

Title: Spatial dynamics of team sports exposed by Voronoi diagrams

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Abstract: Team sports represent complex systems: players interact continuously during a game, and exhibit intricate patterns of interaction, which can be identified and investigated at both individual and collective levels. We used Voronoi diagrams to identify and investigate the spatial dynamics of players' behavior in Futsal. Using this tool, we examined 19 plays of a sub-phase of a Futsal game played in a reduced area (20 m(2)) from which we extracted the trajectories of all players. Results obtained from a comparative analysis of player's Voronoi area (dominant region) and nearest teammate distance revealed different patterns of interaction between attackers and defenders, both at the level of individual players and teams. We found that, compared to defenders, larger dominant regions were associated with attackers. Furthermore, these regions were more variable in size among players from the same team but, at the player level, the attackers' dominant regions were more regular than those associated with each of the defenders. These findings support a formal description of the dynamic spatial interaction of the players, at least during the particular sub-phase of Futsal investigated. The adopted approach may be extended to other team behaviors where the actions taken at any instant in time by each of the involved agents are associated with the space they occupy at that particular time. (C) 2012 Elsevier B.V. All rights reserved.

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