

Chess is a two-player game with special rules to be followed. The project is primarily a 1 vs. 1 chessboard; player 1 is the human, and player 2 is a 4-Degrees Of Freedom (DOF) robotic arm capable of moving pieces across the table, capturing the opponent's (human's) pieces, and retrieving its pieces upon reaching the other end of the chessboard, requiring no human assistance.

We acknowledge that this project has been attempted before; however, ours is executed differently in several ways as follows: A custom Object Detection Model (ODM) is built for this project using nearly 10K images as a dataset. The model will be aided by the Luxonis OAK-D camera, in addition to an array of sensors (to be determined) specifically used for retrieving pieces that belong to the robotic arm if the pawn reaches the other end of the board. The arm will be composed of multiple stepper and servo motors, allowing it to move in three dimensions. Additionally, it will have obstacle detection sensors (such as ultrasonic, infrared transmitters, and receivers) to prevent interference with the camera. Pressure sensors will allow the system to shut down in the event of the player leaving the game. Finally, a dedicated control panel will give the player commands and control over the system. Some of these commands could be executed using voice control, aided by specific voice detection modules.

The main microcontroller will be a System On Chip (SOC) Raspberry Pi; it will be required to connect the camera and house the ODM; and a secondary microcontroller will be necessary to control the motors operating the robotic arm, modules, and the sensors that complement the project.