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Performance Evaluation of the 2022 FIFA World Cup Teams Using the Measure of Spatial Entropy of Successful Passes

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INTRODUCTION:

In recent years, network science has received increasing attention from the research community to analyze players' performance in team sports. Most studies have focused on analyzing the passing network using various measures of network centrality while ignoring the spatial distribution of passes. The concept of spatial entropy is defined as a measure of the distribution of different elements within a grid area, and it is a direct measure of the level of complexity or disorder of spatial structure. The aim of this study is to evaluate passing performance of players from different positions at the 2022 FIFA World Cup through the measure of spatial entropy.

METHODS:

First, the event data of all 64 matches during the 2022 FIFA World Cup provided by Opta are processed to extract the spatial coordinates of 55887 successful passes. Next, the average spatial entropy of successful pass coordinates is calculated separately for goalkeepers, defenders, midfielders, and forwards. Here, we calculate the spatial entropy by dividing the average nearest neighbor distance by the expected average nearest neighbor distance. The average nearest neighbor distance is the average of the distances of all successful passing points on the pitch and other successful passing points that are closest to each other. The expected average nearest neighbor distance is equal to half of the square root of the area of the pitch divided by the number of successful passes.

RESULTS:

The average values of spatial entropy of successful pass coordinates are 0.32, 0.77, 0.79 and 0.78 for goalkeepers, defenders, midfielders and forwards respectively. Among all teams, Senegal presents the highest spatial entropy of 0.73 per game and Spain has the lowest value of 0.52. Serbian goalkeepers show the highest average spatial entropy of 0.56, and Saudi Arabia has the highest value of 1.10 for defenders. Brazilian midfielders own the highest average spatial entropy of 0.95; while Japan, which upsets Spain and eliminates Germany, has the highest average spatial entropy of 1.16 for its forwards.

CONCLUSION:

The novel findings of this study are that, in the 2022 FIFA World Cup, (I) the goalkeeper passes have the least value of spatial entropy, which is consistent with the finding of a previous study on 2017-2018 La Liga; (II) the defender, midfielder and forward passes have similar values of spatial entropy, mainly because they are all highly involved in the games and have greater randomness in their range of movement on the pitch; and (III) the Spain team has the least average value of spatial entropy of successful passes among all teams, which may be related to the fact that they have the highest number of passes per game. In the following study, we will focus on the effect of spatial entropy of players' pass coordinates on other match behaviors and even the outcomes of games.

Topic: Statistics and Analyses

Presentation E-poster

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