Chapter II
A General-Purpose Taxonomy of Computer-Augmented Sports Systems

Sean Reilly
Trinity College, Ireland

Peter Barron
Trinity College, Ireland

Vinny Cahill
Trinity College, Ireland

Kieran Moran
Dublin City University, Ireland

Mads Haahr
Trinity College, Ireland

ABSTRACT

The area of computer-augmented sports is large and complex and spans several disciplines. This chapter presents a general-purpose taxonomy of computer-augmented sports systems, which is intended to assist researchers and designers working in this domain. Allowing systems to be classified with regard to form as well as function, the taxonomy is intended to have several uses, including serving as a clear map to aid in the understanding of the domain and as a tool to help researchers analyse the state-of-the-art by characteristics of systems. The taxonomy also offers a common vocabulary to the multidisciplinary teams that work in computer-augmented sports and can be used to identify sparsely populated regions of the domain as promising areas for future research. The authors present and demonstrate the use of the taxonomy using four example systems selected from an extensive review.
INTRODUCTION

The use of technology in sport has a range of applications, including training, refereeing and injury prevention. While the tradition of using technology for sport is long-standing (e.g., electric detection systems for fencing), recent advances in mobile and sensor technologies have given rise to a considerable range of sports systems that use the new technologies in interesting ways. The domain of technology-augmented sport systems has therefore increased considerably in complexity, not only with regards to the form of the solutions but also in respect to their functions and scope. While the new developments are exciting for developers and researchers working in the field, it takes a considerable amount of work to understand the domain as its complexity grows.

Taxonomies are used to organise and classify objects in complex domains. A taxonomy familiar to most people is the Linnaean Taxonomy devised by 18th century botanist Carl Linnaeus, which is used to classify living things. The taxonomy as a scientific endeavour has since been used outside biology, for example in the educational field. In the field of computer science, taxonomies are used for a variety of purposes, including aiding in the understanding of complex domains (Meier, 2005) and highlighting design and engineering differences of state-of-the-art systems within a particular domain (Yu, 2005). A hierarchical taxonomy, such as the one presented in this chapter, is a tree-structure of classifications for a given set of objects. At the top of the structure is a single classification, usually called the root, which is applicable to all objects. Nodes below the root represent more specific classifications, which apply to subsets of the total set of objects.

In general, the development of a taxonomy is often a useful technique to help deal with a complex domain. By offering a framework and vocabulary to reason about the domain, a good taxonomy can help reduce the complexity of a large domain with many interacting concerns into a number of well-defined concerns that can be dealt with more easily. The creation of a taxonomy for a given domain is often connected with a maturation of that domain.

This chapter presents a general-purpose taxonomy of computer-augmented sports systems. The taxonomy is based on the findings from an extensive review of the domain of sensor-augmented sports systems in which twenty systems were identified and analysed in detail, incorporating both commercial applications and research projects. To present the taxonomy we employ a number of example systems from the survey to illustrate categories and give an indication of the number of systems that belong to the different categories. As for any taxonomy, the overall purpose of ours is of course to aid in understanding a complex domain. Specifically, our taxonomy is intended to have the following purposes:

- The taxonomy can be considered a map of the complex domain of computer-augmented sports systems. Its clear presentation and separation of concerns can help researchers, designers and developers approach the field in a systematic fashion. They can analyse concerns across many applications and obtain a good level of domain understanding without undertaking expensive and time-consuming analysis of many individual systems.
- The taxonomy allows any computer-augmented sports system to be classified in term of its key characteristics with regard to form as well as function. Any solution can be broken down into a set of constituent components and defining characteristics, which allows it to be placed it in the greater context of the field of computer-augmented sports systems. In this way, the taxonomy can be considered a tool to help analyse the state of the art in this rapidly developing field.
- The field of computer-augmented sport systems is by its very definition multi-dis-
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