Real time tracking and detection of chess piece movement

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Introduction

- We have developed a chess piece movement detection model which will track and detect chess piece movements and display them in a virtual chess board
- Our aim was to develop a real-time model but we couldn’t complete it in the given span of time.
- We have recorded a part of a chess match and the movements we made in the chess board are tracked and displayed in the virtual chess board.

Approach

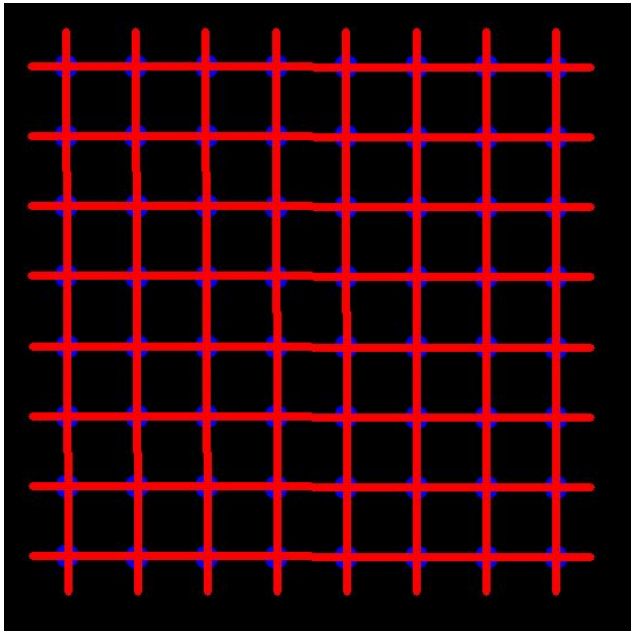
Detection of boundary of the Chess Board

- The initial frame of the match recording is used for boundary detection.
- The reference image is gaussian blurred followed by canny edge detection to detect all the edges.
- The edges are enhanced using dilation followed by thresholding to either 0 or 255.
- The contours having area above a threshold are detected, among which the one with the smallest area corresponds to the chess board boundary.

Approach

Detection of corner, edge and intersection points

- The corner points of the chess board boundary is determined.
- The neighbouring corner points are joined and divided each line into 16 divisions and 17 edge points.
- The even edge points of the divisions of parallel lines are connected.
- The intersection of these parallel lines will be the center points of each cell / grid points.



Approach

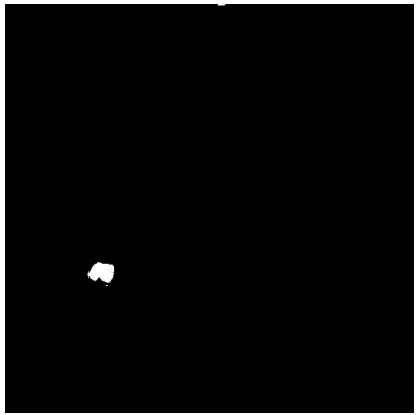
Detection of Stable frames

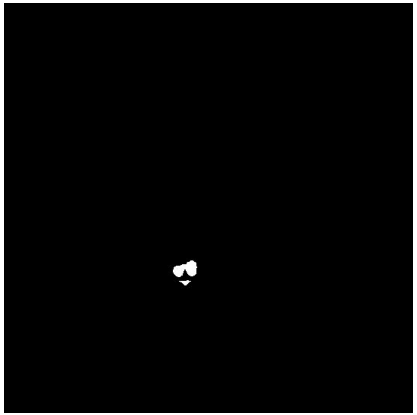
- The area of the chess board boundary in the initial frame is taken as the reference value.
- Traverse through each frame to find the area of contour corresponding to the chess boundary.
- The difference between area of the reference and each frame will be compared to a threshold
- If this difference will be higher than the threshold, it will indicate the presence of hand over the board.
- Consecutive 30 frames without the presence of hand are found, and the middle frame among them is taken as the stable frame.
- This process is repeated till all the frames are traversed..

Approach

Detection of chess piece movement

- The stable frames are gaussian filtered, canny edge detected, dilated and thresholded
- Consecutive stable frames are subtracted from each other and median filtered.
- The center of the biggest contour of the filtered image is identified and mapped to its closest point in the grid.
- The grid points are mapped to a corresponding to column and row index.





Approach

Displaying the movements in Virtual Chess Board

- Each chess piece are mapped to a unique number, which is positive for white piece, negative for black and zero if a cell is empty.
- Images of each pieces are collected which will displayed on the board.
- The movements are updated on the virtual board.