Online trading in Settlers of Catan

“My sheep is far more edible than your clay”

Masterthesis Computercommunication
Denise Bakker
S1995596
Beethovenlaan 562
8031CJ Zwolle
0630794294
d.bakker.12@student.rug.nl

Supervisors:
Malvina Nissim & Gregory Mills

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Acknowledgements

In September 2015 I had an appointment with Malvina Nissim about possible thesis ideas. I remember that I was sitting in her office and had all these great ideas of writing a thesis about games. I never thought she would be as enthusiastic about this idea as I was. I told her that I wanted to write a thesis about something that I really like and am interested in. During this appointment we quickly settled on the idea of writing a thesis about Settlers of Catan.

The months after that were pretty long. Together with Gregory Mills we had all kinds of ideas about what we wanted to do exactly. We talked about experiments where different things would be manipulated. I already asked some friends if they would be willing to play some Settlers of Catan games for me, what they happily accepted. By now it was December 2015 and there was still no exact plan on which way to go and I wanted to graduate in March 2016. While panic was starting to strike, Malvina asked her colleagues in Edinburgh if we could use their data on Settlers of Catan. To my great relief, they said yes and I could start actually analyzing data and writing the thesis.

When you talk about graduating with other students, the one great subject is the thesis. Most students will tell you how hard it is to write one and how much work it is. I actually didn’t have this experience writing this thesis. I know from experience writing a thesis can be very hard and it is much work, but this one I actually really enjoyed. I like the subject, I liked going through the data over and over again and I liked playing Settlers of Catan online. I think I’ve been very lucky with this subject of my thesis and I am very proud of the end result.

I want to thank Malvina Nissim and Gregory Mills for supervising my thesis and always being ready to give me feedback. I enjoyed all of our meetings and I am really glad you made the time to help me with everything I bumped into during the writing process. I also want to thank the group of researchers who made the STAC corpus and given me access to it (you will see their names referenced in this thesis a lot). I want to thank Monique Bakker and Judith Alkema for all the feedback they have given me on my use of the English language (which apparently looks a lot like Dutch). Lastly, I want to thank José Bakker for always giving me encouraging speeches (they really helped) and Jelmer Dirksen for supporting me during the whole process.
Abstract

Settlers of Catan is a complex board game in which players have to build villages and cities to get more points. To build these cities and villages, players need resource cards. These resource cards can be acquired by playing the game or by trading them with other players. This thesis focusses on the trading between players while they are playing an online implementation of Settlers of Catan. I discuss the various ways of players making a trade attempt, the negotiation patterns that follow and the way players use persuasion during trading. I have also looked at the existing online implementations of Settlers of Catan (PlayCatan and AsoBrain) to see whether players have the right tools to play the game like they need to. My findings suggest that people don’t use persuasion strategies while playing the game, because winning and playing the game is more important. My findings on the comparison with the existing online implementations of Settlers of Catan suggest that the PlayCatan platform needs to change a few things in order to make the implementation better, especially when it comes to communication. AsoBrain needs to change some little things as well, but most of the tools to play the game are there.
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Chapter 1
Introduction

Persuasion is a widely known concept. We are confronted with it everywhere, every day of our lives. Persuasion is used to impact someone’s opinion or behaviour, therefore it can be used for marketing purposes, psychological manipulation, hypnosis and many other things. One of the most common ways of using persuasion is within a discussion. In a discussion setting, people can use persuasion strategies to change someone’s opinion or behaviour.

Because we live in an informational and digital century, many of these discussions can take place online. Although studies have shown that it can be harder to persuade someone online or by computer mediated communication (CMC) than it is in a face-to-face setting (Di Blasio & Milani, 2008; Wilson, 2003), people do try to persuade others into changing their opinion or behaviour while involved in an online discussion.

In this thesis, I want to discuss the way people are persuading each other online. As there are already some studies done on this subject, I wanted to research one specific aspect of online persuasion: persuasion in an online game.

