psycopg2: For connecting to the PostgreSQL database.
   - re: For regular expression matching and tokenization.

4. Database: The system should integrate with PostgreSQL database to store and retrieve data.

5. User Interface: The GUI should provide a user-friendly interface for file selection, token analysis, and displaying the results.

6. Error Handling: The system should be able to handle and display any errors or exceptions that occur during the tokenization process.

7. Performance: The system should be able to analyze and tokenize code efficiently, with minimum processing time and memory usage.

8. Security: The project should ensure secure database connections and handle user inputs safely to prevent any vulnerabilities.

9. Documentation: The system should include proper documentation, including code comments, user manuals, and technical specifications.

10. Testing: The project should undergo thorough testing to ensure the accuracy and reliability of the tokenization process.

11. Deployment: The system should be easily deployable on different systems and provide clear instructions for installation and setup.

12. Scalability: The system should be designed in a modular and scalable manner, allowing for future enhancements and additional features.

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CHAPTER 2

NEEDS

2.1 NEED FOR LEXICAL ANALYSER IN COMPILER DESIGN

In the field of computer science, compilers are essential tools that allow developers to write code in high-level programming languages and translate it into machine code that can be executed by computers. The process of creating a compiler involves several stages, and one of the critical stages is lexical analysis.

A lexical analyzer, also known as a lexer or scanner, is a component of the compiler that breaks down the input source code into a sequence of tokens. These tokens are then passed to the next stage of the compiler, which is the parser. The parser uses the tokens to create a parse tree, which is a data structure that represents the syntactic structure of the input code.

In the context of compiler design using React and Node.js, a lexical analyzer is an essential component that helps developers to create efficient and reliable compilers. React is a popular JavaScript library for building user interfaces, while Node.js is a platform that allows developers to run JavaScript on the server-side. These technologies provide a powerful set of tools for creating robust compilers that can handle complex source code.

One of the advantages of using React and Node.js in compiler design is that they provide a modular and scalable approach to building compilers. React allows developers to create reusable components for the user interface, while Node.js provides a robust backend environment for handling the compilation process. This modular approach makes it easier to maintain and update compilers as new features and technologies emerge.

Another advantage of using React and Node.js in compiler design is that they provide a high degree of flexibility and customization. Developers can use a wide range of libraries and tools to create lexical analyzers that meet their specific needs. For example, they can use regular expressions to define the syntax of the input code, or they can use finite-state machines to create more complex lexical analyzers.

In conclusion, a lexical analyzer is a critical component of the compiler that helps to break down the input source code into a sequence of tokens. In the context of compiler design using React and Node.js, a lexical analyzer provides a modular and scalable approach to building compilers. With the flexibility and customization provided by these technologies, developers can create efficient and reliable compilers that can handle complex source code.

2.2 LIMITATIONS OF CGF

Context-Free Grammar (CFG) is a mathematical notation used to describe the syntax of a programming language or any other formal language. However, like any other notation, CFG also has its limitations. Below are some of the limitations of CFG:

Cannot capture semantic information: CFG only describes the syntax of a language, which means it cannot capture the semantic information or the meaning of the language. For instance, a CFG cannot describe the meaning of "if (x=5) then y=10 else y=20" statement in a programming language.

Limited expressiveness: CFG has a limited expressive power, which means it cannot handle complex languages or language constructs. For instance, it cannot handle context-sensitive languages, where the production rules depend on the context or history of the symbols.

Ambiguity: CFG can produce ambiguous grammars, which means that a sentence in the language can have more than one parse tree. Ambiguity is a problem because it makes parsing difficult and can lead to unexpected behavior in a compiler or interpreter.

Not suitable for error handling: CFG is not suitable for handling errors in the input language. For example, if a user enters an incorrect syntax, a CFG cannot detect the error and provide useful error messages.

Limited support for left-recursive productions: CFG does not support left-recursive productions, which means that it cannot handle grammars that involve left recursion. Left recursion occurs when a non-terminal symbol appears as the first symbol in one of its own production rules.

Cannot handle languages with unbounded nesting: CFG is not suitable for handling languages that involve unbounded nesting, such as nested parentheses, brackets, and braces. This is becauseCFG has a limited stack capacity, which can lead to stack overflow errors.

Cannot handle languages with dynamic scoping: CFG cannot handle languages that use dynamic scoping, where the scope of a variable changes dynamically during the execution of a program.

