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**NEW YORK INSTITUTE OF TECHNOLOGY**

CSCI-610 – Theoretical Concepts in Computers and Computation (FALL 2023)

**Snake and Ladders Game Project**

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**Introduction:**

Snakes and Ladders is a Indian board game which today is considered a world classic game. A minimum of two players and a minimum of four people can participate in this game. There are snakes and ladders across the board connecting the classes. Players roll a die, which when rolled will flip and produce a random output from the set of {1,2,3,4,5,6} and move it across the board.

Going down the ladder moves the player forward to a square up the board, while landing on the snake means moving onto the previous four levels. For the player, the game begins when a six (1) is rolled on the dice from the dice values. Rolling a six also gives the player another chance to roll the dice again. Once player 1 (p1) from the players set has rolled a dice, then it will be player 2’s turn to roll (p2) dice, following the same rules.

When a snake obstacles appears, the player will move back several rows/sections, while a stair allows the player to move forward several rows/sections. Goal of the game is for the player to reach the 100th piece first

The goal of the game is to reach the final four. The game is based on fun, and it’s a race that kids love.

A screenshot of a game

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**Design and Implementation:**

Computational theory when they are integrated with the Game Theory there will be a great advancement in the field of Computer Game design that works on computer ,android games or let's say any game. Computational and automata tools may play a significant role in the design and development of game theory.

In this project we used Java Programming language to implement the game. When the user starts the game, It will have 4 players considered for the game. The one who throws a 1 on dice will enter the game first and it applies for the rest of the players too. Then as the game progresses. The players score can be visible on the right side of the panel.

We also have a alert giving functionality when a player is eaten by snake or when a player climbs on to the ladder. A restart button is included at the bottom of the panel, as the players can restart a fresh game at anytime.

A diagram of a computer program

Description automatically generated with medium confidenceWe implemented the game using Java and JavaFX. Initially we have all the structure of board built using javafx and we have a empty JLabel placed at each of the block. So whenever a place throws a number through dice. The image of the player coin will be updated in the blocks JLabel space. We have event listeners for rolling a dice and restarting the game.

**NFA Diagram:**

A diagram of a circuit

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**Limitations:**

Machines can solve a few computer problems, such as can be expressed in regular language. The problems which involve more complexity may be having some dynamic inputs and outcomes, that cannot be solved.

If the size of needed features increase it becomes more complex to built the systems using the automata. It also does not provide any proper error handling to resolve the issues. It is also not adaptive to use the model in all the situations, it requires a lot of changes to adapt to a environment structure.  
  
The model produced by the Automata are not real-world models. When a real-world model is drawn out will have more issues coming into picture.

**Challenges:**

We have faced challenges during building the base part of the board as we have the images to be placed on the board in the appropriate positions, which involves finding the pixel height and width of the screen everytime to place a element.

We also faced a issue to move the player coin image based on the dice input. As we have to delete it from a position and then update the JLabels of the other position. Simulating the rolling of a dice and implementing snakes and stairs work also became challenging as the number of players increased.

**Conclusion:**

In conclusion, our snakes and ladders project was a valuable learning experience. we successfully completed the project with all the required functionalities. But we missed few implementations as part of storing the data of players to a database and also had few challenges in designing the game concept.

Throughout the project, we gained a solid understanding of how theory of computation works in game designing and how it is built in a programming language like Java. We encountered various obstacles during the implementation of the snakes and ladders game, especially for board design layout. We overcame these challenges by consulting textbooks and external resources.

Overall, we found that building a game using java was an effective way to gain hands-on experience in building game using automata theory. We are proud of the knowledge gained from this project and will use this knowledge to improve our programming skills in the future.

**References:**

<https://medium.com/@greekykhs/how-to-implement-snakes-and-ladders-using-java-93147be2ab86>

<https://medium.com/@mmanalwar/automata-theory-limitations-and-applications-c58a2fd01150#:~:text=Limitations%20of%20Automata%20Theory&text=These%20machines%20can%20only%20solve,be%20solved%20by%20these%20machines>.