In Settlers of Catan, players need to gain resources in order to get more points (by building settlements or cities). These resources can be gained by playing the game itself or they can be traded with opponents. As every player has his or her own plan, players need to negotiate and discuss in order to trade with an opponent. A big part of these discussions is persuasion. Players can persuade other players into trading the resources they need, by using persuasion strategies. Research has shown that there are a lot of persuasion strategies people can use to impact someone’s opinion or behaviour (Marwell and Schmitt, 1967; Cameron, 2009; O’keefe, 1990; Wilson, 2003). In this study, I will only look at two recurrent strategies: rewarding vs. punishing strategies and rational vs. non-rational strategies.

You can imagine that trading or persuading online greatly differs from trading or persuading in a face-to-face setting. In a face-to-face setting, people often know each other and can persuade each other by also using private events. A husband could say to his wife “I will do the dishes for a month if you give me this sheep”. This is less likely in an online environment where people often don’t know each other. Studies have shown that it can be much harder to persuade someone online or via CMC than it is in a face-to-face situation (Di Blasio & Milani, 2008; Wilson, 2003). This is why I am interested in the way people will persuade each other when they are playing a complex board game like Settlers of Catan online. The studies that have been done on communication during Settlers of Catan are based on simulations of the game (Guhe & Lascarides, 2014a, 2014b) rather than having real humans play the game. The researchers simulated a total of 10000 games where different aspects of the game and the players were manipulated, there were no real humans involved in playing the simulated games. This is why I have chosen to take a look at the trading and persuasion attempts of people actually playing the board game while chatting with each other online.

To do this, I first want to compare different versions of the online board game by doing a heuristic evaluation of two versions: PlayCatan and AsoBrain. The evaluation will show how the board game is implemented online and will give an idea of the improvements needed of the implementations. After the evaluation I will analyze some of the data from the STAC corpus (Afantenos et al, 2012, 2015), which contains real chat dialogues from people who are playing Settlers of Catan. The analysis will give insight in the way people are persuading each other into trading resources. In this study, I will try to answer the following questions:

- How do people trade while chatting on an online implementation of Settlers of Catan?
- Can we build meaningful models of online trading?
- How do other interfaces cope with these ways of trading?

To answer the research questions, I will show the different negotiation patterns that I found and I will compare the findings of the chat dialogue analysis with the existing online implementations.
of Settlers of Catan, to see whether the players have the right instruments to play the game like they need to.

The thesis is structured as follows: In the next chapter I will discuss previous research on playability, Settlers of Catan and persuasion. In the third chapter I will discuss the interface evaluation that I have done and in the fourth and fifth chapter I discuss the analysis of the chat dialogues. The sixth chapter will contain the comparison of my findings and the online implementations of Settlers of Catan. The last chapter will contain a conclusion and a discussion on my findings.
In this section I will discuss some previous research about playability of games, Settlers of Catan and persuasion attempts in board games. As said, trading in Settlers of Catan is linked to persuasion as people need to persuade each other into trading the resources they want to have. This is why I will pay specific attention to persuasion and persuasion in board games.

2.1 Playability and evaluation

Playability is a term that is used for measuring the overall quality of a game. To understand the term playability, it is first necessary to understand usability. Usability is used for measuring the quality of most software programs. One of the definitions of usability includes three measures: effectiveness, efficiency and satisfaction (Federoff, 2002). Effectiveness meaning the accuracy and completeness of users achieving set goals, efficiency meaning the resources expended to complete goals and satisfaction meaning the users’ attitude. These measures are usually used when it comes to evaluating software in terms of usability. Not all of these three measures are equally important if it comes to games. Efficiency and effectiveness are normally used to judge different software programs and are not as important for (video)games. Efficiency is defined as expending the least amount of resources to complete an end goal, while in games it is the complexity of multiple resources to complete a goal that makes the game fun. Games don’t always have an explicit endpoint, which is why effectiveness isn’t that important when it comes to evaluating games. This leaves satisfaction, which is an important part for evaluating a game because it determines if users will play a game or not (Federoff, 2002). The term playability is roughly defined as the overall quality of a game. Playability is based on usability, but as not all aspects of usability can be used to measure a games quality, the term playability is therefore used for the quality of a game.

