Chapter IV
Technologies for Monitoring Human Player Activity Within a Competition

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ABSTRACT

Monitoring of player activity within a competition is currently a reality within some high performance sporting teams, and the demand and level of sophistication for this information will continue to grow as players and coaches seek this knowledge. This new found scientific wisdom can guide the training and preparation of the athlete, with the aim of improving performance and reducing the likelihood of injuries. To date this information has been collected manually, which is time consuming and expensive. The challenges are to validate the accuracy of these systems and once this criterion is satisfied to expedite the analysis process to enable as close to real time feedback as possible. Outside of the coach and player arena there is growing demand from the other associated parties, such as the host broadcast media, referees and the spectator, all of whom are seeking new knowledge on “what is happening” during the play.

INTRODUCTION

Most of the world’s professional and high performance sporting teams employ video and/or performance analysts to assist coaches with technical and tactical match analysis. The performance analysis packages currently in use range from simple statistical databases to high-end programs that incorporate video and extensive quantitative and qualitative analyses. Sport is now a professional pursuit and with this many changes have occurred. The amateur traditions where the local school teacher, also doubled as the star player have been replaced with competi-
Technologies for Monitoring Human Player Activity Within a Competition

tive teams forced to continually explore all possible avenues to improve their game and obtain a competitive advantage over their rivals. No longer is it good enough to just employ the best players and coaching staff, teams are looking for that edge in other sectors. One interesting field of innovation is the use of technology from existing disciplines and modifying this to enable monitoring of player activity within a competition, this is known as player tracking. The information that can be obtained from player tracking systems are extensive, in particular key components of the sports performance can be objectively measured. These include the technical and tactical game data such as a spatiotemporal breakdown, distance covered by each player, velocity profile, work-to-rest ratios, and the proportion of time spent in other game related activities. With the continuous developments in technology and the evolution of sport specific user interfaces, sporting teams will be able to make immediate adjustments to their playing strategies to provide them with this competitive edge.

Presently the collection and subsequent analysis of sports performance data has required a high degree of human labour. For example, to code an 80 minute rugby match requires over 100 man hours and the input of between six and ten analysts. The time and human resources required is directly related to the amount of detail necessary for the coach and player - for example to code or track the number of times a player passed to their left versus their right, how many carries an individual had with the ball, number of times the ball was kicked from a certain place versus passed, number of missed tackles by each player, success rate of a particular move, etc... will all take extensive time to code and track. From this information more delayed descriptions of player activity can be quantified in areas such as the movement patterns, distances travelled, and velocity zones of each player in the game. Currently there is very little, if any, of this essential data available, however armed with this detailed information on actions performed by their team, as well as the opposition, the coaches would be able to react and make tactical changes. This could include adjustments to the team’s strategy on the field, instruction to specifically focus and improve in certain aspects of the game, as well as instruction to target identified weaknesses in the opposing team. The ability to make these changes in real time or delayed time is dependent on the hardware, software, and the level of detail required for the coach. There are several other sectors who have an interest in knowing “what is happening” during the game, these end-viewers such as the media and the spectator who enjoys watching the game, are driving the commercial aspect of player tracking technology and the need to develop a system as close to real time as possible.

Given the intense labour input currently required to code games, the ability to semi-automatically code player movements in close to real time is seen as the “Holy Grail” of sports performance analysis. One of the leading systems, UK-based company ProZone® (ProZone Sports Ltd., Leeds, UK), offers this service at a considerable price. Complete installation of the system in a stadium is priced at approximately £300,000, and there is an analysis fee of approximately £2,500 per game (ProZone, 2008), thus highlighting the large financial resource requirements to monitor human player activity within competition. Once commissioned this system is fixed for that particular stadium and therefore cannot be transported from one venue to another, and there is an overnight turn-around time for feedback to players and coaches as the system requires manual tracking of players. The fact that sporting teams are willing to pay considerable sums for the knowledge that is uncovered in monitoring player activity within a competition demonstrates the importance of this new technology. Based on this new demand to “know what is happening” during the game from the player, coach, referee, media, and spectator sectors within the modern day sporting community, the objectives of this chapter are to:
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