User Requirements

End User:

1. The robot should accurately detect the boundaries, orientation, and position of the chessboard.
2. The robot should correctly recognize the letters and numbers on the board (mapping the board with letters and numbers).
3. The robot should accurately detect the checkered pattern on the board and map it using the recognized numbers and letters.
4. To verify the accuracy of specific moves, the robot should correctly distinguish and classify the colors of the squares that form the checkered pattern on the board.
5. It should identify the types of chess pieces and assign the appropriate moves to each piece type.
6. To ensure accurate moves and track move accuracy, the robot should differentiate the colors of the chess pieces and correctly classify them according to their colors.
7. For a seamless and smooth game experience, the robot should know the movement patterns of each piece and use them correctly.
8. The robot should be able to hold and place chess pieces independently to provide a good partnership to the user.
9. The device setup and preparation for the game should be simple and easy, allowing users to start the game quickly without dealing with technical details or complex steps.
10. It should be supportive and instructive for beginners, identifying incorrect moves, giving warnings, and suggesting possible moves.
11. The robot should be portable, enabling users to use it in different locations and take it with them on travels if necessary.
12. It should be storable, allowing users to place it in a box or cabinet when not in use to save space.
13. The robot should be easy to maintain, enabling users to quickly perform checks without needing technical expertise.
14. It should be budget-friendly, making it accessible to people from all walks of life as a hobby tool.
15. The robot should be durable against impacts and falls that may occur during daily use, providing a sense of security to the user.
16. It should be suitable for children, with an interface and control system that does not include complex structures they cannot understand.
17. The robot should offer a safe experience. It should not contain sharp edges or pointed parts that could cause injuries, and it should be designed to avoid damage to the user or surrounding objects in case of potential collisions. Proper electrical insulation should be ensured, avoiding issues like overheating and noisy operation.

Shipping and Storage Companies:

1. The product should be lightweight, making it easy for shipping and warehouse personnel to carry.
2. It should have a compact design, reducing costs in shipping and storage processes.
3. The robot should be impact-resistant, able to withstand minor collisions during transportation.
4. The packaging should facilitate easy storage and transport.

Sellers/Distributors:

1. The product should be marketable and competitive with similar products.
2. It should have a design and presentation that captures customers' interest.
3. It should offer different features that convince the customer.
4. The product should be reasonably priced and seen as an affordable option for customers.

Environmental Concerns:

1. The device should be made from recyclable or biodegradable materials.
2. It should not contain toxic substances or inhibitors that could harm ecosystems.
3. Rechargeable batteries or direct power connections should be preferred to avoid waste battery generation.
4. The product's packaging and protective equipment should be made from recyclable or biodegradable materials.
5. The product should not consume unnecessary power.
6. The device's parts should be repairable and replaceable, preventing the entire device from becoming waste due to minor regional damages.

Objectives

Chess Playing:

* The robot should accurately detect the boundaries, orientation, and position of the chessboard and distinguish it from surrounding objects and the surface it is on.
* It should correctly recognize the letters and numbers on the board.
* The robot should accurately detect the checkered pattern on the board and map it using the recognized numbers and letters.
* To verify the accuracy of specific moves, the robot should correctly distinguish and classify the colors of the squares that form the checkered pattern on the board.
* It should identify the types of chess pieces, classify them, and assign the appropriate moves to each piece type.
* To ensure accurate moves and track move accuracy, the robot should differentiate the colors of the chess pieces and correctly classify them according to their colors.
* For a seamless and smooth game experience, the robot should know the movement patterns of each piece and use them correctly.
* The robot should be able to hold the chess pieces independently without damaging them and place them in the appropriate positions.
* It should be supportive and instructive for beginners, identifying incorrect moves, giving warnings, and suggesting possible moves.
* The robot should grasp the pieces without damaging them and place them correctly on the target position or off the board.
* It should detect when a user makes an incorrect move and warn them.
* The robot should have the ability to develop strategies to compete with the user and offer a satisfying experience.
* It should not move too slowly.
* The robot should quickly decide on and execute its moves without making the user wait too long.
* It should keep track of the move order.
* The robot should inform the user after each move.

Ease of Use and Maintenance:

* The robot should be easy to maintain.
* The setup and preparation for the game should be simple and easy, enabling users to start playing quickly without dealing with technical details or complex steps.
* It should have easy setup procedures.
* The robot should be easy to start.
* Broken or faulty components of the device should be easily replaceable, or such services should be provided.

Portability and Storability:

* The robot should have a compact design.
* It should easily fit into its box or a similar space after use.
* The device should be easily portable by a single individual and placeable in a specified position.
* It should be easy for shipping companies to transport.
* The robot should be easy to stack and store in shops or warehouses.
* The device should be sufficiently durable to withstand impacts that may occur during transport, avoiding quick damage and breakage.

Marketability:

* The robot should have a modern and attention-grabbing design/appearance.
* It should be competitively priced.
* The device should offer unique features that make it stand out and introduce new elements.

Safe Operation:

* The device should be electrically insulated and safe.
* It should not contain sharp or pointed parts that could cause injuries.
* Its movement speed should not cause pain upon impact.
* The robot should not collide with or damage surrounding objects.
* It should be easily deactivated with a single button in case of an emergency.
* The robot should not have surfaces that can harm the skin upon contact.

Eco-Friendly Design:

* It should be made of recyclable materials.
* The device should not engage in unnecessary power consumption.
* It should not contain toxic substances or paints.
* The device should be repairable, preventing it from becoming waste due to minor malfunctions.
* It should not cause waste battery generation.