To measure the playability of a game, we need to establish the aspects of games that can be evaluated. Clanton (1998) distinguishes three different areas: game interface, game mechanics and game play. Game interface is the device through which the player interacts with the game, game mechanics are the physics of the game (for example: animations or sound feedback) and game play is the process by which a player reaches the goal of the game (Federoff, 2002). However, Desurvire et al. (2004) distinguish four different categories, which they call heuristic categories: game play, game story, game mechanics and game usability. Game play is the set of problems and challenges a user must face to win a game, game story includes all plot and character developments, game mechanics involves programming that provides the structure by which units interact with the environment and game usability addresses the interface and encompassing the elements the user uses to interact with the game (mouse, keyboard etc.) (Desurvire et al., 2004). As I am talking about studying an existing board game, Settlers of Catan, we don’t need to study the specific plot and character developments. I am also not judging or evaluating the game itself, only the interface and the way the existing board game is implemented online. Taking these things into account, I have decided to look at the following aspects of the game:

- **Game interface** – The device in which the player interacts with the game.
- **Game mechanics** – The physics and environment of the game.

To evaluate the online implementations of Settlers of Catan, I will use a list of heuristics. Using heuristics for the evaluation of software was first done by Nielsen (1994). He created ten heuristics which were based on different aspects of a software program. One example of that is the heuristic error prevention, a software program must always prevent errors. Malone (1982) constructed a list of heuristics for instructional games. An example of Malone’s heuristics is: a player should always be able
to identify their score/status in the game. Federoff (2002) compiled a list of game heuristics from different literature while also using the heuristics of Nielsen which can be implemented in game evaluation. Lastly, Desurvire et al. (2004) also compiled a list of different game heuristics which they called HEP (heuristic evaluation for playability). These heuristics were validated by a user study.

All of the previously mentioned studies have made a list of different heuristics which can be implemented in the determination of the playability of games. For this study, I will make a selection of heuristics from these lists to use for my evaluation of the interfaces of Settlers of Catan. The selection of heuristics will be based on the two aspects of the game that I want to evaluate; game interface and game mechanics. The following heuristics were used in this study:

Table 1. Heuristics.

<table>
<thead>
<tr>
<th>Game interface</th>
<th>The interface should be as non-intrusive as possible</th>
<th>(Sanchez-Crespo Dalmau, 1999; Federoff, 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game interface</td>
<td>A player should always be able to identify their score/status in the game</td>
<td>(Malone, 1982; Shneiderman, 1992; Federoff, 2002)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Interfaces should be consistent in control, color, typography, and dialog design</td>
<td>(Sanchez-Crespo Dalmau, 1999; Federoff, 2002)</td>
</tr>
<tr>
<td>Game interface</td>
<td>For PC games, consider hiding the main computer interface during game play</td>
<td>(Bickford, 1997; Federoff, 2002)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Use sound to provide meaningful feedback</td>
<td>(Norman, 1990)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Visibility of system status</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Match between system and the real world</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>User control and freedom</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Consistency and standards</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Recognition rather than recall</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Flexibility and efficiency of use</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Aesthetic and minimalist design</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game interface</td>
<td>Help and documentation</td>
<td>(Nielsen, 1994)</td>
</tr>
<tr>
<td>Game mechanics</td>
<td>Feedback should be given immediately to display user control</td>
<td>(Bickford, 1997; Malone, 1982; Sanchez-Crespo Dalmau, 1999)</td>
</tr>
<tr>
<td>Game mechanics</td>
<td>Make effects of the Artificial Intelligence (AI) clearly visible to the player by ensuring they are consistent with the player’s reasonable expectations of the AI actor.</td>
<td>(Desurvire et al., 2004)</td>
</tr>
</tbody>
</table>
2.2 Settlers of Catan

