

A TRACKING SYSTEM USING MARKERS FOR ASSOCIATION FOOTBALL

Silva, J. 1), Araújo, D. 1), Duarte, R. 1), Parola, A. 2), Lima, J. C. 2) & Nabais, F. 3)

1) Faculty of Human Kinetics, Technical University of Lisbon, Portugal

2) REQUIMTE, Dep. Chemistry, Faculty of Science and Technology, New University of Lisbon, Portugal

3) YDreams, Portugal

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Introduction

In the last few years we have witnessed technological advances in association football. These include sophisticated motion analysis systems that are now being used by elite teams. However, the role of human operators is still necessary on these systems. The aim of this study is to develop a non-intrusive, automatic tracking system, without the need of an operator disambiguation, using an invisible marker that absorbs on the infrared (IR) spectral region.

Methods

The earlier stages of this study consisted in the selection of appropriate IR dyes and optimization of the concentration to be used. Epilight 1110 (peak absorbance at 1100nm) was the selected dye that is soluble in ethanol. We have soaked three black shirts (100% cotton) with different solutions of ethanol containing the dye in concentrations: 0.49 g/L, 0.098 g/L and 0.049 g/L. The three shirts were used by association football players in a 10vs10 ball possession exercise. The players were filmed in three different zones each (Zone 1 is the nearest and Zone 3 the farther). The images were recorded using a digital video camera SONY DCR-SR36 equipped with a SCHOTT – RG850 filter that cuts off light below 850 nm. The selected frames were measured in the grayscale, from min. 0 (black, strong IR absorption) to max. 255 (white, low IR absorption).

Results & Discussion

The shirt with the most concentrated solution presents the lower values in all zones, which means is the darkest one (between 48.0 and 56.4). However, the players, who were wearing a shirt that has not been soaked, had the highest values (between 85.65 and 90.95). Comparing the three different zones, the one nearest to the camera (Zone 1) presents the lower values for any concentration. Although the use of only one camera leads to significant standard deviation values, differences in grayscale values between all concentrations and between zones are clear from Table 1.

	Concentration (g/L)			
	0.49	0.098	0.049	None
Zone 1	48 ± 4	67 ± 6	78 ± 3	86 ± 3
Zone 2	54 ± 3	72 ± 3	82 ± 5	91 ± 3
Zone 3	56 ± 4	69 ± 4	79 ± 4	91 ± 5

Table 1. Mean ± standard deviation of the grayscale values of the shirts in three different zones

Conclusion

In this study we showed that this method, with computer graphic's algorithm currently in development, has promising results towards an automatic and invisible individual tracking system.