AI CHESS PLAYING ROBOTIC ARM

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Introduction

Nowadays, robots, specifically robotic arms, are being widely used in many different fields. Our project's target was making a chess playing robotic arm that can identify the different types of chess pieces and moves them correctly on the chess board. Chess is a sport actively played by about 2% of the world population [1].

The originality in our project comes from the use of Jetson Nano, a unique software algorithm based on analyzing changes in camera frames of the chess board to let the robotic arm know when its turn is in addition to some security measures such as giving warning signals to the user in case he makes an illegal move.

Overview

The method implemented was detecting and identifying the chess board and chess pieces observed by the camera using jetson nano and playing chess moves by moving the pieces across the board using motors controlled by Arduino UNO. The project cost us about 9000 TL. Main success criteria in our project include:
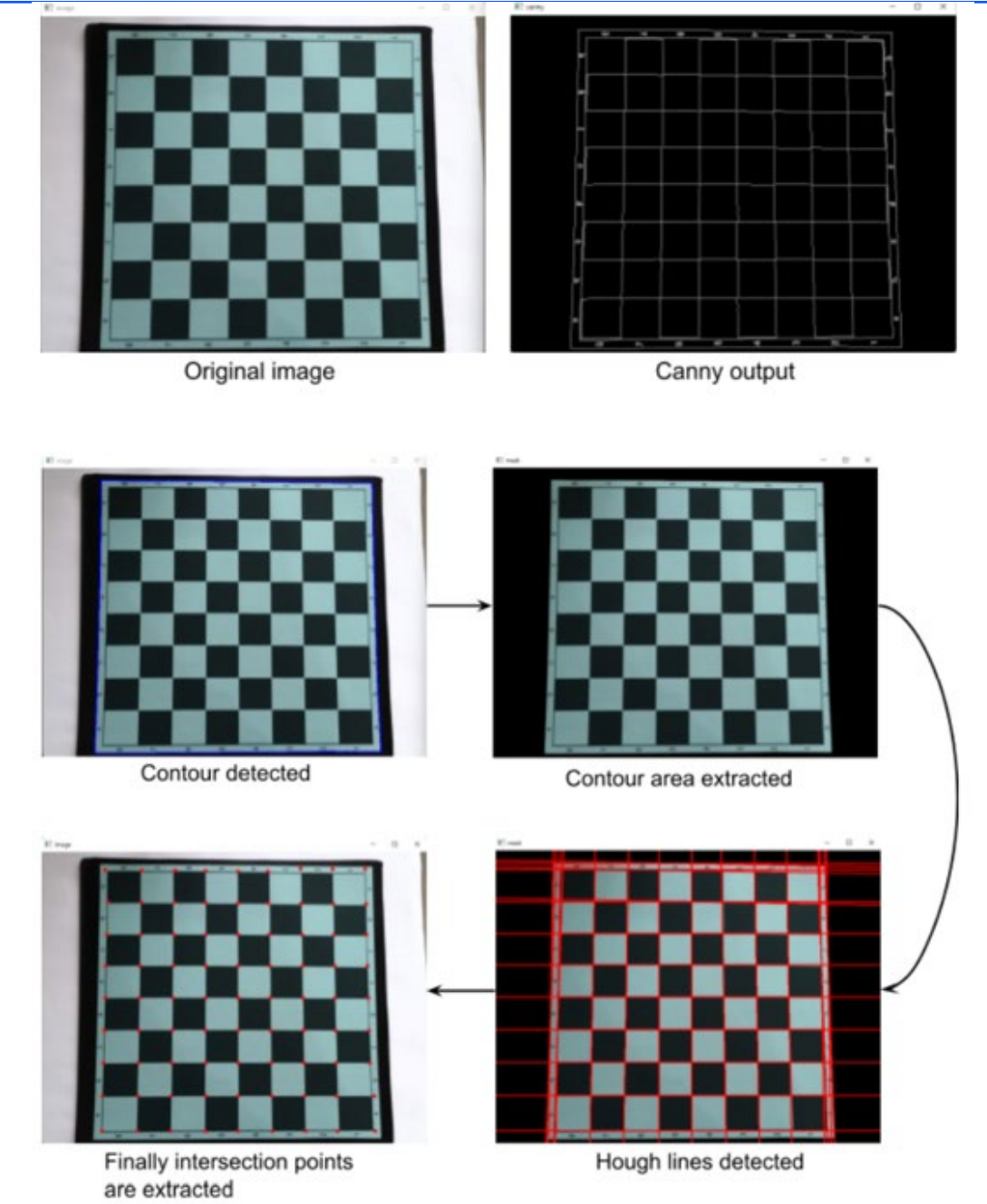- 100% detection accuracy of the chessboard
- 97% detection and identification accuracy of chess pieces (error tolerance of two chess pieces)
- Dropping the chess piece within the boundaries of the square on the chessboard
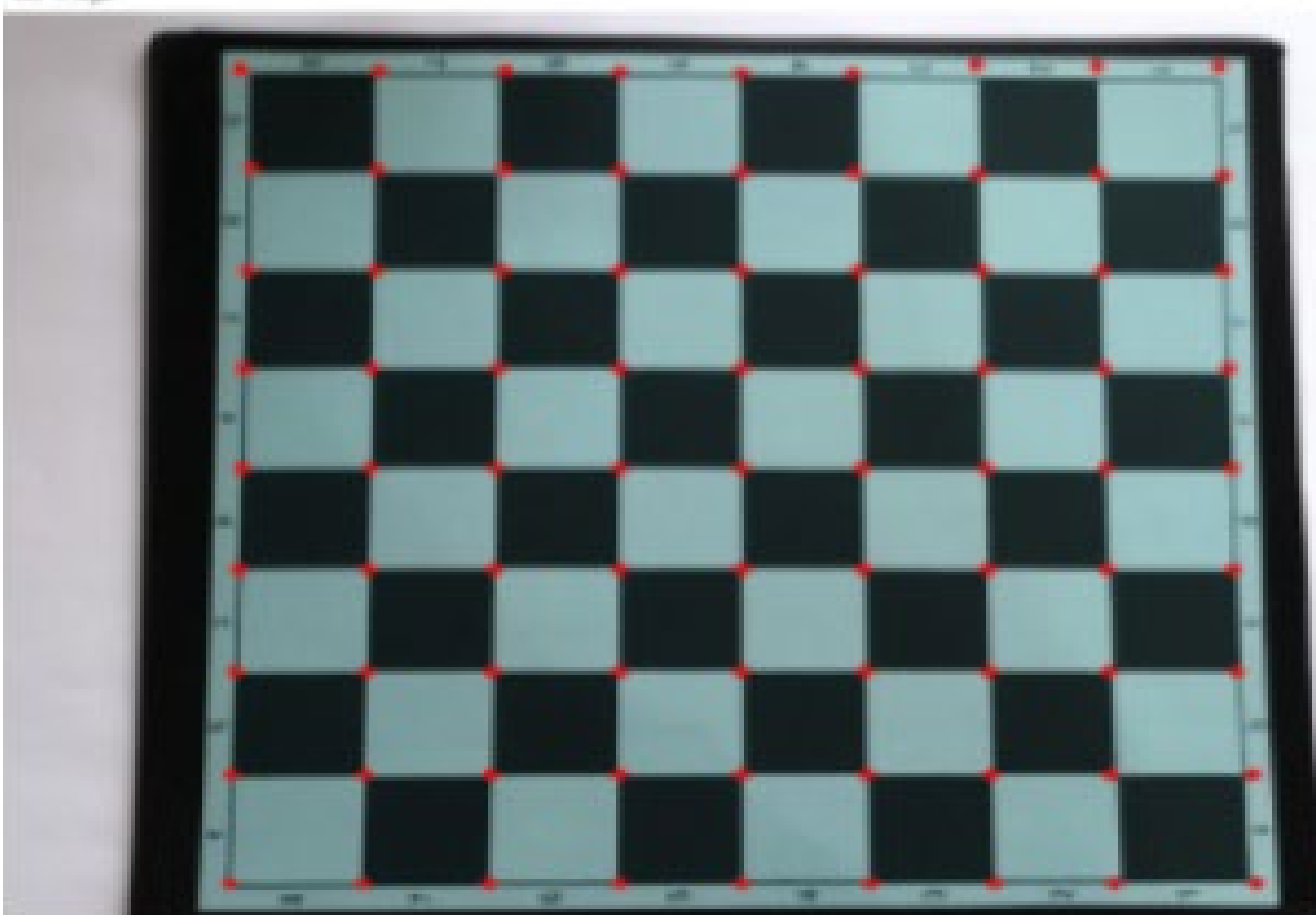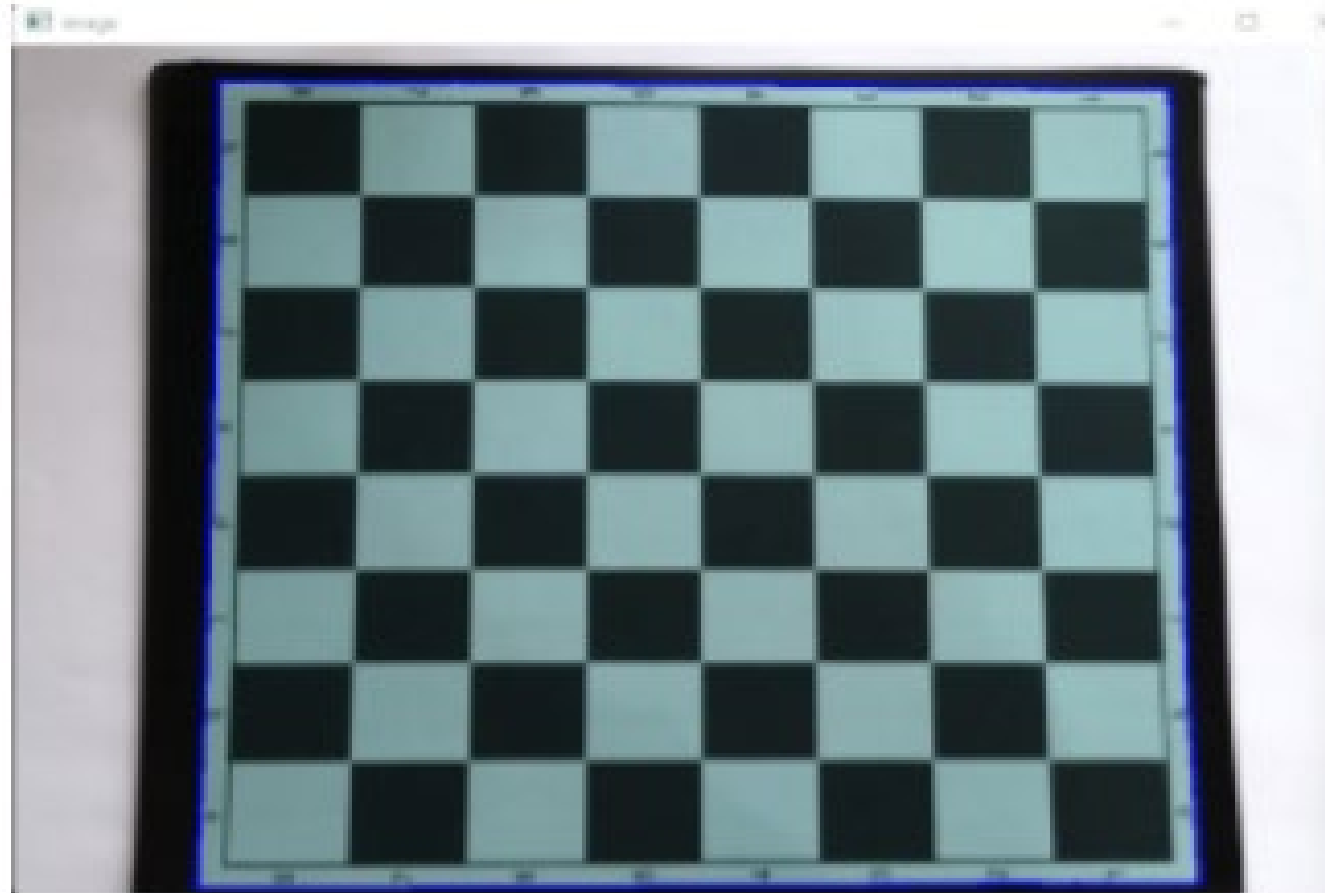
Mathematical Background

