Chapter 20
Stadium Design in Digital Age: Automatic Bowl Generation Tools

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ABSTRACT

The chapter is divided in two sections: the first section provides a general overview of the parametric design and analysis of a bowl while the second shows key study. The chapter explores the genetic sequence of the DNA of the bowl and how it can be identified and ordered in order to build a global definition of its form. The author underlines some formal characteristics that may produce particular emotional aspects and how to control even those. Even the “arena” effect, the feeling of belonging, and at the same time the segmentation of audience categories can be parameterized. The parametric approach has been used to respond to similar needs for performance monitoring of existing stadia. The second section of the chapter describes a key study: the parametric approach used by Arup for the restructuring interventions to the bowl of the Camp Nou Stadium during the competition organized by the Catalan club. The project proposal has been designed together with the architecture studio of Ricardo Bofill.

INTRODUCTION

The purpose of this paper is to identify the creative processes that come into play within the design of a sports facility and how these can be synthesized through a geometric definition algorithm.

The most obvious feature identifying mankind is the ability to deform the environment and objects, sometimes these transformations are voluntary and planned, while they are often side effects of transformation processes as, for instance, in case of actual global warming.

Architects are entrusted with the task of transforming space in order to provide a service to the community. Deciphering what kind of transformation maximizes the service provided is not an intuitive matter. We can find an example in the mechanisms of natural selection. They operate in a chaotic manner producing extremely complex organisms and extremely suitable to perform particular functions, however it is very complicated to understand how these have worked in their transformation. In case of man-made transformations, it is not just chaos to act yet the creativity of the mankind. A planned transformation process can therefore only be the birth of a project.

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Among all anthropizations of urban environment, this chapter will deal with the typology of constructions intended for show displaying. Spectator’s enjoyment is the key element that defines an architecture which will be designed for this purpose. The quality of the show’s fruition heavily influences the shape of the bowl and this is easily evident from a simple consideration: actually modern stadia are not so distant to classical amphitheaters.

Strictly speaking, a contemporary design hosting gladiator clashes, would be almost entirely analogous to what people can admire at the Coliseum and the use of modern computerized systems would not result in a sensible difference.

This last statement might sound contradictory to the subject of this paper. However, any method generating parametric algorithm cannot redefine the bond between form and function.

Instead, the computational approach allows obtaining several solutions for the shape of the bowl, following the definition of the geometry’s generative principles.

This preamble may seem almost redundant, but it is necessary because of a widespread misunderstanding that tends to associate the computational approach with a particular class of organic geometries such as those typical of deconstructivist architecture.

On the other hand, a computational approach means looking for the optimal solution and more control. Moreover, the ease of creation of complex computerized geometric models facilitates digital representation, as well as, the transferring of information and project quality to partners, clients, and public audience, which ultimately will be the one that will give the most critical feedback on the project.

**Analysis of the Main Components of a Bowl**

A stadium can be considered as an apple.

Peel is the visible part of the fruit, it must be inviting and show the quality of the pulp which we will then enjoy. The skin hides the inner complexity of the apple; however, it also invites those who are approaching to give a bite. In this allegory, the peel of a stadium is the façade that identifies its iconicity.

The façade is not always present in a sports facility but usually the recognizability of stadiums is strong also in its absence.

Either the skin as element which separates the inner and outer spaces or shades the interior, as well as the concourse’s finishes or even the layout of the structural elements and stairs creates the uniqueness of the stadium.

The pulp consists of all the functions necessary to play the game and host the audience. Finally, the apple core, which may mistakenly seem to be the least important part. However, it is a well-known fact that the tree entrusts its seeds just in the core. The apple core is the playing field, so where the show is taking place. Then everything acquires a sense around the play, and it is evident that bowl, architectural layout and façade are strongly influenced by the shape of the playing field. The size of the soccer field is a rectangle, although not always standard, it is usually close to the dimensions of 105x68m. However, not all stadia are designed to accommodate only football matches. The awareness that a game during a league is played at home every two weeks has usually discouraged the developers from building a structure dedicated to football only. Many fields are usually also used to host rugby matches, athletic competitions or events. The running track surrounds the playing field, and usually this causes more distance between the pitch and the tiers, especially the short sides are penalized. Therefore, a running track could also disrupt the experience of the show. The typical Olympic stadium and the typical stadium dedicated to football are therefore different.