

Metrics for Exploration Games

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Abstract

Procedural generation and analysis techniques like quality-diversity search, genetic algorithms, and expressive range analysis use metrics to define how they operate, and their results are limited by what the metrics used can capture. Existing metrics for measuring the quality and complexity of exploration-based games are very rudimentary. We propose new representations for exploration-based game spaces that are necessary to support richer metrics for evaluating their gameplay properties, and give examples of metrics that can be derived from these representations. We show that these new metrics are potentially useful by using them to explain observable variation between the design of several exploration-based games.

Keywords

exploration, metrics, games

Introduction

Examples

Example Metric: Cyclic Fraction

One simple metric measurable from the decision graph alone is “cyclic fraction” – The fraction of all decisions which are part of some cycle (as opposed to being part of a branching structure or dead end that does not contain any cycles).

Fragments

“ “ Unfortunately, there is no established set of metrics for dungeon levels like there is for platformer levels [14]. Therefore, we follow the example set by Smith et al. [30] and adapted the metrics put forth by Lavender [15], which were in turn inspired by Smith and Whitehead [29] “ “

[14] is: Britton Horn, Steve Dahlskog, Noor Shaker, Gillian Smith, and Julian Togelius. 2014. A comparative evaluation of procedural level generators in the mario ai framework. In *Foundations of Digital Games 2014*, Ft. Lauderdale, Florida, USA (2014). Society for the Advancement of the Science of Digital Games, 1–8. See refs.bib or 15, 29, and 30.

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Individual metrics by nature capture only part of the variation that is desirable and/or of interest, so groups of metrics are used together to try to get a fuller picture of what's being studied/generated. For complex artefacts like games, metrics can be especially difficult to deal with, because reducing a complex interactive artefact to a series of numbers can be done in so many different ways, and because each of those ways offers insight into only a thin slice of the game being measured.