Results
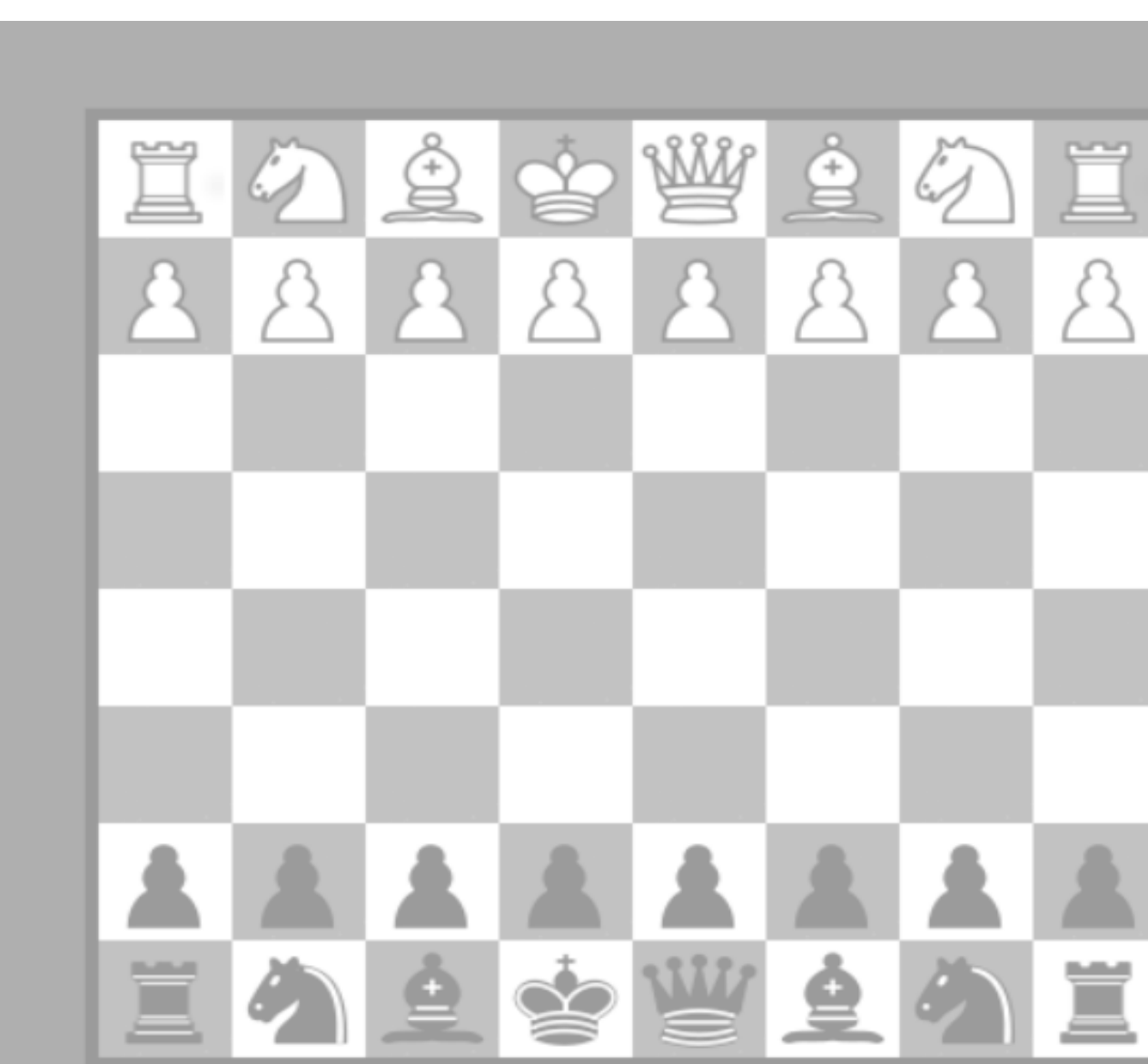
Conclusions

In conclusion, we achieved our goals and objectives concerning this project as we were successful in creating our own chess-playing robotic arm that can play short chess matches with human players. We were also able to achieve the success criteria set for each work package. We achieved the desired high accuracy (100% for the detection of the chessboard and > 97% for the identification of chess pieces) in the software part and regarding the hardware part, our robotic arm drops the chess pieces within the square boundaries of the targeted square. Finally, after completing our project, as mentioned before, it can be used in training chess players. In addition, the design of the robotic arm helps in it being used in labs as an equipment organizer. We are happy to have implemented the idea we had in mind in real life regarding the project of a real chess-playing robotic arm.

References

[1] Keener, G. 2022, June 14. "Chess is Booming". Retrieved October 19, 2022, from https://www.nytimes.com/2022/06/17/crosswords/chess/chess-is-booming.html

[12] Yang, D. 2022 December 4. "Stockfish 15.1". Retrieved October 19, 2022, from https://stockfishchess.org/