In conclusion, while CFG is a powerful notation for describing the syntax of a language, it has its limitations. These limitations can make it difficult or impossible to use CFG for certain languages or language constructs.

2.3 TYPES OF ATTRIBUTES IN LEXICAL ANALYSER

A lexical analyzer is a key component of a compiler that is responsible for scanning the input code, identifying tokens, and associating attributes with these tokens. Attributes provide additional information about a token, such as its value, position in the source code, or syntactic and semantic properties. By associating attributes with tokens, the compiler can build a parse treethat represents the syntactic structure of the input code, and use this tree to generate machinecode or other output.

There are several types of attributes that can be associated with tokens in a lexical analyzer. The first type is a simple attribute, which is a basic piece of information that is associated with a token. For example, a simple attribute for an identifier token might be its name or value. Similarly, a simple attribute for a numeric token might be its value or type. Simple attributes are easy to understand and are used in many compilers to provide basic information about tokens.

The second type of attribute is a composite attribute, which is a combination of simple attributes. For example, a composite attribute for a function call might include the name of the function, the list of arguments, and the position of the call in the source code. Composite attributes are used to group related pieces of information together for easier processing. They are particularly useful when dealing with complex language constructs such as function calls, expressions, or conditional statements.

The third type of attribute is a synthesised attribute, which is a piece of information that is derived from the parse tree. For example, a synthesised attribute for a conditional statementmight be the set of variables that are modified within the condition. Synthesised attributes are useful for propagating information up the parse tree and for providing additional information to the next stage of the compiler. They allow the compiler to perform additional analyses, such as optimization, error detection, or code generation.

The fourth type of attribute is an inherited attribute, which is a piece of information that is passed down the parse tree from a parent node to a child node. For example, an inherited attribute for a function call might include the types of the function parameters. Inherited attributes are useful

for passing information down the parse tree and for providing additional information to child nodes. They allow the compiler to perform additional analyses, such as type checking, name resolution, or scoping.

The fifth type of attribute is a static attribute, which is a piece of information that is known at compile time and does not change during execution. For example, a static attribute for a constant might be its value or type. Static attributes are useful for optimising the code and for reducing the memory usage of the program. They allow the compiler to perform additional analyses, such as constant folding, dead code elimination, or data flow analysis.

