PCS-2 Project Report
Tic-Tac-Net

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Introduction:
Tic-Tac-Net combines the classic Tic-Tac-Toe game with socket programming. This project also uses the concept of virtualization. The game allows two players to play against each other over a network, with one player acting as the server and the other as the client.

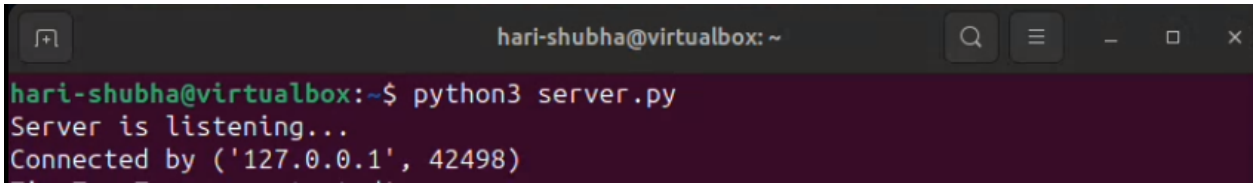
Key Features:
1. Implementing Virtualization using VirtualBox.
2. Socket Programming
3. Pygame for implementing the Tic-Tac-Toe game

Implementing Virtualization:
- Oracle VM VirtualBox is used to create a Virtual Machine on the host OS, which is MacOS 13.4 in this case.
- The guest OS, which is the OS running inside the virtual machine is Ubuntu 23.1
- Virtual Machine(VM) : This is a special environment that Oracle VM VirtualBox creates for the guest OS while it is running. In other words, the guest OS runs on the Virtual Machine.
- The ‘server.py’ script runs on the Virtual Machine, independent of the host OS.
- The steps mentioned in the VirtualBox user manual are used to create the virtual machine.

Socket Programming

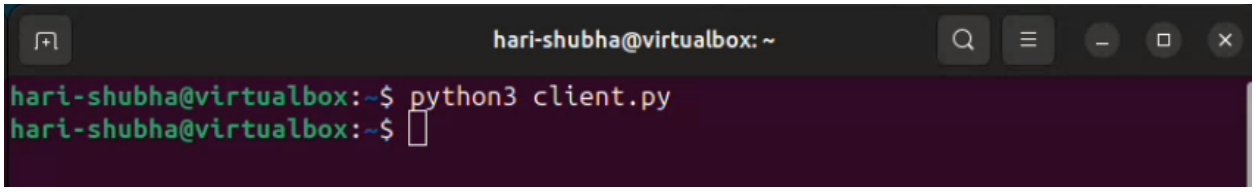
Server:

- The server script initializes a TCP/IP socket using `socket.socket(socket.AF_INET, socket.SOCK_STREAM)`.
- It binds the socket to the host address ('0.0.0.0') and a specified port (e.g., 12345) using `server_socket.bind((HOST, PORT))`.
- The server listens for incoming connections using `server_socket.listen(1)`.
- When a client connects, the server accepts the connection with `server_socket.accept()`.
- Upon connection, the server receives data from the client using `client_socket.recv(1024).decode('utf-8')`.
- If the received data is '`run_game`', the server initiates the Tic Tac Toe game by running `tic_tac_toe.py` using subprocess.
- After processing client requests, the server closes the connection with `client_socket.close()`.



Client:

- The client script creates a TCP/IP socket to connect to the server using `socket.socket(socket.AF_INET, socket.SOCK_STREAM)`.
- It connects to the server's address and port using client_socket.connect((SERVER_HOST, SERVER_PORT)).
- The client sends a request ('run_game') to the server using `client_socket.sendall('run_game'.encode('utf-8'))`.

