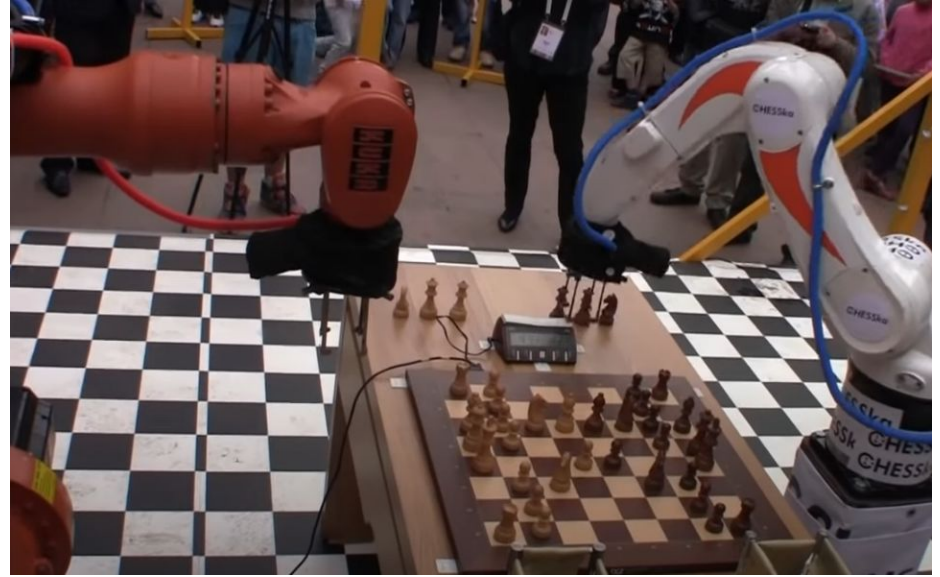


# Tartans Gambit: Design Review

Team E0: Juan Cortes, Luis Ortega, Lillie Widmayer

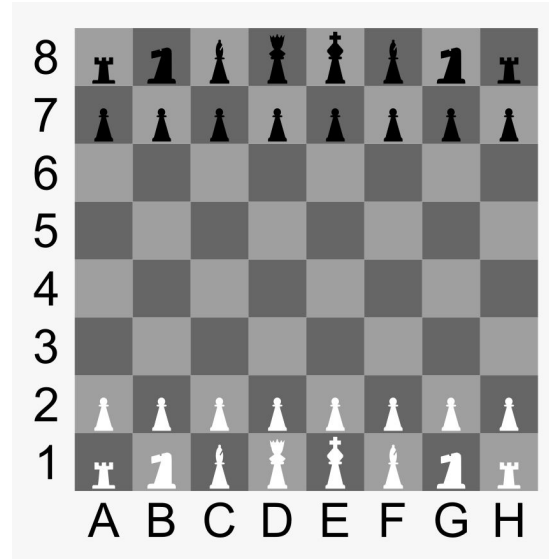
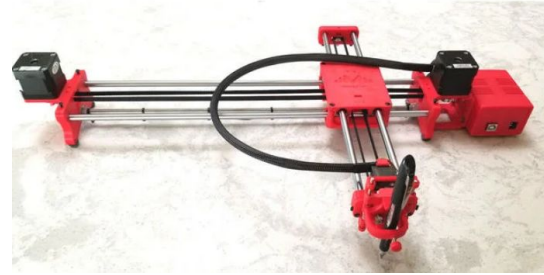
# Application Area

- Physical chess playing experience without the need for physical contact
- Allow chess players to practice specific scenarios and setups

