AUTOMATA PROJECT REPORT
TOPIC: MULTI CHANNEL PDA COUNTER

SUBMITTED BY:

WARIHA ASIM SHEIKH (65914)

MADIHA M.SHAHID (65889)

CLASS ID: 118692

SUBMITTED TO:

MISS MISBAH ANWER

DEPARTMENT OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE (BSCS)

SUBMITTED TO THE FACULTY OF COMPUTING,KARACHI INSTITUTE OF ECONOMICS AND TECHNOLOGY

1. Introduction:

Pushdown Automata (PDA) is a type of automata that uses stack for memory. It makes learning easy. Our project **Multi-Channel PDA Counter** is based on Python and Tkinter.

In this tool user can view real time:

- How states are changed
- In stack how push operations are performed and stack becomes empty after reset
- What is counter behavior

In our project there are:

- 3 separate counters (A,B,C)
- Data is saved in JSON file
- Current state and stack are shown
- It receives notification on Target

This project explains practical form of Theory

2. Related Work:

Previous PDA tools can only check whether string is accepted or rejected, and visualization is also limited.

Search and other tools often check

- How PDA explains context-free grammar
- It helps in tracing transitions in stack.
- Use Python and GUI tools.

But, multi-channel, persistent PDA found very less.

In our project:

- we have three independent counters.
- Data is saved in the middle of sessions.
- Real-time visualization is implemented.

Through our project, learning became more interactive.

3. Methodology:

The project was implemented in Python using the concepts of oop.

For every channel the system stores:

- counter value
- stack
- current state (q0, q1, qf)
- last input

The Function ChannelCounter behaves like PDA
The Function increment() handles push and Transitions
The Function reset() clears stack and returns back to q0

In Tkinter Gui:

- It shows label state and Stack
- Increement and reset is implemented with the help of Button.
- Start screen continue or start new session

When Target is completed notification is pop up also sound is enabled.

4. Experiment and Results:

The project is tested through different cases:

- continuous counting
- reset button
- resuming the program after coding.

Following are the results:

- All channel works independently.
- State Transaction follows correct logic.
- Stack is updated correctly.
- Data is saved in JSON file.
- Notification pop-ups work correctly.

Conclusively, our project shows PDA concepts clearly.

5. Conclusion:

Multi-channel PDA counter makes PDA theory an interactive tool.
The student can easily understand stack-based memory and state transitions.

In future, we can implement:

- custom PDA rules
- animations
- and more advanced features can be added.

6. References:

- TutorialsPoint : Pushdown Automata
  https://www.tutorialspoint.com/automata_theory/pushdown_automata.htm
- GeeksforGeeks : Pushdown Automata and Implementation Concepts
  https://www.geeksforgeeks.org/pushdown-automata/
- Academic discussions and tutorials on PDA simulation tools