CHAPTER 3

SYSTEM & ARCHITECTURE DESIGN

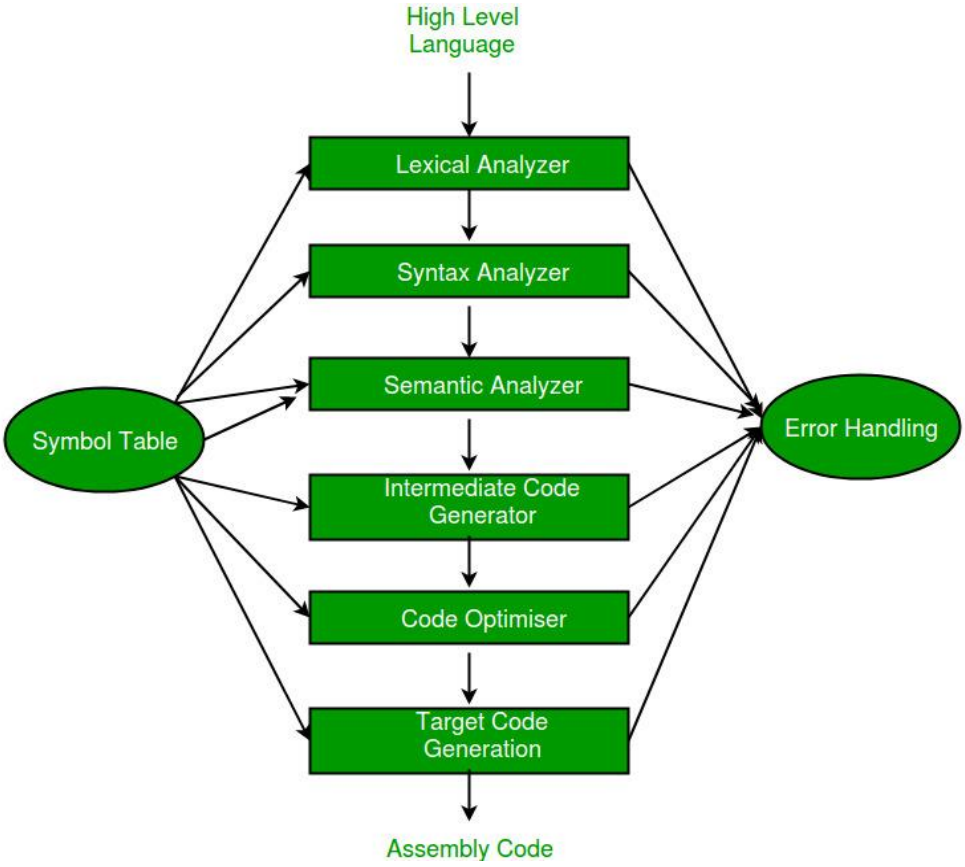
3.1 SYSTEM ARCHITECTURE

The system architecture of the lexical analyzer project consists of two main components: the front-end (UI) and the back-end (tokenization and database).

1. Front-end (UI) Design:
   - The front-end is responsible for providing a user-friendly interface for the users to interact with the lexical analyzer.
   - It includes components such as labels, buttons, and text fields to display information and capture user inputs.
   - The front-end communicates with the back-end to trigger the tokenization process and retrieve the analysis results.

2. Back-end (Tokenization and Database) Design:
   - The back-end handles the core functionality of the lexical analyzer, including tokenization and database operations.
   - Tokenization: It involves breaking the input code into tokens based on predefined patterns. Regular expressions are used to identify and extract different token types.
   - Database: The back-end interacts with the database to store and retrieve tokenized code snippets, as well as user information.
   - PostgreSQL is utilized as the database management system, allowing efficient data storage and retrieval.

3.2 ARCHITECTURE DIAGRAM



COMPONENT DIAGRAM

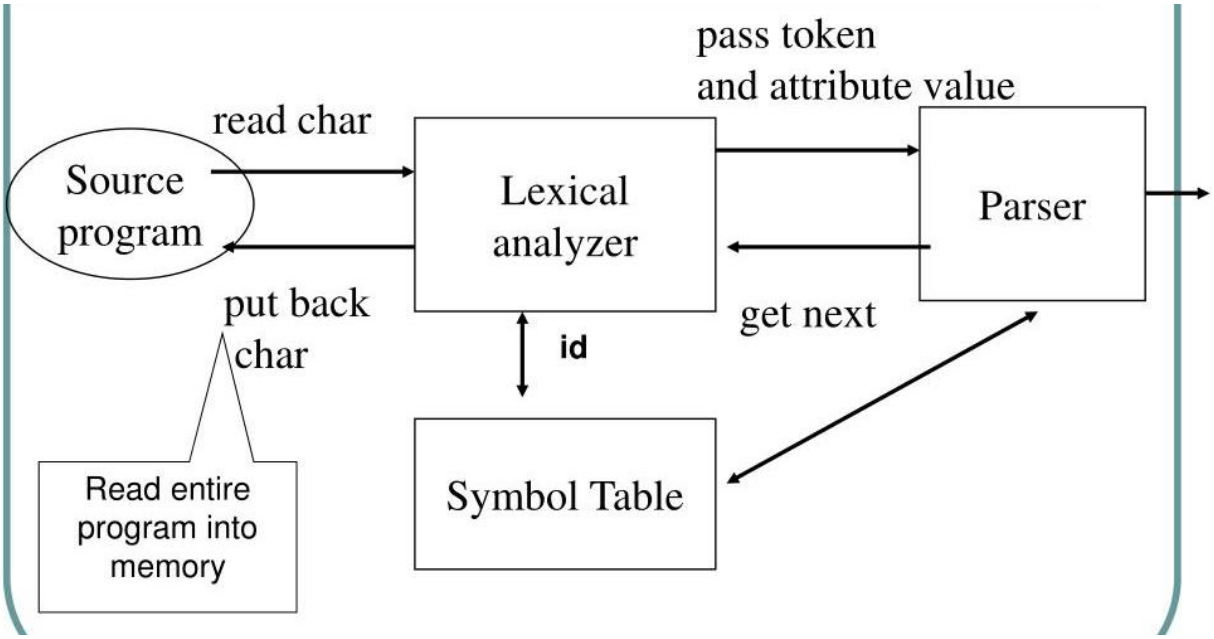


Fig. 3.1

CHAPTER 4

REQUIREMENTS

4.1 TECHNOLOGIES USED

The lexical analyzer project utilizes several technologies to implement its functionality:

Python: The project is written in Python programming language, which provides a robust and efficient platform for developing the lexical analyzer.

