# SNAKES AND LADDERS (Using FSM/Pygame)

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## Introduction:

Snakes and Ladders is a classic board game that involves the players moving their pawns on the basis of die throws. If a snake head is encountered, the player's progress is reset until the tail of the snake. Conversely if the player encounters a ladder's base, they climb up until the head of the ladder. The end objective however is to reach the final tile with valid die throws.

This FPGA project combines hardware design with Python to create a Snake and Ladders game using a Finite State Machine (FSM) and Pygame. Verilog code handles the game's main logic, like rolling the dice, updating player positions, and managing events like climbing ladders or sliding down snakes. The FSM defines different game stages to ensure smooth progression. Pygame is used to display the game board, player positions, and updates. Python reads a dynamically updating text file where FSM writes state values. The game window reflects these changes in real-time.

In our project, the user will be able to trigger random integer inputs to simulate throwing of dice and can play a single player version of the classic snakes and ladders game.

## Objective:

To simulate a snake and ladders game using verilog FSM logic and an interactive pygame window.

## Methodology:

The Snake and Ladders game is designed using an FPGA with a Finite State Machine (FSM) model, incorporating states such as Idle, Dice Roll, Player Move,

Ladder Climb, Snake Slide, and Win Condition. The design approach is structured as follows:

- **State Diagram Design**: Define the states and transitions based on player actions like dice roll, movement, and interaction with snakes and ladders.
- **Verilog Implementation**: Write the FSM in Verilog, describing each state and its transitions based on inputs like dice roll and player position.
- **Simulation and Verification**: Simulate the Verilog code to verify the accuracy of the FSM design and ensure correct gameplay behavior.
- **Pygame Interface**: Use Python and Pygame to display the game board and dynamically update the player's position based on FSM outputs.

**Resources Used** :

Software: Microsoft VScode,Python (v3.10)

Concepts Used: Finite State Machines (FSM), Verilog HDL.

**Expected Results:**

- **Functional State Transitions:** Smooth transitions between defined states, such as dice roll, player move, and interactions with snakes and ladders, based on player actions.
- **Input Handling:** Accurate handling of inputs like dice rolls and player decisions, ensuring correct movement and game progression.
- **Output Generation:** Successful display of player positions, correct movement on the board, and real-time updates of game status (e.g., player reaching the end or encountering a snake/ladder).

**Conclusion:**

This project demonstrates how FSM concepts can be effectively used to design interactive games like Snake and Ladders on an FPGA. By implementing the FSM in Verilog and simulating it using Vivado, we aim to create a reliable system that accurately tracks player progress and updates the game state. This project bridges the gap between theoretical FSM design and practical FPGA applications, enhancing our skills in hardware description language (HDL) programming and simulation tools while integrating hardware and software for an engaging user experience.