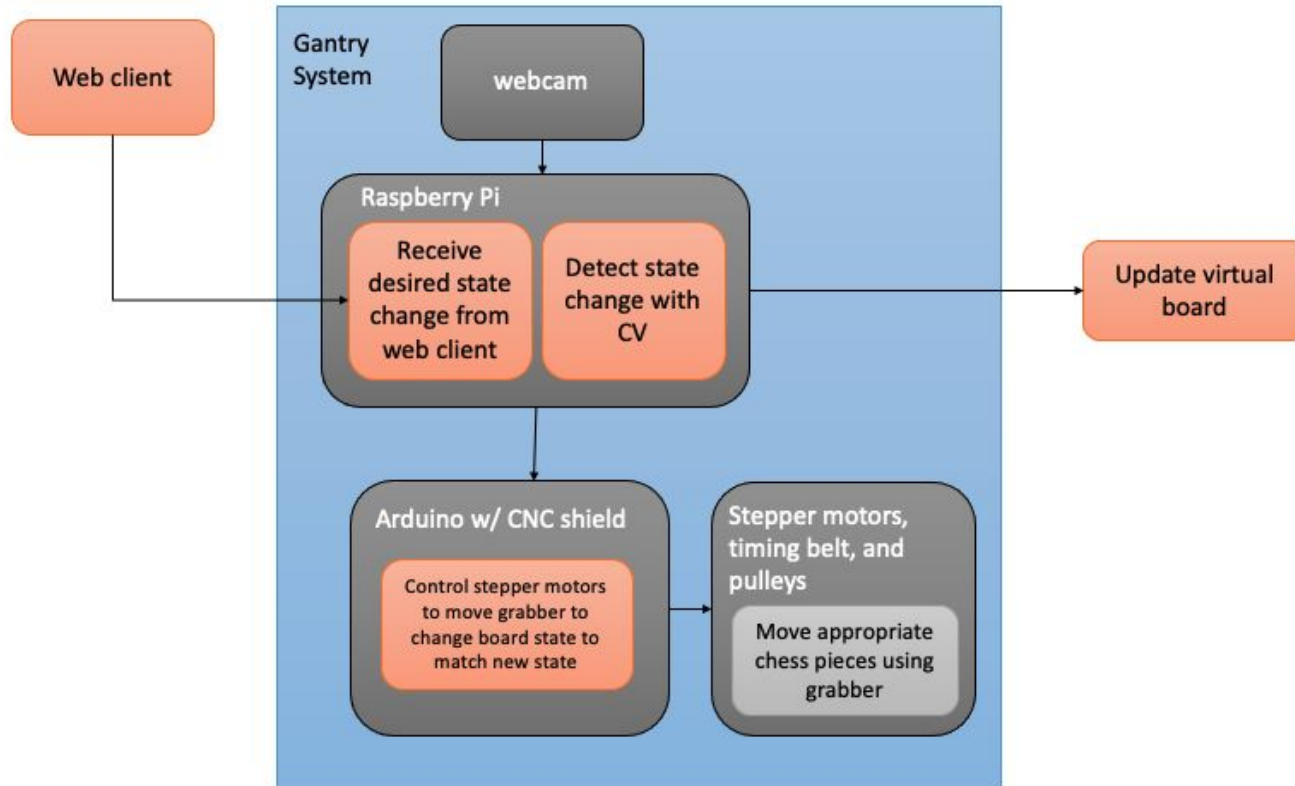


# Solution Approach

- Gantry System
  - 3 Axis Movement
  - Gripper claw
- Board State Detection
  - OpenCV
  - Camera on top of Gantry System
- Web Client
  - User makes move
  - Move is sent to gantry
  - Chess.js for move validation
- Physical Chess Board
  - Custom pieces for easy grabbing
  - 15 in x 15 in board



# System Specification / Block Diagram



# Implementation Plan

## Copying and Assembling

- XY Movement of Gantry

## Buying

- Camera
- Labeled Chess Board

## Downloading

- Chess.js - move validation
- OpenCV - computer vision

## Designing

- Gripper
- Chess Pieces

## Developing

- Web interface
- Board state detection algorithm
- Gantry control software

# Metrics and Validation

## Functionality metrics

CV Detection of square boundaries to ensure that pieces are within squares.

Visual confirmation that only intended pieces are touched.

Visual confirmation that correct piece movement is detected.

Visual confirmation that correct piece is moved by gantry.

We can quantify the data from tests to determine accuracy of piece movement and detection.

## Tests

Manually give position commands to gantry system and ensure that we can move to each square

Manually test grabbing a piece and ensure that piece can be grasped, moved, and dropped on another square

Give web client inputs to move certain pieces, confirm that correct move is done on physical board

Move a piece on the physical board, check web client to verify that the movement was detected and the state updated

## Risk factors

Gripper functionality, gripper design, piece detection

If parts of our design constantly fail we will have to redesign and reprint pieces

