Chinese Chess State Recognition

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1 Introduction

Chinese chess is one of the most popular board games in China. It is a two-player strategy board game set up with 32 chess pieces on a board nine lines wide and ten lines long. The chess pieces are all of the same flat circular disk shape. Each piece is labeled with a Chinese character to represent one of the seven types. The color of the piece indicates the player‘s ownership.

2 Project Goal

The goal of the proposed project is to correctly recognize the state of a Chinese chess game by processing the images captured by the camera of an Android mobile phone. With the essential information extracted from the images, we will be able to save and share the record of a game very efficiently.

3 Work Flow

To reach the goal, we need to detect the chess board, identify the location of each chess piece and recognize the type of the piece.

3.1 Chess Board Detection

To extract an accurate representation of the chess board, the following operations will most likely be applied, edge and corner detection, rectifying the image to a top-down view and line detection.

3.2 Chess Piece Location Identification

Considering the similar disk shape of all the pieces, we can apply morphological operations to identify each chess piece. We can then map the center of the each piece to the closest line intersection on the chess board since all chess pieces are supposed to lie on the intersections.

3.3 Chess Type Recognition

Several studies had been done regarding Chinese chess type recognition. Since the only difference between different chess types is the character printed on the center of the piece. The problem is very similar to a Chinese character recognition problem. Yang and Wang [2001] reported a 3D vector feature extraction method and compared it with the ring projection method. Chen et al. [2011] extracted features by equally dividing the chess piece into 360 circular sectors and computing the mean distances from the contours of the character to the center of the piece in each sector. They also defined the sector with the max distance to be the first sector to achieve rotation invariance. Hu et al. [2009] achieved rotation invariance by transferring the signals into frequency domain and extract only the amplitudes. We will experiment with the methods mentioned above and the ones introduced in class to find a method sufficient to the systems needs.

References

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