AlgoArts Technologies™

Data Visualisation in Football

Visualisation Series White Paper I

14 July 2016

Overview

Quality of football is defined by the contributions of players, coaches, managers and owners. The interest in the game is sustained when the quality of the game is high. This can be achieved through timely insights describing technique, result, purpose, strategy and meaning of the game. Visualisation improves quality, and improves interest in the game. This requires a specialized effort in gathering relevant data and preparing content that enables meaningful interpretation and assimilation of the content.

Contents

1. Difficulties and Challenges in Understanding

Players and Coaches need to express precisely the requirements of the game. A variety of skills required of players have to be effectively defined and described for developing proper training programs and evaluating their skills. Team effort plays a vital role in the game. An intricate understanding and coordination among players following strategies lead to prolonged and alternative action sequences. This needs to be attended for the sake of understanding, training and generating results. Understanding action sequences of adversary team, their strengths and weaknesses needs to be elicited to design effective strategies.

When experts and coaches present a game played in part or full, need an effective set of factual data that enable to assess the intent and action of players. This also enables them to present individual and team effort relating to outcome of the game. Experts and coaches also face the challenge of identifying the areas of interest in the game presented and illustrating the same for gaining appreciation of players and enthusiasts.

Enthusiasts have a pressing demand for relevant data to be presented at various points of times and on occurrence of specific set of events. They also have a memory to relate to the player and the game in the context of specific set of events to be refreshed with archival statistics. Inquisitive and intelligent spectators have a compelling urge to compare the game situations at various stages. Dramatic development of the game, emotional surges and heroes of the game immerse the viewers into the game providing a challenge to specify and present the same in an absorbing way.

2. Why Visualise?

Data visualisation brings meaning to a generally vague scenario. A meaningful comment can be made only after a sequence of events occurs in a match. Effective visualisation is required to appreciate the game in various contexts. Visualisation is in fact a summary of our interests in a documented form. An effective documentary lets us develop a knowledge base and also use it to improve the quality of the game by helping players, coaches, managers, owners and game lovers in general.

3. Techniques of Visualisation

Visualisation is essentially an art of representing data for meaningful and effective communication in the form of graphics on a screen. Data has attributes. The more the number of attributes, the more it becomes difficult to represent and convey. We may undermine our ability to express data with more than one attribute in the form of a one dimensional graphic entity. It is possible to express effectively for the case of ball possession by teams during a ninety minutes play as show below.

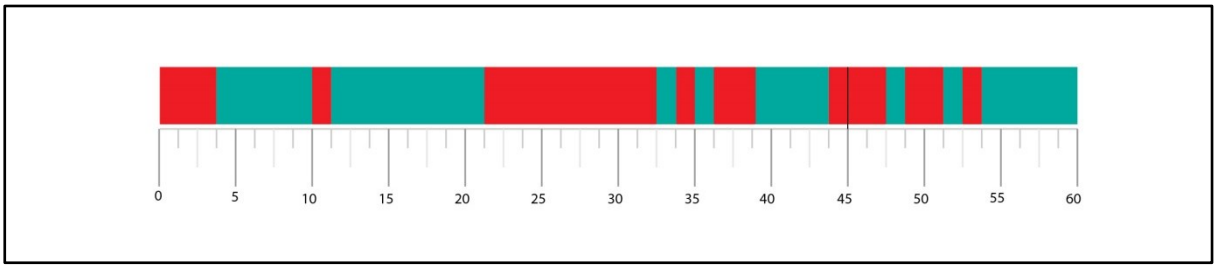

Figure 1. Ball possession by teams during sixty minute period.

Figure 1 shows the sequence and time duration of ball possession by the competing teams during ninety minutes of play. Duration can be read from the scale while colour indicates the team that possess the ball.

A two dimensional graphic representation can embed lot of interest and meaning as shown in the Figure 2 below. The figure below shows a visualisation of player being marked along with relative orientations of players marking with respect to time, as viewed from the top and when the players are moving across the field. In this figure, blue colour indicates the player with ball who is marked. Red and green colours indicate the players who are marking the player referred. Length of the arcs indicates angular movement of the players with respect to each other. Circles in colours indicate equal time intervals. Maroon, pink, purple, blue, and orange colour circles represent the sequence of increasing time instants. Arrow marks indicate the general direction of stadium (black arrow head) and initial orientation of the player marked (blue arrow head) and other players (red and blue arrow heads) as shown in Figure 2.

