Artificial intelligence for improving team sports

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This is a radiography of a brain showing a hardware processor. Credit: UC3M

Researchers at the Universidad Carlos III de Madrid (Spain) are participating in a study to develop a system for evaluating sport performance through application of Artificial Intelligence techniques to automatically analyze the development of plays.

The principal aim of this Project is to determine certain performance indicators in team sport competition and training for analyzing what kind of plays and strategies are most apt for each case. "In the near future, performance analysis of executions and decisions in real time could be made, providing precise feedback to improve performance during competition", remarked the head of the research at the Artificial
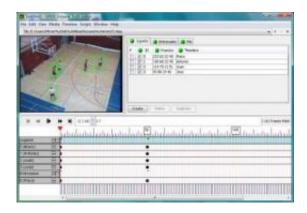
Intelligence Group at the UC3M Colmenarejo Campus, Miguel Ángel Patricio, who is carrying out this project with the research group Deporte y Rendimiento (Sport and Performance) from the Universidad Politécnica de Madrid (UPM).

One of the keys of the project lies in the introduction of Artificial Intelligence in order to evaluate the actions which make up the plays in team sports. The scientists have focused the first prototype in which they are working on basketball, and they hope to obtain models for automated analysis of sport behavior. For that purpose, they register all the actions of the players on the court through a series of cameras, to then, in the second phase, describe what has happened during the activity by applying some complex reasoning algorithms which allow them to determine the tactics and types of play that are happening on the scene.

According to the researchers, a very significant advantage of this type of system is that it applies a certain objectivity when analyzing the game without having to depend on a human expert who studies the opponent and who may obtain different results according to his/her background, knowledge, or the context. "Another very important advantage", added Miguel Ángel Patricio, "is the higher quantity of information which can be processed, given that the machines have a much greater capacity than a human being". In this sense, this research line advances with new technologies. "At the beginning, its application to sport produced a certain amount of rejection because the huge amount of data produced couldn't be processed. But with time we are seeing that the information provided by these new technologies is more concrete and useful for athletes and coaches", noted another of authors of the research, UPM professor, Ignacio Refoyo, who forms part of a team of Real Madrid basketball coaches.

This is a screenshot of the software. It allows one to analyze a sport team behavior. Credit: UC3M

Through applications of Artificial Intelligence techniques, specifically those related to automated information knowledge extraction systems, the project also attempts to exploit automatically acquired sport activity information. "Through these techniques", Patricio pointed out, "we are trying to interpret a large quantity of acquired information to find relationships and patterns which may even be unknown to experts in sports activities". In this way, for example, some keys or reasons could be determined from the data as to why some teams win more or lose more.

The UC3M [Artificial Intelligence](#) Group is developing in a parallel fashion another research line for the application of new sensors to evaluate sport performance. Specifically, they are studying the possibilities of time-of-flight cameras, for which Microsoft has opted to incorporate in the Xbox video game console to interpret users' movements. The goal of these researchers is to use this type of sensor in biomechanics to represent athletes' movements in a tridimensional manner. This could have applications then, they predict, for other types of daily physical activity and even for rehabilitation from injuries that have repercussions in human body movement or synetics.