



Use of the Information Gap on Deckbuilding in Hearthstone

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Abstract. In collectable card games, players need to decide which cards they can use during the real game. This process is called deckbuilding, and the total choices of cards could be dozens of times more than the deck capacity. It is difficult to construct a good deck due to the large search space. Many authors have devoted effort to finding the hidden correlations between cards. After all, Hearthstone is a player versus player (pvp) game, and the opponent's behaviour is nonnegligible. Taking the opponent's thoughts into consideration increases the complexity exponentially. This paper explores a way of deckbuilding that takes psychological advantage of other players in order to increase the win rate or provide more fun. Several experienced and competitive players will be interviewed. They will be provided with the outcome and performance of such a deck, and their opinions on several aspects will be recorded. Their thoughts indicate the potential and feasibility of this new deckbuilding method to a large extent.

Keywords: Collectible Card Game, Deckbuilding, Hearthstone, Information Gap.

1 Introduction

The deck of a Collectible Card Game (CCG) defines what the player can do in the real game and how to win on a larger scale. Thus, deckbuilding plays a significant role in gameplay. However, the total number of available cards is hundreds or even

Thousands in a certain game version. The combinations seem to be infinite, and many studies have been made on finding the "best" deck. Hearthstone: Heroes of Warcraft is Blizzard's one of the most popular online CCG [1]. In this game, players need to construct their own 30-card deck before the real match. Focusing on deckbuilding, some authors conducted four experiments to computationally explore the design of Hearthstone. They address the difficulty of constructing good decks, the specificity and generality of decks, and the transitivity of decks [2].

AI has become more popular in recent years. It seems that AI can do better than humans on problems like finding an optimal solution from a considerable number of choices. Hearthstone's deckbuilding is one such problem. Hearthstone's deckbuilding is one such problem. Some authors focus on evolutionary algorithms which allow the deck to keep evolving through the training process. For example, some propose a

variant of the evolutionary algorithm that uses the concept of an active gene to reduce the range of the operators only to generation-specific subsequences of the genotype [3]. Some others explore the possibility of automated deckbuilding: a genetic algorithm is applied to the task, with the evaluation delegated to a game simulator [4].

Although the possibility of decks is hard to determine, players will only encounter a few of them. The reason is that as time goes on, several competitive decks will become popular among the majority of players. Especially in ranked games, the opponents' decks are almost predictable. This paper introduces a new way of deckbuilding using information gaps. That is, our deck is unpredictable based on the existing decks in the environment. But we can know our opponent's deck construction or strategy. The rest of the paper will provide two examples of this kind of deck and the logic and thinking behind them. This way of deckbuilding can increase the win rate and the diversity of deck types; in other words, it can be more fun. What is more, game designers could take psychological effects into consideration when designing new cards and, most importantly, when balancing the existing cards.

2 Game Mechanics and Strategy

2.1 Hearthstone

Hearthstone is a two-player online CCG. Players first need to choose one of the 11 heroes. Each playable Hearthstone hero has a unique Hero Power and their own set of special class cards [5]. Then a 30-card deck of that class needs to be built with neutral cards and cards that can only be used by this class. After the deckbuilding phase, two players will be matched. They take turns to do the following actions aimed at destroying the opponent's hero: pick a starting hand, draw a card, play cards, attack, and use hero power [6].

2.2 Deck Types

There are three basic deck types:

(1) Aggro: This type of deck usually consists of low-cost cards aiming to deal the most damage in the early game. For example, minions that can control the board quickly and spells that can deal damage to the hero directly are common in aggro decks. The core strategy is to finish the game as quickly as possible because the majority of cards are powerless in the late game.

(2) Control: Control decks want everything under control, so the cost of cards is usually smooth but with high quality. The core strategy is to keep the hero's health safe, and the enemy minions on the board are acceptable. Finally, the player can rely on the high-cost and high-value cards to win.

(3) Combo: These decks are based on several cards that have strong associations with each other. They can bring considerable amount of advantage (usually lethal) when played together. This is called a combo. The core strategy is to draw as many cards as possible to find all the necessary pieces.

These three types of decks counters each other like Rock Paper and Scissors:

The Aggro deck counters the Combo deck because those combo cards are usually invaluable when played separately. The combo deck usually cannot resist the attack in the early game before gathering all the combo cards.

The Control deck counters the Aggro deck because the cards have a higher quality so that it can exchange for multiple cards from the Aggro deck. What is more, there are AOE spells that can clear the minions on the board and many ways to restore health. So the aggro deck usually cannot deal enough damage.