Tkinter: Tkinter is a standard Python library used for creating graphical user interfaces (GUI). It is utilized in the project to design and implement the UI components.

PostgreSQL: The project integrates with PostgreSQL, an open-source relational database management system. It is used to store and manage the tokenized code snippets and user information.

psycopg2: psycopg2 is a Python library that provides an interface to PostgreSQL. It enables the project to establish a connection with the PostgreSQL database and perform database operations.

Regular Expressions: Regular expressions are employed for tokenization, allowing the project to identify and extract different token types based on predefined patterns.

These technologies collectively contribute to the development and functionality of the lexical analyzer, enabling efficient code tokenization, database management, and user interface implementation.

4.2 REQUIREMENTS TO RUN THE SCRIPT

To run the script for the above lexical analyzer project, you will need the following requirements:

1. Python: Make sure you have Python installed on your system. You can download the latest version of Python from the official Python website (https://www.python.org/) and follow the installation instructions for your operating system.

2. Tkinter: Tkinter is a standard Python library for GUI development. It is typically included with Python installations, so you should have Tkinter available by default. However, if you don't have Tkinter installed, you may need to install it separately based on your operating system.

3. psycopg2: The project utilizes the psycopg2 library to connect to a PostgreSQL database. You can install psycopg2 using the pip package manager by running the following command in your terminal:

```
pip install psycopg2
```

4. PostgreSQL: The project interacts with a PostgreSQL database, so you need to have PostgreSQL installed on your system. You can download the PostgreSQL installer from the official PostgreSQL website (https://www.postgresql.org/) and follow the installation instructions for your operating system.

5. pgAdmin: pgAdmin is a popular administration and development platform for PostgreSQL. It provides a graphical interface to manage and interact with the PostgreSQL database. You can download pgAdmin from the official pgAdmin website (https://www.pgadmin.org/) and install it on your system.

Ensure that you have all the above requirements fulfilled on your system before running the lexical analyzer script.

Additional Dependencies:

Depending on the specific requirements of your project, you may need to install additional dependencies. For example, you may need to install a database driver, a templating engine, or a middleware package. You can install additional dependencies using npm by running the command npm install <dependency> in your project directory.

Once you have installed the required dependencies, you can start building your project. The exact steps will depend on the specifics of your project, but the general process involves writing code for the client and server sides of your application, setting up your database, and deploying your application to a production environment.

