Avoiding Revenge Using Optimal Opponent Ranking Strategy in the Board Game Catan

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ABSTRACT

The study analyses the attitude of players in a board game called Catan. In Catan, we are basically handling the players as opponents, but this does not rule out the possibility of cooperation. In a game with three players, in order to increase the chances of winning, it is worth acting together against the lead player. Cooperation has several possible modalities. In the article, the focus is on blocking situations which can lead to revenge. The primary objectives of this study were to examine how different types of thinking can cause revenge situations and which are the successful strategies among players. Strategies (as a mathematical solution to a decision problem) are examined in the study via computer modeling. To help the model, some kind of behavior of human Catan players was studied which enables profiling gaming styles used in the model. The winning chances of the player who was not involved in revenge have improved considerably, by 43%. To avoid being involved in revenge situations, the best solution is to accept other players’ opponent ranking methods.

KEYWORDS

Agent, Board Game, Catan, Game, Opponent Ranking, Optimal Strategy, Player, Revenge, Simulation

INTRODUCTION

Personal Motivation and Objectives

Modern board-games (also known as ‘Eurogames’) are of particular interest to artificial intelligence (AI) researchers because state variables of most modern board-games are discrete, and decision making is turn-based. The gameplay in modern board-games often incorporates randomness, hidden information, multiple players, and a variable initial setup that makes it impossible to use opening books (Szita, Chaslot & Spronck, 2010).

According to Pfeiffer (2004), Catan is interesting for AI researchers, because players can choose from a large action-set, they have to balance long and short-term decisions, always depending on the performance of their opponents.

There are papers which focus on analyzing optimal game strategies in Catan (e.g. Guhe & Lascarides, 2014; Szita, Chaslot & Spronck, 2010) but it is important that these analyses do not involve robbing strategies.

The mentioned AI researchers worked on the rational model of how to play Catan. Although when people are playing against one another, irrationality quite often occurs.

Today, various versions of Catan exist. Originally, we are talking about a board game, but since then it has been computerized, including offline and online versions. Playing Catan against strangers via the internet provides a chance to make decisions more on statistically and rational basis instead of emotional ones when playing against friends or family members.

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Playing Catan online, it was experienced that revenge is an emphasized part of the game. It was noted, that revenge ruins the chances of winning and these experiences gave the motivation to look at this phenomenon more closely.

Thomas (2003) collected six types of decisions that are made during the game. One of them is ‘Evaluating the other players’ positions’. In Settlers of Catan, it is important to be able to accurately evaluate the other players’ positions to determine how close each one is to winning and what they need to do in order to win. This evaluation system (developed for AI) uses the unit of turns. Based on the evaluation process player chooses which opponent’s development to slow down (Thomas, 2003).

That method seems reasonable, but it would be a hard calculation method for a human player and due to this fact, there are differences in how player calculate or estimate their winning chances.

The aim of this paper is to analyze the optimal strategy regard to revenge, furthermore to try quantifying the impact of revenge on the winning chances.

**Introducing the Board Game: Catan**

**The Eurogame Genre**

‘Settlers of Catan’ is a popular multiplayer strategy board game. According to a crowd-ranked list of the best board games (https://www.ranker.com/crowdranked-list/the-best-board-games-of-all-time), based on the opinion of 34.3 thousand voters, the classic strategy game, chess is ranked first, the second is Risk (American-style board game) and the third one is Catan (ranked first in Eurogame category).

Eurogame (also called German-style board game, German game, or Euro-style game) is the most common label of the games like Catan. Eurogame is often mentioned in contrast to the American-style board games.

In Eurogames luck is less dominant, strategy plays a bigger role. The impact of random is reduced, the unpredictable randomness is represented mainly by other players’ behavior and usually in such cases where its effect is not so dominant to game mechanics, e.g. resource distribution in the initial setup.

There is less conflict, and if there is any, it is usually an indirect one.

This is also supported by the themes of the games. Usually, economic themes are applied in contrast with military themes used in American-style board games. Due to this fact, players usually are in play until the end of the game. In American-style board games usually, there is a chance for player elimination.

In Eurogames, there are also hidden scoring opportunities. With these scoring opportunities, winning is more open to all players, or minimally it is ensured that all players are involved in the outcome of the game until the moment of conclusion (Woods, 2008).

According to Rören (2007) in the American-style board games, game mechanics are generally developed as a consequence of the theme chosen. In Eurogames the focus of design is the game mechanics, the theme is not really important. Rören calls this separation as mechanics first and themes first design perspective.

Woods (2012) states that in contrast with American-style board games (e.g. Risk) Eurogames offer predictable playing times.

Eurogames are considered to be abstract games. Although the environments in Eurogames echo the spatial emphasis of wargames and Anglo-American hobby board games, they are typically abstracted and/or stylized to a far greater degree, often falling closer to traditional abstract games in terms of fidelity to the represented environment (Woods, 2012).

Järvinen (2007) collected the library of game mechanics which consists of 40 elements. Woods (2012) identified the most common game mechanics in Eurogames: choosing, placing, point-to-point movement, bidding, building, allocating, submitting, buying, trading, taking, information seeking, arranging, upgrading, and voting.

Finally, maybe the most important characteristic of Eurogames to this paper is that there are multiple strategic paths to win the game, which makes the ranking of the opponents harder, what is a crucial point in this paper.
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