The Combo deck counters the Control deck because the Control deck cannot stop their opponent from gathering the combocards. Due to the high cost of those high-quality cards, the Combo deck usually won't receive enough pressure before the combo is ready.

These counter-relations are not that severe, and all decks are possible to win against any other deck depending on the players' behaviour and the cards' drawing sequence. In particular, Aggro decks often have the highest win rate because the counterplay by Control decks is weak. As long as the opponent fails to draw AOE spells or restore health cards, Aggro decks can win super fast. Due to the high efficiency of promoting ranks, Aggro decks become the most popular deck type.

2.3 Metagame

The metagame represents the game's environment, in other words, 'what everyone else is playing' [7]. In Hearthstone, the metagame is all the decks players use in ranked mode (the ladder). As mentioned earlier, several decks will become popular among the players. Hearthstone's metagame usually consists of tens of decks, one or two for each class.

2.4 Deck Prediction

When a Hearthstone game begins, both players' classes will be revealed. In the meta-game, each class only has a few popular decks. Thus, the opponent's deck type can be predicted from minimal information, in particular only from the actions they performed on their first turn [8]. In some extreme conditions almost all cards are clear if the opponent chooses to copy and paste popular decks. In fact, that's what most players are doing. At the very least, knowing the opponent's deck helps inform a player on how they should adapt their own strategy to best counter the opponent's.



Fig. 1. A screenshot of the deck "Reincarnate Shaman" reaching the Legend rank in May 2017

3 Using Information Gap on Deckbuilding

Based on the information from the metagame, the first step is to build a deck that's not in the environment. So that the opponent will not be able to predict the deck or even be misdirected. With the help of deck prediction, the information gap on the deck's components can increase our win rate. At this time, a combo deck can make full use of this advantage.

3.1 Unpopular Combo

The first deckbuilding method is to construct an unpopular combo. Not only is the combo itself unexpected, but the class doesn't have a combo deck in the metagame at that time. When the opponent sees this class, they will treat it as an Aggro or Control deck.

Take the author's experience as an example: During the time of Hearthstone's expansion Journey to Un'Goro, the class Shaman mainly consisted of Control and Aggro decks. The card Reincarnate, which was released almost three years ago, was chosen as the core card. Together with 3 to 4 cards in the same release, they formed a combo to create minions on the board that nothing else was able to clear at that time. Nobody else was playing that combo in ranked games because such decks were usually considered for fun, and most players might only have heard about it from some video highlights but have never met.

When meeting a Control deck, the opponent will not think about combo decks when they see a Shaman class. If they predict this to be an Aggro deck, they will keep cards that can clear small minions or restore health. Unfortunately, those cards are useless against a Combo deck. After one or two turns, the opponent would find that this deck has very few low-cost cards, so they would assume that this was a Control deck. The match between control decks usually ends in very late stages as they compete for high-quality resources. So the opponents usually won't interfere with the deck from drawing cards and wish to win by "fatigue" (if a player has exhausted all cards in deck

they will begin to fatigue, which will do increasing damage each turn). As a result, all the combo cards could be gathered easily. Even though some players finally realized that I might have some combo, they had already been affected by the wrong predictions in the beginning. In general, that deck had a much higher win rate than the normal counter-relation of Combo decks against Control decks.

It is similar for another Combo deck, the opponents would waste resources on cards that help them to survive in early games. That strategy definitely delays them from gathering all the combo cards. The player who draws key cards first is the winner between Combo decks.

When encountering an Aggro deck, the opponent would use minions to dominate the board in order to deal steady damage each turn. That is a common strategy for Aggro decks against each other. This might give a few more turns' safe time, which results in a higher chance to draw cards that can clear the minions. Although this deck was countered, this information gap would slightly increase the chance to survive and it cannot be worse. This unpopular combo deck is capable to reach the highest "Legend" rank as shown in Figure 1.

3.2 Popular Combo But Incomplete Components

During the time of Hearthstone's release of The Boomsday Project in August 2018, there was a popular combo deck based on the core card "Mechathun". It can destroy the enemy hero directly if there are no other cards in deck, hand and on board. The combo works with the help of 2 more cards after exhausting all cards in the deck ("Bloodbloom" ensures enough Mana cost and "Cataclysm" clear the board and hand). Since the combo needs all cards to be drawn, all cards are guaranteed. So, it is obvious for the opponent to know when the combo is going to launch. When they find themselves cannot win before that combo, they usually concede. In most cases, players even do that before seeing all the combo cards. (In Hearthstone, matches players can concede at any time to lose the game immediately. So that the player could save time without watching the useless animation of cards. This is a common behavior among all players.)