CHAPTER 5

CODING & TESTING

5.1 CODING

default Editor

```
import tkinter as tk
from tkinter import filedialog
from collections import OrderedDict
import re
import customtkinter
import psycopg2
customtkinter.set_appearance_mode("Dark")  # Modes: system (default),
light, dark
customtkinter.set_default_color_theme("blue")

def query():
#configure and connect to postgres
    conn =psycopg2.connect(
        host="localhost",
        database="myDB",
        user="postgres",
        password="sushmashok@7246",
        port="5432",
    )
    c =conn.cursor()
    #create a table
    c.execute('''CREATE TABLE IF NOT EXISTS table3
    (first_name TEXT,
    last_name TEXT);''')
    conn.commit()
    conn.close()
def submit():
    conn =psycopg2.connect(
        host="localhost",
        database="myDB",
        user="postgres",
        password="sushmashok@7246",
        port="5432",
    )
    c =conn.cursor()
```

```
    c.execute('''INSERT INTO
table3(first_name,last_name)VALUES(%s,%s)''',(f_name.get(),l_name.get()))
    conn.commit()
    conn.close()
    x_label=customtkinter.CTkLabel(root,text="Last Users :
",text_color="silver")
    x_label.place(x=1200,y=235)
    update()
# Token types
def update():
    conn =psycopg2.connect(
        host="localhost",
        database="myDB",
        user="postgres",
        password="sushmashok@7246",
        port="5432",
    )
    c =conn.cursor()
    #grab stuff
    c.execute("SELECT * FROM table3")
    records=c.fetchall()
    output=''
    for record in records:
        output_label.configure(text=f'{output}\n{record[0]} {record[1]}')
        output=output_label.cget('text')
    conn.close()
TOKEN_TYPES = OrderedDict([
    ('KEYWORD',
r'(auto|break|case|char|const|continue|default|do|double|else|enum|extern
|float|for|goto|if|int|long|register|return|short|signed|sizeof|static|st
ruct|switch|typedef|union|unsigned|void|volatile|while)'),
    ('IDENTIFIER', r'[a-zA-Z_][a-zA-Z0-9_]*'),
    ('CONSTANT', r'(0x[0-9A-Fa-f]+|\d+\.\d*|\.\d+|\d+)'),
    ('STRING_LITERAL', r'\".*?\"'),
    ('OPERATOR', r'(\+\+|--|->|==|!=|<=|>=|\+=|-
=|\*=|/=|%=|<<|>>|<<=|>>=|&=|\^=|\|=)'),
    ('PUNCTUATOR', r'([(){}\[\];,])'),
    ('COMMENT', r'(/\*.*?\*/|//.*)'),
])

# Function to tokenize C code


def tokenize_c_code(code):
```

```
    tokens = []
    for token_type, pattern in TOKEN_TYPES.items():
        for match in re.findall(pattern, code):
            tokens.append((token_type, match))
    return tokens

# Function to open file dialog and get file path


def open_file_dialog():
    file_path = filedialog.askopenfilename()
    if file_path:
        txt_file.delete('1.0', tk.END)
        txt_file.insert(tk.END, file_path)

# Function to analyze C code and generate symbol tree


def analyze_c_code():
    file_path = txt_file.get('1.0', tk.END).strip()
    if not file_path:
        result_text.delete('1.0', tk.END)
        result_text.insert(tk.END, 'Please select a file.')
        return

    try:
        with open(file_path, 'r') as file:
            code = file.read()
            tokens = tokenize_c_code(code)

            # Generate symbol tree in tabular format
            symbol_tree = []
            for token in tokens:
                symbol_tree.append([token[0], token[1]])

            result_text.delete('1.0', tk.END)
            result_text.insert(tk.END, '{:<15}{}\n'.format('Token',
'Lexeme'))
            result_text.insert(tk.END, '-'*30 + '\n')
            for symbol in symbol_tree:
                result_text.insert(
                    tk.END, '{:<15}{}\n'.format(symbol[0], symbol[1]))
    except Exception as e:
        result_text.delete('1.0', tk.END)
```

```
        result_text.insert(tk.END, 'Error: {}'.format(str(e)))
    submit()

# Create main window
root = customtkinter.CTk()
root.title('Lexical Analyzer')
root.geometry("620x500")
# Create text box for file path
label= customtkinter.CTkLabel(root,text="Lexical Analyzer for C
programming
Language",height=40,width=50,font=("Robolo",20),text_color="silver")
label.pack(pady=10)
label2= customtkinter.CTkLabel(root,text="What is Lexical Analyzer ?
",height=15,width=100,font=("Robolo",15),text_color="silver")
label2.place(x=33,y=50)
label3= customtkinter.CTkLabel(root,text="Lexical Analysis is the very
first phase in the compiler designing.  A Lexer takes  the modified
source code which is written in the form of sentences . In other words ,
it helps you to convert a sequence of characters into a
",height=15,width=100,font=("Robolo",15),justify="left",text_color="silve
r")
label3.pack(pady=10)
label4= customtkinter.CTkLabel(root,text="sequence of tokens.The lexical
analyzer breaks this syntax into a series of tokens.It removes any extra
space,comment written in the source code.Programs that perform Lexical
Analysis are called lexical
analyzers/lexers.",height=15,width=100,font=("Robolo",15),justify="left",
text_color="silver")
label4.pack(pady=0)
label5= customtkinter.CTkLabel(root,text="WORKING DEMO  :
",height=15,width=50,font=("Robolo",15),text_color="silver",justify="left
")
label5.place(x=383,y=145)
text_frame= customtkinter.CTkFrame(root,corner_radius=10)
text_frame.place(x=383,y=225)
txt_file = tk.Text(text_frame, height=1,
width=72,bd=0,bg="#292929",fg="silver")
txt_file.pack(pady=10,padx=10)

# Create buttons for file dialog and analysis

btn_browse = customtkinter.CTkButton(root, text='Lookup',
command=open_file_dialog)
btn_browse.place(x=633,y=265)
```

```
btn_analyze = customtkinter.CTkButton(root, text='Run',
command=analyze_c_code)

btn_analyze.place(x=633,y=300)
label1= customtkinter.CTkLabel(root,text="OUTPUT  :
",height=15,width=50,font=("Robolo",15),text_color="silver",justify="left
")
label1.place(x=383,y=335)
txt_frame= customtkinter.CTkFrame(root,corner_radius=10)
txt_frame.place(x=383,y=365)
result_text = tk.Text(txt_frame, height=25,
width=75,bd=0,bg="#292929",fg="silver")
result_text.pack(pady=10)
f_label=customtkinter.CTkLabel(root,text="First Name
:",text_color="silver",height=0.5,font=("Robolo",15))
f_label.place(x=383,y=168)
f_name=customtkinter.CTkEntry(root,text_color="silver",height=0.75,width=
200)
f_name.place(x=655,y=168)
l_label=customtkinter.CTkLabel(root,text="Last Name
:",text_color="silver",height=0.5,font=("Robolo",15))
l_label.place(x=383,y=194)
l_name=customtkinter.CTkEntry(root,text_color="silver",height=0.75,width=
200,bg_color="#292929")
l_name.place(x=655,y=194)
output_label=customtkinter.CTkLabel(root,text="",text_color="silver")
output_label.place(x=1200,y=260)

query()
root.mainloop()
```

