

# CST4L: CS PROFESSIONAL TRACK

CODE: 4383 BS COMPUTER SCIENCE PS204

## LabActivity2\_NFA:

```
package LabActivity;

import java.util.*;

public class LabActivity2_NFA {

    private Map<String, Map<Character, Set<String>>>> transitions;
    private String startState;
    private Set<String> acceptanceStates;

    public LabActivity2_NFA() {
        transitions = new HashMap<>();
        acceptanceStates = new HashSet<>();
        buildNFA();
    }

    private void buildNFA() {
        startState = "q0";
        acceptanceStates.add("q2");

        // q0 Transition
        Map<Character, Set<String>> q0Trans = new HashMap<>();
        q0Trans.put('a', new HashSet<>(Arrays.asList("q0", "q1"))); //
non-deterministic: stay or move
        q0Trans.put('b', new HashSet<>(Arrays.asList("q0")));
        transitions.put("q0", q0Trans);

        // q1 Transition
        Map<Character, Set<String>> q1Trans = new HashMap<>();
        q1Trans.put('a', new HashSet<>(Arrays.asList("q0", "q1")));
        q1Trans.put('b', new HashSet<>(Arrays.asList("q0", "q2")));
        transitions.put("q1", q1Trans);

        // q2 Transition
        Map<Character, Set<String>> q2Trans = new HashMap<>();
        q2Trans.put('a', new HashSet<>(Arrays.asList("q2")));
        q2Trans.put('b', new HashSet<>(Arrays.asList("q2")));
        transitions.put("q2", q2Trans);
    }

    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        LabActivity2_NFA nfa = new LabActivity2_NFA();
    }
}
```

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```
while (true) {
    System.out.println("\n---NFA String Acceptance Checker---");
    System.out.print("Enter a string (or type 'exit' to quit): ");
    String input = scan.nextLine();

    if (input.equalsIgnoreCase("exit")) {
        System.out.println("Program terminated.");
        break;
    }

    if (!nfa.isValidInput(input)) {
        System.out.println("Error: Invalid input! Please enter only 'a'
and 'b' characters.");
        continue;
    }

    boolean accepted = nfa.simulateQueue(input);
    System.out.println("Output: " + (accepted ? "Accepted" :
"Rejected"));
}

scan.close();
}

public boolean simulateQueue(String input) {
    Set<String> currentStates = new HashSet<>();
    currentStates.add(startState);

    for (int i = 0; i < input.length(); i++) {
        char symbol = input.charAt(i);
        Set<String> nextStates = new HashSet<>();

        for (String state : currentStates) {
            nextStates.addAll(getNextStates(state, symbol));
        }

        currentStates = nextStates;
    }

    for (String state : currentStates) {
        if (acceptanceStates.contains(state)) {
            return true;
        }
    }

    return false;
}
```

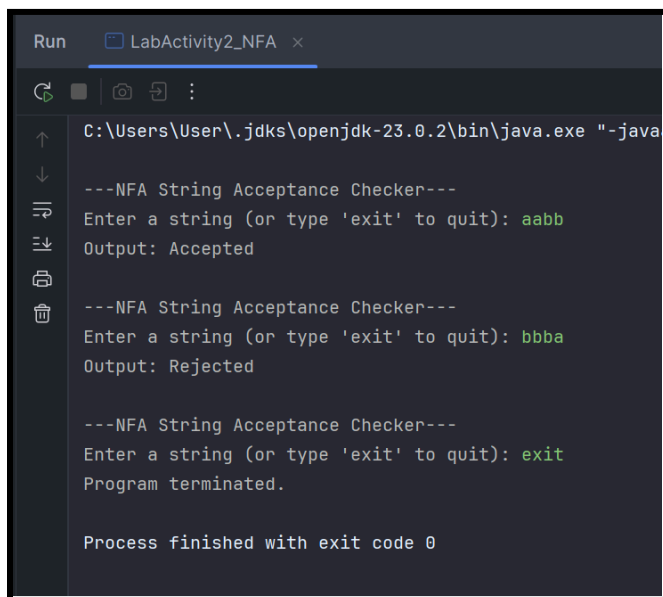
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```
private Set<String> getNextStates(String state, char symbol) {
    if (transitions.containsKey(state)) {
        Map<Character, Set<String>> stateTrans = transitions.get(state);
        if (stateTrans.containsKey(symbol)) {
            return new HashSet<>(stateTrans.get(symbol));
        }
    }
    return new HashSet<>();
}

private boolean isValidInput(String input) {
    return input != null && !input.isEmpty() && input.matches("[ab]+");
}
}
```

OUTPUT:

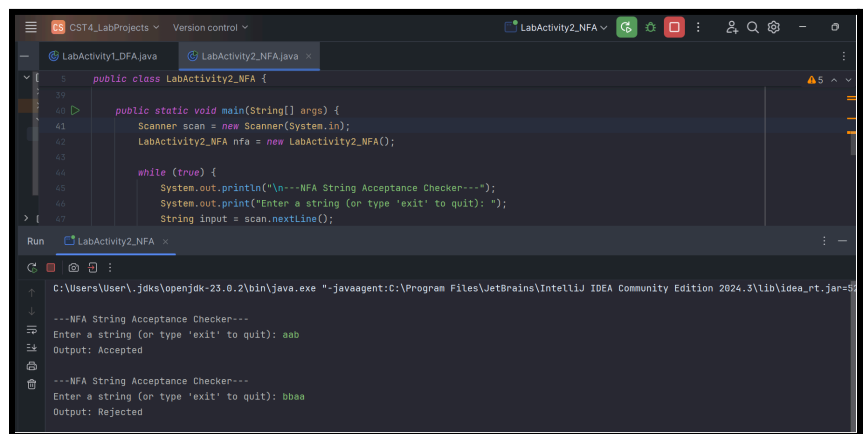


```
Run LabActivity2_NFA x
C:\Users\User\.jdk\openjdk-23.0.2\bin\java.exe "-java
---NFA String Acceptance Checker---
Enter a string (or type 'exit' to quit): aabb
Output: Accepted

---NFA String Acceptance Checker---
Enter a string (or type 'exit' to quit): bbba
Output: Rejected

---NFA String Acceptance Checker---
Enter a string (or type 'exit' to quit): exit
Program terminated.

Process finished with exit code 0
```



```
public class LabActivity2_NFA {
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        LabActivity2_NFA nfa = new LabActivity2_NFA();

        while (true) {
            System.out.println("\n---NFA String Acceptance Checker---");
            System.out.print("Enter a string (or type 'exit' to quit): ");
            String input = scan.nextLine();
        }
    }
}
```

```
Run LabActivity2_NFA x
C:\Users\User\.jdk\openjdk-23.0.2\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2024.3\lib\idea_rt.jar=8
---NFA String Acceptance Checker---
Enter a string (or type 'exit' to quit): aab
Output: Accepted

---NFA String Acceptance Checker---
Enter a string (or type 'exit' to quit): bbaa
Output: Rejected
```