Explore the Design Space

Cameron Browne, Queensland University of Technology (QUT)

This article outlines some simple strategies for optimising the search for new games in the conceptual game design space. While most games are created through the combination of existing ideas, naïve combinatorial search is not enough. A brief exploration of a family of path-based tile games, and games derived from them, is presented by way of example.

1 Introduction

How are games created? Why are some designers more skilled at producing good designs than others?

In a Platonist view of the world,[1] the games are all out there, like undiscovered mathematical constructs and theorems, just waiting to be found. And while finding new designs is only part of the process – identifying the true value of new designs can require just as much skill – it makes sense that a systematic exploration of the potential design space might benefit the search.

This paper outlines some strategies for exploring the conceptual game design space efficiently, using as a case study a simple path-based tile game from 1960, and some of the many subsequent designs that build upon it.

2 Models of Creativity

The concepts outlined in this paper refer to two key models of human creativity.

2.1 Boden's Model

A widely accepted model of human creativity proposed in 1990 by cognitive scientist Margaret A. Boden [1], posits three distinct forms of creativity:

1. *Combining* familiar ideas in new ways.

2. *Exploring* the conceptual space for previously undiscovered ideas.

3. *Transforming* the conceptual space.

The aim in each case is 'to come up with ideas or artefacts that are *new, surprising and valuable*' [1, p1]. Combinatorial creativity, the first form, is especially relevant to the field of Computational Creativity, where the question is how to direct computers – which are excellent at trying combinations of things – towards exploring more fruitful parts of the conceptual space.

2.2 Weber's Model

Around the same time, mathematician Robert J. Weber proposed another model of human creativity from a similarly technical perspective, based on the historical development of hand tools [2]. Weber observes that the mechanisms for invention include:

1. *Joining* existing features in new ways.

2. *Adding* new features to existing ones.

3. *Refining* features through fine-tuning.

4. *Transforming* the feature space through abstraction.

Weber also highlights the question of how to handle the combinatorial explosion of 'promiscuous ideas' when joining all possible ideas in the conceptual space. He suggests the use of search heuristics, and different levels of joining, to focus the exploration.

2.3 Creative Leaps

Noy *et al.* define a *creative leap* as 'the momentary intersection of two different matrices of association in the design space' and describe it as the crux of the creative act [3]. A creative leap draws together new combinations of ideas from different regions of the design space, but a key point is that some degree of overlap between these concepts must generally exist. This is essentially the mechanism behind the theory of *conceptual blending,* in which related concepts are blended within associated frames [4]. This suggests strategies for exploring the design space effectively, as follows.

2.4 Implications for Game Design

Boden's model is a higher-level description of *what* mechanisms are at play, while Weber's model is a lower-level description that gives instructions for *how* to create new artefacts. Yet both models highlight the importance of combinatorial search, and distinguish it from transformational forms of creativity.

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[1]L. Horsten, *Philosophy of Mathematics*, 2007: http://plato.stanford.edu/entries/philosophy-mathematics