5.1 TESTING

Test Case: 1

```
int fact() {

   int n; long factorial = 1.0;
   cin >> n;
   if (n < 0)

      cout << "Error!";
   else {
      for(int i = 1; i <= n; ++i) { factorial *= i; }

      cout << "Factorial of " << n << " = " << factorial;}
   return 0;}
```

Output:

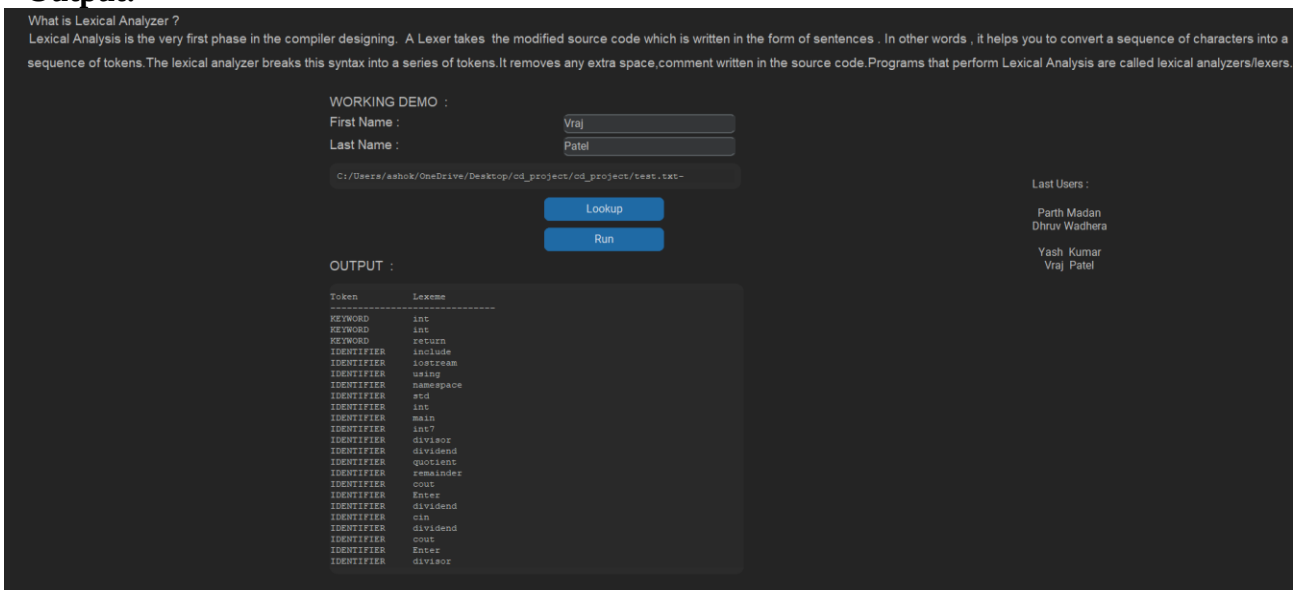


Fig 5.1.1

Test Case: 2

```
#include <iostream>
using namespace std;

int main()
{
   int divisor,
dividend, quotient,
remainder;

   cout << "Enter
dividend: ";
   cin >> dividend;

   cout << "Enter
divisor: "
   cin >> divisor;

   quotient =
dividend / divisor;
   remainder =
dividend % divisor;

   cout << "Quotient
= " << quotient <<
endl;
   cout <<
"Remainder = " <<
remainder;

   return 0;
}
```