The idea of giving up combo cards comes from anonymous players and was promoted by famous Hearthstone anchor Yilingshu. Since everyone is familiar with this combo and would escape before it is actually played, we can build a deck without the combo cards pretending to be that popular deck.

The first advantage is that we can bring more cards to help survive or draw cards. The core combo cards cannot be played individually, and some foreshadowing cards are weak since they all work for the combo that can win directly. If the player draws them in the early game, that means they are stuck in the hand uselessly. By replacing them with surviving cards or cards that can draw more cards, it is easier to exhaust all cards, in other words, one turn before the enemy's death or a higher win rate.

Another advantage is that we can ignore cards that can destroy the combo. At that time, there are cards that can change the opponent's hand. If the core card "Mechathun" is changed or destroyed ahead of time, the combo is destroyed, and the deck has no way to win. Since the deck doesn't even have core cards, there's no worry about combos being destroyed.

In the video highlights of Yilingshu, the “deceptive” effect worked well, and all opponents conceded once they felt the combo was ready [9]. The information gap was created because almost all players believed that a combo deck contained the core combo cards.

4 Limitations and Discussion

These two deckbuilding strategies both have limitations since both players’ behavior and psychological activities are largely unpredictable. Also, playing this type of deck requires experience, skills, and knowing the metagame well. Which means this is unsuitable for new hands.

For the unpopular combo deck, the biggest weakness of combo decks is not solved. If the opponent’s aggro deck is lucky enough to have a perfect card drawing sequence, the survival chance in the early game is still low.

Another problem is largely related to the game designers. Some decks are so strong that the player doesn’t need to worry about any other issues. In other words, sometimes the player only needs to play available cards each turn to finally win. A popular deck is popular because it’s competitive and easy to play. Unpopular cards, to some extent, don’t have enough quality. It is common that a game has some unbalanced units because the designer’s work is also hard. Sometimes popular decks become unstoppable if the drawing sequence is lucky enough. All predictions or psychological effects are useless if they lack absolute quality. However, such situations hardly happen in unpopular decks.

For the popular incomplete combo deck, its winning option completely depends on whether the opponent concedes. This only works in high ranks where everyone is familiar with the popular combo. What is more, some players are unremitting, and they don’t concede until the very last moment.

A user study is conducted based on several player’s evaluation. They all have at least five years of gaming experience and have reached the highest rank. Their attitudes towards three aspects of this type of deck are recorded in Table 1. The first aspect is whether this deck would have a higher win rate compared to other popular decks in the metagame. The second is whether playing this information gap deck would be more fun. The third is whether this deckbuilding method could increase the diversity of popular decks, or, in other words, improve the metagame.

Player A is extremely competitive and once reached the top 100 on the Chinese server. He can master popular decks (especially aggro decks) and promote ranking quickly. He thinks this deckbuilding method can only increase win rates at a very limited level. Time has proven that popular decks are popular because of their high win rates. Unfortunately, player A has lost interest in Hearthstone and thinks it is no fun playing it. Also, he thinks most players play to win, so they would only choose decks with the highest win rate. Thus, the majority of decks in the metagame would not change.

Table 1. Players' attitude on this deckbuilding way collected via 5-likert scale questions from 1 to 5

Player	Higher win rate	More fun	Greater diversity
A	1	NA	NA
B	2	3	1
C	3(high rank)/1(other)	5	2

Player B is not that extreme and often tries different decks. He agrees with a higher win rate, but not too much. He likes to play fun decks, but he worries about whether the psychological advantage would work. Since most players would play aggro decks, it's easy to win. Such combo decks are still countered and have little influence on aggro deck players.

Player C once reached the top 1000 without paying for cards. He thinks the information gap works well in high ranks because experienced players are easier to predict. Also, he loves this "deceptive" feeling and would be happy for a whole day as long as there was a single victory. Lastly, player C thinks the diversity is dominated by the designers.

5 Conclusion

This paper introduces the use of information gaps in deckbuilding and provides two specific ways to do so. Several experienced players accept those decks' performance, especially in high ranks. However, happiness largely differs between players. Some only wish to win quickly, while others enjoy the process. Finally, all players think that the metagame is decided by the Aggro decks, in other words, the designers. With powerful cards, those decks are easy to play together with a high win rate and efficiency. Most players would choose such deck and the trend is hard to change. This paper's deckbuilding method could provide new thoughts to game designers on balancing cards and improving the metagame.

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