

Quantitative Match Analysis of Soccer Games with Two Dimensional DLT Procedures

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INTRODUCTION

Match analysis has been widely executed for soccer games. For many years these analyses were mainly based on "observation sheets" methods, in which a tester took charge of a player to draw his trajectory on a sheet. Ohashi et al (2000) developed a quantitative method for the match analysis using trigonometric surveying with two potentiometers. However, it is not realistic to analyze the movement of all the players in a match, because these methods basically need at least one or two testers for one player. The purpose of this study was to develop a new simple quantitative method for match analysis of soccer games with a single video camera filming.

METHODS

Two-dimensional DLT procedures were used for the calculation of the players' positions, with an assumption that all the players' movement was on the same level ($Z=0$). A game of Japanese Professional Soccer League (J-League, Nagoya vs. Kashima) was filmed with a video camcorder set at the highest point of the audience stand of a stadium. The actual image of the video was shown in Figure 1. Two-dimensional coordinate system was set as shown in the Figure 1 with X and Y axes along the goal line and the touchline, respectively. Twenty-nine points with an already known coordinates on the field, such as the intersection point of a touchline and the center line, were used for the reference points for 2D-DLT calculation. Standard errors for the estimation were $X=0.40\text{m}$ and $Y=0.55\text{m}$. All the players were digitized every 0.5 second (2Hz) throughout the game. Trajectory, distance covered, and running speed were obtained for each player.



Figure 1: Video image and the coordinate system for the analysis

RESULTS AND DISCUSSION

Figure 2 shows moving trajectories of three players (defense=BK, midfielder=MF, and forward=FW) of Nagoya team during 2nd half of the match. The trajectories show the distinctive features of the players and the positions.

Distance covered by each player was obtained every 5 minutes in the 2nd half of the match and the changes are shown in Figure 3 for all the field players of Nagoya team. The average distance covered was 5886m. There was about 4 minutes interruption (29-33 min) over a judgment of a foul. The graph

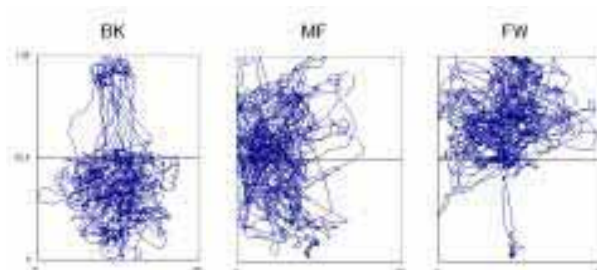


Figure 2: Trajectories of three players with different positions

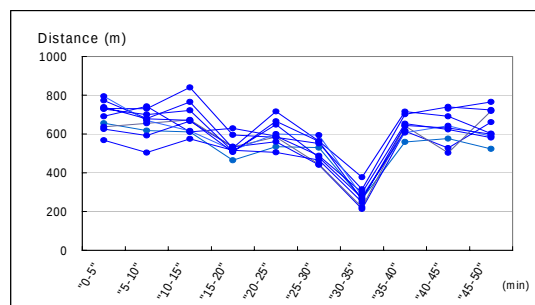


Figure 3: Changes of distance covered of all the players

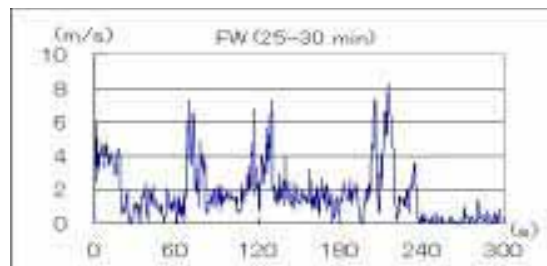


Figure 4: Speed changes of a forward player

well indicates an overall decreasing trend of the running distance with the progress of the match. It also clearly shows a short distance covered for all of the players during the interruption.

Speed changes were calculated from displacement changes for all of the players. Figure 4 shows an example of the speed changes of a forward player for 25-30 minute of the 2nd half. Forwards tended to move faster while their team played offense. Players far from the ball tended to move slower..

CONCLUSIONS

These results suggested useful information could be obtained from individual players' movement with this method. Moreover, team tactics or strategy can be examined because all the players' movement are clarified.

REFERENCES

1. Ohashi, J. et al.: Application of an analysis system evaluating intermittent activity during a soccer match. Science and Football IV, 133-136