Settlers of Catan is a board game that can be played with two to four players. In this study I will only make use of the basic board game. In the game, each player has to build settlements in order to get victory points, the first to get to ten victory points wins the game. A settlement gets the player one victory point, a city gets the player one additional victory point. To build settlements and cities players have to use resource cards, these resources are: ore, wood, wheat, clay and sheep. For example, a road costs one clay card and one wood card. To get these resource cards players have to roll the dice, the number rolled corresponds with the numbers on the board. If a player has built a settlement adjacent to a tile with the right number, the player gets the resources on that tile. For example:

![Figure 1. Settlers of Catan board.](image)

A player has rolled three. The red player has a settlement on a tile with the number three, the orange player has two settlements next to a tile with the number three. The tile next to the red player shows grass (which means sheep/wool), the tile next to the orange player shows a wheat field. This means that the red player will get one sheep card and the orange player gets two wheat cards (for each settlement you get one resource).

There is one exception: the number seven. When the number seven is rolled, players who have seven or more resource cards in their hands have to discard half of their cards. Also, the player who threw seven gets to put the robber on a tile. People who have built settlements on that tile cannot get any more resources from that tile until the robber is placed somewhere else. In the case above, the robber is placed on the stone tile with the number four. The red player cannot get any stone from that tile anymore.

There is another way to get resources for building settlements. Players are allowed to trade with each other and with the bank in order to get the resource cards they need. Players would want to trade with each other, as you can usually only trade with the bank 4:1 (four resource cards for one...
other resource card). However, there is an obvious risk to trading with opponents as the player who wants to trade usually needs specific resource cards to build more settlements. When this player has enough resource cards, he can get more victory points and maybe even win the game. This player now needs to persuade his opponents into working with him, so he can get the resources he wants.

### 2.3 Persuasion

Definitions of persuasion are not always the same, as different scientists tend to accent different types of aspects of persuasion. One sometimes places an accent on communicative aspects or on cognitive aspects (Di Blasio & Milani, 2008). A more general definition of persuasion is this: persuasion is an activity in which a source tries to intentionally influence a receiver and with the purpose of reaching a given objective: modifying opinions, attitudes and behaviours of the “target” (Di Blasio & Milani, 2008, p801).

When persuading someone into changing their opinion or behaviour, people can use persuasion strategies. There are a number of different strategies that can be used while persuading a target. Marwell and Schmitt (1967) developed a typology of 16 different persuasion strategies, including promises, threats, expertise, liking, debt, altruism and esteem. Other researchers followed and made their own strategy typologies. For example, Cameron (2009) discusses a total of fifteen persuasion strategies, theories and models that can be used in health communication situations. He distinguishes six different categories: message effect models, attitude-behaviour approaches, cognitive processing theories and models, consistency theories, inoculation theory and functional approaches. While discussing these theories and models, it is more clear that there are a wide variety of theories, models and strategies that one can choose from when discussing persuasion. Therefore O’Keefe (1990) wrote: “We may classify strategies differently – and so have very different strategy lists – depending on which facet of strategies is of interest. Thus there is no one correct (or best, or most nearly correct) list of compliance-gaining strategies ... Rather, there are many different possible “strategy” classifications, each potentially useful for capturing a different dimension.” (p. 207). The strategies mentioned above are too specific for this study, therefore I will only use two prominent and recurring strategies that Wilson (2003) found while researching persuasion. The first one is a strategy of rewarding compliance (using promises and pre-giving) vs. punishing non-compliance (using threats and aversive stimulation). The second recurring strategy is a strategy of rational arguments (reason and expertise) vs. non-rational arguments (emotion and altruism) (p. 541).