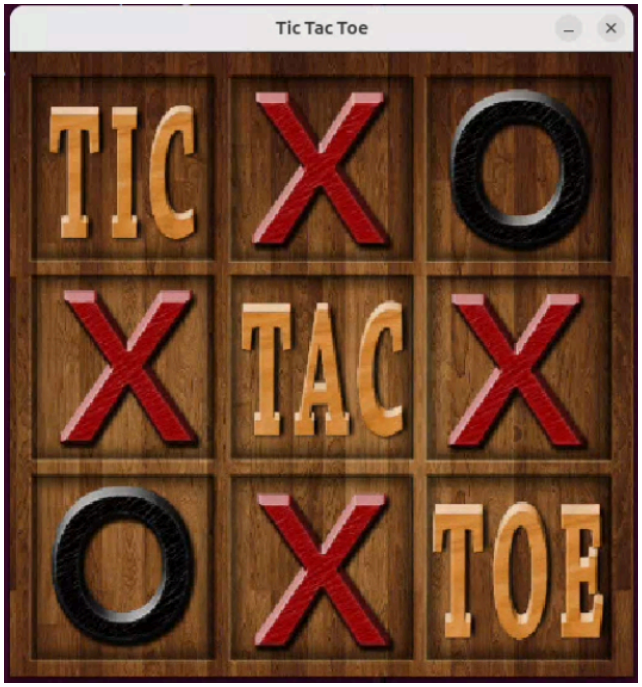


Tic-Tac-Toe implemented using Pygame

- The script initializes the game window using Pygame with grid lines and player symbols (X and O).

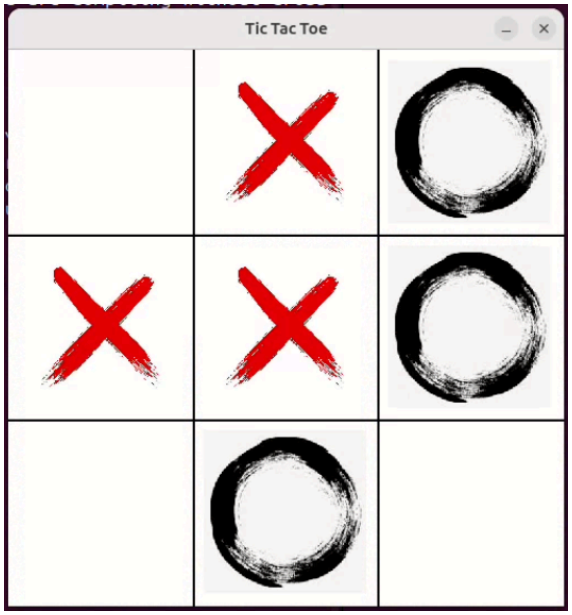
- It also handles player interactions by capturing mouse clicks to place X or O on the board.
- It checks for a win or draw condition after each move and displays the result on the screen.
- Images for X and O symbols ('x.png' and 'o.png') and a cover image ('cover.png') are utilized for display purposes.

Interface:

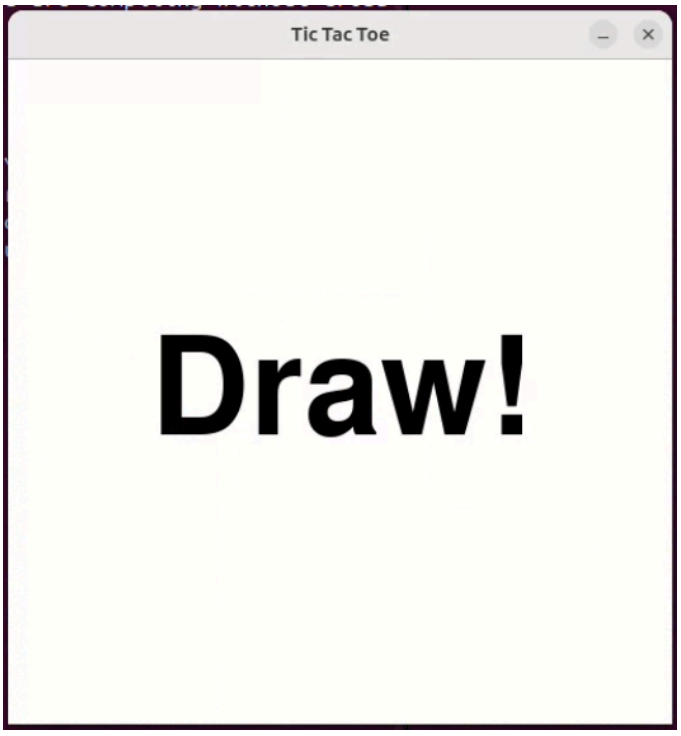


Winning message: (If ‘X’ wins)

Playing interface :



Draw message:



Winning message: (If ‘O’ wins)

References:

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- https://realpython.com/pygame-a-primer/
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- https://realpython.com/python-sockets/?authuser=1
- https://www.geeksforgeeks.org/socket-programming-python/