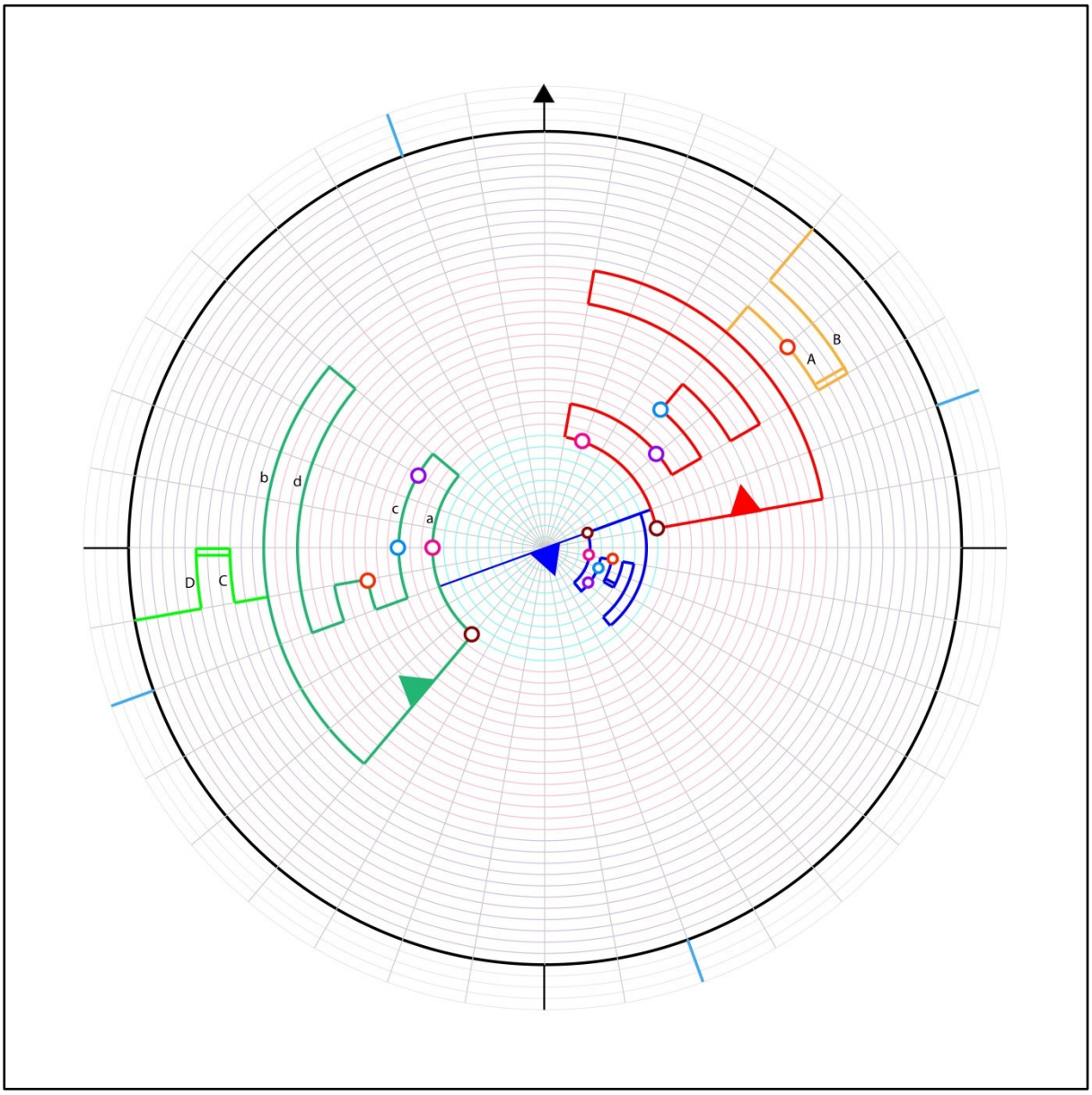

Figure 2. Marked Player: Relative Orientations with respect to Time

The player who is marked is represented in blue colour. His initial orientation is represented by blue colour arrow head at the centre; the arrow indicates the direction of line of sight of the player marked. Initial orientation of the marked player with respect to stadium is represented by extended black lines passing through blue arrow head. Movement of the marking players around the player marked is represented by arcs in green and red colours. As the players change the direction of rotation, for example, when the player represented in green colour moves from a pair of curves indicated as '*a, b*' to a reversed direction as shown by a pair of curves indicated as '*c, d*'. Circles in colours drawn on arcs represent equal intervals of time. The distance between a pair of similar colour circles is constant and represents time (say, 3 seconds). Referring to Figure 2, we can say about five seconds has elapsed when the player marked has reversed his direction of rotation. The two players who are blocking are indicated in green and red and interpretation is made similarly about movement with respect to time. The two players move out of region coloured in pink, (that we term as '*marked region'*) and enter into the region coloured in purple after some time period (about 10 seconds). These players move about the marked player (now at a farther distance) is shown by set of arcs in colours (light green and orange) corresponding to players at outer periphery

in Figure 2 as *'A, B'* and *'C, D'* respectively. This figure shows the player who was blocked for some time as indicated by the figure, becomes successful in performing a pass or shot when the marking players' relative angular position and radial distance changes as indicated in Figure 2 by a pair of radial lines close to each other.

This visualisation provides us with insights of movement pattern of marked and marking players, and conditions when the marking is ineffective. This vital data provides strategies to give better advice and training.

4. Value of Visualisation

Quantitative improvements in football can be realised through visualisation under the following headings.

a. Player skillset
   The data related to possession of ball is extracted from the game through visualisation. This data is quantitative in nature and helps us understand the level of performance and also enables us to compare with others. This data can be used to develop training techniques to improve player skillsets such as Pass Percentage, Tackles and Interception, Blocked and Saved Goals, and other similar skills.

b. Coaches knowledge base
   Data extracted from visualisation graphics creates a knowledge base which can be validated by coaches and improved upon for use in training. Since the knowledge base is founded on quantitative data and the results of training also are quantitative, improvements can be estimated quantitatively avoiding subjective bias.

c. Owners decision abilities
   A reliable repertoire of critical data of players, coaches and games put owners in competent settings to understand, evaluate and decide about various investment propositions involving players, coaches and teams.

d. Viewership
   Viewers tend to become intelligent in absorbing the game over a long period of time. Often they cannot make out the fine differences between the quality of games, performance of players etc. When viewers get absorbed in the game intensely, there is a compelling need for relevant data for appreciating the game as it progresses. All these above situations can be addressed through properly filtered, summarised, and visualised data presented at appropriate points of time. This improves viewership by making the game interesting and sustaining the viewers.

A quantitative measure of variety of things in a game definitely provides an unbiased and effective assessment by all the stakeholders of the game and hence adds value to the game.

5. Additional Resources

Browse Football Analytics and Visualisation Software:
Dodec Lite - http://algoartstechnologies.com/products/dodeclite/

Copyright © 2016 Algoarts Technologies Pvt. Ltd.