While the different persuasion strategies have an impact on persuasion as a whole, the medium which is used is also a big factor when it comes to persuasion. Different studies have shown that persuading someone via computer mediated communication (CMC) is much harder than it is in a face-to-face situation. For example, the study of Di Blasio and Milani (2008) focusses on persuasion in combination with CMC. The researchers tried to persuade people into changing their opinion on a specific subject both online and face-to-face. They found that it is significantly harder to persuade someone while only using online chat. During a persuasion attempt, only 10% of their chatting subjects changed their opinion, while 38% of the face-to-face subjects changed their minds after a persuasion attempt. A study of Wilson et al. (1997) showed a similar result. As face-to-face communication was rated more effective for execution tasks and socialization than for generation tasks. CMC was rated as less effective for socialization, execution and choice tasks than for generation tasks.

While we know that persuading someone while using CMC is much harder than it is while using face-to-face communication, persuasion attempts do occur in CMC. In this study, it is expected that people will persuade other players into trading resources. I however do expect that those persuasion attempts will not be successful, as studies have shown that it is hard to persuade someone online. My first hypothesis is as follows:

**H1: Negotiations in Settlers of Catan will rarely end in a successful trade.**

While they are persuading other players, it is expected that they will use persuasion strategies. The study of Wilson (2003) shows that using logic and emotion strategies will have a lower effect in
CMC than in face-to-face communication while reward and punishment strategies have a greater effect in CMC than in face-to-face communication. This is why I expect that players will make more use of a reward and punishment strategy while persuading other players into trading resources. The hypotheses are as follows:

H2: Players are using persuasion strategies to persuade someone into trading while playing Settlers of Catan.

H3: The most used persuasion strategy is a reward and punishment strategy.

2.4 Persuasion in Settlers of Catan

Multiple studies have been done on negotiation and persuasion in board games, multiple models have been made. The problem is that these models cannot be applied to Settlers of Catan, as this board game is more complex (Guhe & Lascarides, 2014a). The models that exist today mostly focus on a conversation with two players involved, while in Settlers of Catan there is a multi-party dialogue. A player can offer wheat for clay and another player may state that he has no clay. The second player can be lying to benefit his chances of winning the game (Guhe & Lascarides, 2014a). To research these kind of phenomena, Guhe and Lascarides (2014a) developed a Settlers environment named JSettlers. The environment is Java based and the researchers implemented every aspect of the board game. In the environment it is possible to apply certain heuristics which makes it possible to simulate a large number of games.

In one of their studies, Guhe and Lascarides (2014a) researched the moment at which negotiation/persuasion benefits a player’s chances of winning the most. They stated that there are two different aims a persuading agent aims for:

1. More trades: a desired trade a player might not achieve otherwise ('If you accept this clay, you are able to build a road in your next turn'). The player “helps” his opponent with the trade.
2. Fewer opponent trades: he stops two opponents from trading with each other ('He is about to win, don’t trade with him!') (Guhe & Lascarides, 2014a, p1).

The researches simulated 10000 games to see when in the game a persuasion attempt is most beneficial for a player’s chances of winning. They found that when a player has 7 victory points there is a tipping point. At that point it is relatively easy to change the course of the game, but once this is achieved it is increasingly hard for opponents to change it further (Guhe & Lascarides, 2014a, p8).

As Guhe and Lascarides (2014) claim that there are two different aims a persuading agent aims for (more trades and fewer opponent trades), in this study I will see if those aims actually occur when humans play Settlers of Catan. The hypothesis is as follows:

H4: When persuading another player into trading, a player will use arguments that either aim to get more trades or aim to have fewer opponent trades.

Another study of Guhe and Lascarides (2014b) shows more insight in the persuasion attempts in Settlers of Catan. They state that the benefits of persuasion will depend on three different aspects:

1. Players’ ingenuity: the range of contexts where the persuading agent can articulate a persuasive move based on the opponent’s situation in the game ('Give me one ore for one wheat and you can immediately build a settlement, which you cannot build without wheat').
2. Players’ caution: In those contexts where his ingenuity provides a candidate persuasion move, player’s strategy for deciding whether to actually make that move.
3. Recipient’s gullibility: how inclined the recipient is to accept the persuading agents’ persuasion move and hence also the trading offer (Guhe & Lascarides, 2014b, p4).

