AN EVALUATION METHOD FOR POSITIONING USING GEOMETRIC GRAPHS

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Introduction

In game analysis of football, line segments or triangles made by edges linked between players' positions are sometimes used to represent a relationship between players. This paper proposes a game analysis method for positioning using several geometric graphs.

Methods

As a solution of the location problem, geometric graphs such as the Delaunay graph (DG), the Gabriel graph (GG), the relative neighborhood graph (RG) are used [1]. We show the links between players, using such graphs or our original graph called the Dominant graph (DMG). DMG is regarded as a graph reflecting player's velocities, and computed based on the dominant region [2]. Each graph is generated according to player's positions or velocities estimated from a video sequence. It is necessary to distinguish between two teams when making graphs, therefore, the graphs are made against all players without distinction of team, and then only the edges between players belonging in the same team are preserved and the other lines are removed.

Results & Discussion

An example of the generated graphs for an actual football scene is shown in Fig.1. In this figure, three kinds of graph are included, and the thickness of each edge (line) becomes DG > GG > RG. From these graphs, we can observe the strength of link between players or an isolated player. Each line of these graphs is regarded as one of pass courses, and its stability is indicated by the line thickness. Also, by analyzing through the whole game, the player having concentration of lines is regarded as a core player like a game maker, and the pair of players having the frequently connecting line must be the hotline players of the game.

Conclusion

Using several geometric graphs indicating the links between players in the neighborhood, we found that useful information including goodness of positioning, relationship between players and stable pass course can be obtained.
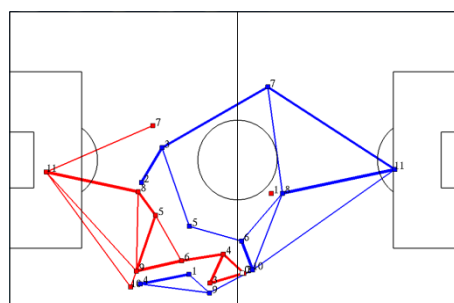

Fig.1. An example of the generated graph

References

1. Okabe, A. et al. (1992). John Wiley & Sons, New York.
2. Taki, T. et al. (2000). *4th Asian Conf. on Computer Vision (ACCV2000)* : 693-698.