Output:

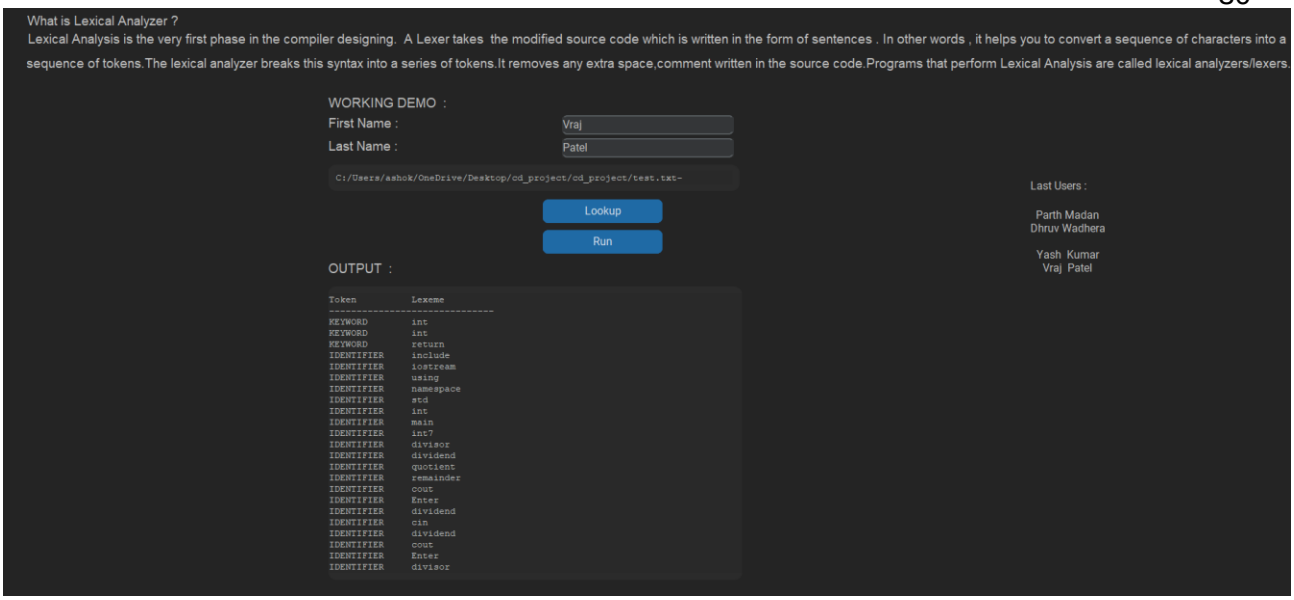
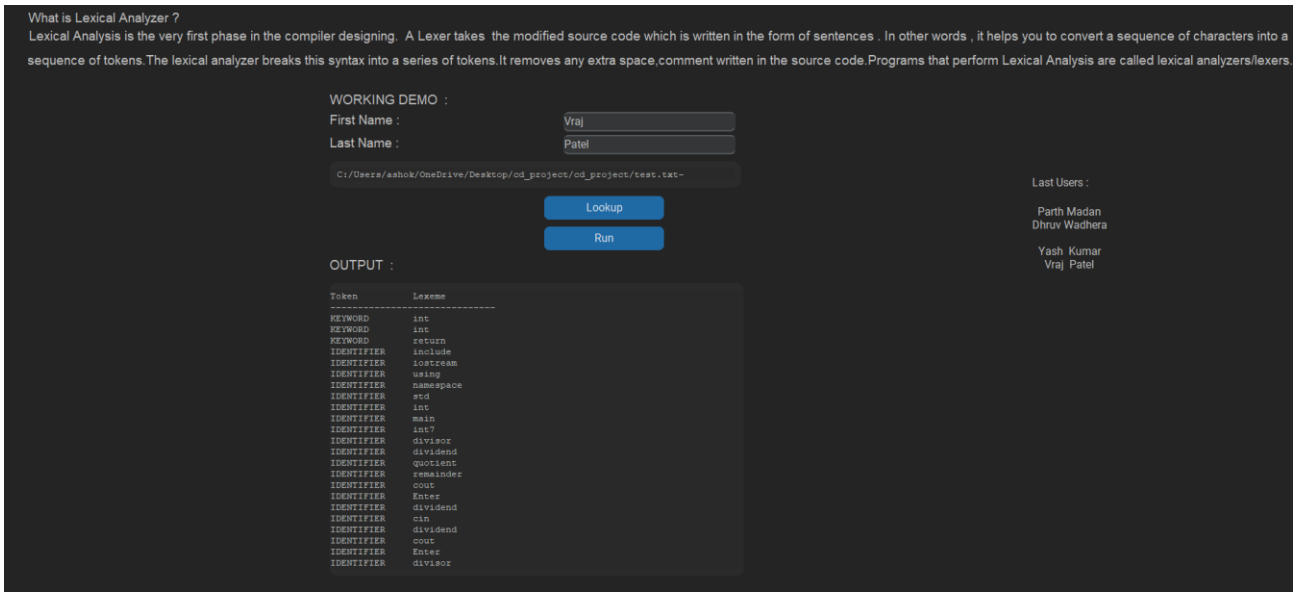