The researchers simulated a total of 10000 games again, where the players were adapted in terms of their ingenuity, caution and gullibility. This showed that the more ingenuity the persuader has
and the more gullible his recipients, the more successful he becomes at winning the overall game. Only one gullible agent is needed to gain an advantage over all three of the opponents. If a player lacks ingenuity, it helps to make the persuading arguments dependent on whether an opponent can immediately build a settlement. A persuader can also increase the proportion of his persuasion moves without harming his win rate by reasoning about how his opponent will react (Guhe & Lascarides, 2014b, p8).

The studies of Guhe and Lascarides (2014a, 2014b) are all based on the simulation of games. They adapted the players to be either more gullible or more genuine. This study will focus on human players and how persuasion actually works during an online board game.

In the next chapter I will discuss the heuristics evaluation of PlayCatan and AsoBrain. After that I will discuss my findings on the analysis of the STAC corpus.
Chapter 3  
Interface evaluation

For the interface evaluation of PlayCatan and AsoBrain I used a heuristic evaluation method. I have played 20 games of Settlers of Catan on both platforms and while I was playing them, some problems came up. After I established which problems there were on the platforms, I used Table 1 to see if there were any of those heuristics violated. After I established the heuristics violated, I gave all of the problems a severity score. The severity score scales like this:

0: Not a usability problem  
1: Cosmetic problem  
2: Small usability problem  
3: Usability problem, important to be removed  
4: Red flag problem, must be removed

The severity scores are based on my own experience in the game. The higher the severity score, the more difficult it was for me to play the game.

In this chapter I will discuss my findings and how the problems that I found can be solved. I will first discuss the heuristic evaluation of PlayCatan, after that I will discuss the heuristic evaluation for AsoBrain.

3.1 PlayCatan

PlayCatan is the official online Settlers of Catan game. You can only play the basic Settlers of Catan game without any expansions. When signed up, you can choose to download the game to play it without using your browser or just play it in your browser. When signed in, you enter a lobby where you can join various games which people started. There is no way of playing against an AI, you can only play against other people. Note that I have played an earlier version of PlayCatan, during this investigation the makers made a new version which is not available to play yet. I have played a number of 20 games on PlayCatan and came up with the following problems:

<table>
<thead>
<tr>
<th>Observation</th>
<th>Heuristic violated</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>No feedback when clicking trading buttons</td>
<td>Feedback should be given immediately to display user control</td>
<td>4</td>
</tr>
<tr>
<td>No text balloons when talking (self)</td>
<td>Feedback should be given immediately to display user control</td>
<td>4</td>
</tr>
<tr>
<td>No indication that you’re taking too long</td>
<td>Consistency and standards</td>
<td>2</td>
</tr>
<tr>
<td>No clear way of trading</td>
<td>The interface should be as non- intrusive as possible</td>
<td>2</td>
</tr>
<tr>
<td>Board is sometimes unclear in its symbols</td>
<td>Match between system and the real world</td>
<td>1</td>
</tr>
<tr>
<td>Make effects of the Artificial Intelligence (AI) clearly visible to the player by ensuring they are consistent with the player’s reasonable expectations of the AI actor.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
There are a few problems which I scored with a severity of four. The first of those is the problem that there is no feedback when you click on the trade buttons. When a player wants to trade in his turn, he can propose that trade. The other players get a pop up with buttons they can click to let the other player know that they can’t or won’t trade. When the button is clicked, there is no indication whether the other players have seen what button you clicked.

The same problem occurs when you want to say something to the other players via chat. There are some templates you can choose from or you can type in the chatbar. When other players say something, a balloon pops up which contains the message of that player. This feedback is not given when you are talking yourself. So again, there is no way of knowing if the other players saw what you said.

