

COLLECTIVE BEHAVIOUR EXHIBITED IN THE CASE OF DIFFERENT INDIVIDUAL ADJUSTMENT MODALITIES: A SIMULATION STUDY

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Abstract

Introduction:

Our project aimed at improving the understanding of how a space-time collective behavior dynamically emerge from individuals' adaptations. A previous study has shown that players used different adjustment (Feigean et al., 2018). Two mains adjustments were described, local when players interact with only one single player and global when players interact with the overall spatiotemporal shape. The purpose of this simulation study was to test hypotheses about local and global adjustment modalities in their correlates in terms of collective behavior emergence.

Method:

We created a dynamical model of two interacting football teams, which was built on three physical forces that apply to every agent, called avoidance force, side force, zone force. We introduced local and global adjustment modalities which were defined as social forces. We obtained 100 simulations. Within each simulation, individual agents' position at each instant (i.e., coordinates) were calculated. From these positions data, we calculated metrics to characterize the collective behavior, such as the centroids, the stretch index and the surface area.

Results:

The results showed that the centroid position (y) was higher in term of the direction of the game for the team set with global adjustment than for a team set with local adjustment modality. The size of the surface area was higher for a team set with a global adjustment modality than for a team configured with a local adjustment modality. The same result was found for the stretch index. The width and the length of the team was lower for a team set with a local adjustment compared to the team configured with the global adjustment modality.

Discussion:

Together, the results highlighted two specific shape of behaviors, a condensed behavior that was obtained by the local adjustment modality and a deployed behavior obtained by the global adjustment modality. This study gave new directions for the research on teamwork in sport teams. The simulation device adopted here also provide the opportunity to generate a large amount of spatiotemporal data that are hard to capture in the natural sport setting.

References:

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