What is Lexical Analyzer ?
Lexical Analysis is the very first phase in the compiler designing. A Lexer takes the modified source code which is written in the form of sentences . In other words , it helps you to convert a sequence of characters into a sequence of tokens.The lexical analyzer breaks this syntax into a series of tokens.It removes any extra space,comment written in the source code.Programs that perform Lexical Analysis are called lexical analyzers/lexers.
WORKING DEMO :
First Name :
Vraj
Last Name :
Patel
C:/Users/ashok/OneDrive/Desktop/cd_project/cd_project/test.txt-
Lookup
Run
OUTPUT :
Token Lexeme
KEYWORD int
KEYWORD int
KEYWORD return
IDENTIFIER include
IDENTIFIER iostream
IDENTIFIER using
IDENTIFIER namespace
IDENTIFIER std
IDENTIFIER int
IDENTIFIER main
IDENTIFIER int7
IDENTIFIER divisor
IDENTIFIER dividend
IDENTIFIER quotient
IDENTIFIER remainder
IDENTIFIER cout
IDENTIFIER Enter
IDENTIFIER dividend
IDENTIFIER cin
IDENTIFIER dividend
IDENTIFIER cout
IDENTIFIER Enter
IDENTIFIER divisor
Last Users :
Parth Madan
Dhruv Wadhera
Yash Kumar
Vraj Patel

Fig 5.1.2

CHAPTER 6

OUTPUT & RESULT

6.1 Output:



6.2 RESULT

The Result component in our lexical analyzer project is responsible for displaying the output of the analysis process. It takes two props - tokens and errors - which are arrays of token objects and error messages, respectively.

When the component receives these props, it first checks if there were any errors during the analysis process. If so, it renders each error message as a list item with a red color and bold font for better visibility.

If there were no errors, the component renders the tokens as a table with columns for the token type, lexeme, and line number where the token was found. Each row of the table represents a single token object from the tokens array, and the table is dynamically generated based on the size of the array.

To make the token table more user-friendly, we also added a hover effect that highlights the row when the user hovers over it with their mouse. Additionally, we added pagination to the table to ensure that it doesn't take up too much screen space and is easy to navigate.

Overall, the Result component is an essential part of our lexical analyzer project as it provides a clear and easy-to-read output for the analysis process. By displaying any errors or warnings and organizing the tokens into a table, users can quickly understand the results of the lexical analysis and use it to further develop their compiler.

CHAPTER 7

CONCLUSION

7. CONCLUSION

In conclusion, the lexical analyzer project successfully developed a Python script to perform lexical analysis on source code files. The project aimed to analyze and extract tokens from the input code, identify their types, and generate meaningful output. The project utilized the regular expression module in Python to define patterns for different types of tokens.

Through the implementation of the lexical analyzer, it was demonstrated that the script could effectively process source code files, tokenize the input, and categorize the tokens into different classes such as keywords, identifiers, operators, and literals. The output of the lexical analyzer provided valuable information about the structure and components of the source code.

The project's approach of using regular expressions and Python programming language proved to be efficient in achieving the desired functionality of lexical analysis. It offered flexibility and extensibility, allowing for easy modification and adaptation to different programming languages or specific requirements.

Overall, the lexical analyzer project successfully fulfilled its objectives of developing a functional and adaptable script for analyzing source code. It provides a solid foundation for further enhancements and integration into more comprehensive programming language processing systems.

CHAPTER 8

REFERENCES

8. REFERENCES

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