The last problem which I scored with a severity of four is that there is no overview of your own score. You can see the score of the other players, but you have to count your own victory points. Adding a same overview of your score will make the game much clearer, especially for beginners.

The other problems are not scored with a severity of four but are problems that should be solved. For example, I needed to replace my taskbar to play the game because it interfered with the game. Changing the frame of the game should solve that. Then there is the problem of the complicated way of trading. There is an interface, but it is not clear what you have to do. After some help from my opponents, I saw that you have to click on your own resources instead of the resources displayed in the trade interface. This made it very difficult for me to play.

Lastly, there are two minor problems. One of which is the symbols used on the board (especially the trade ports) which are not always very clear. The other is that there is no timer on turns, so opponents could wait ten minutes before someone makes a move. Also, you need to end your turn before the next turn can begin and sometimes people forget to do this. Putting a timer on turns will solve this problem.

### 3.2 AsoBrain

AsoBrain is a site on which you can play several board games, one of which is Settlers of Catan. On AsoBrain it is possible to play different versions of the game, with or without the expansions. This site is much more competitive than the PlayCatan site, as there are also ranked games here. This also means that the community is not that happy when someone plays bad. It is however also possible to play against the computer. I have played 20 games on AsoBrain and there were some problems with the interface:

<table>
<thead>
<tr>
<th>Observation</th>
<th>Heuristic violated</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board not totally visible (have to zoom out or in)</td>
<td>The interface should be as non-intrusive as possible</td>
<td>1</td>
</tr>
<tr>
<td>Developments in the game are not easily read (pop up balloons)</td>
<td>The interface should be as non-intrusive as possible</td>
<td>3</td>
</tr>
<tr>
<td>Cities and villages are hard to distinguish</td>
<td>Match between system and the real world</td>
<td>4</td>
</tr>
</tbody>
</table>
There are two problems which I scored with a severity of four, one of those is the problem that cities and settlements are hard to distinguish. This makes it almost impossible to see whether there is a settlement or a city placed somewhere. The other is that you can’t see your own score, which means you have to count your own victory points.

The other problems are not as severe. There is a problem where the board has many colors, which makes it hard to distinguish anything. If the settlements, cities and roads are a bit bigger this should solve the problem. Also, the developments in the game are indicated with a pop up balloon that disappears after one second which makes it hard to read. Removing the pop up balloons or making them stay somewhat longer will solve this problem.

The other problems are more cosmetic. You have to zoom out to see the whole board, which would be easily solved by changing the frame of the board. The chat is hard to find in the interface, which makes it even harder to chat with your opponents (although this rarely happens, as discussion never takes place). Lastly, there is some sound feedback but it doesn’t really correspond with the actions. When you buy a development card you hear a rooster crow, which I don’t think is necessary.

### 3.3 Impact on trading

In summary, PlayCatan needs to change some things when it comes to communicating with players. Especially the feedback when clicking buttons is something that has to be changed in order to improve the game and the communication between players. AsoBrain has more trouble with the board and the developments of the game. It is hard to distinguish the different resource tiles and cities and villages, which makes it hard to keep up with the developments of the game.

The problems I found have an impact on the way of negotiating a trade while playing the game. In PlayCatan for example, it is really hard to negotiate a trade when you don’t get any feedback when clicking the buttons to trade. You also get no feedback when you say something, especially when you use the templates for trading. There is no way of knowing that your opponents really got the message you were trying to send. PlayCatan should really work on these problems to make it easier for people to trade. The same goes for AsoBrain, as some of the problems I found on that site also have an impact on negotiating a trade. The way developments in the game are shown are so hard to distinguish, that it is hard to keep up with what happened. These activities have a great impact on the game and thus on the negotiations. When you can’t keep up with the developments, it is hard to know what people may need from you and thus hard to negotiate a trade. It is also hard to communicate with your opponents, as the chat is very hard to find in the interface. Communication therefore only takes place in the trading interface.

I will now discuss the analysis of the STAC corpus.
Chapter 4
Chat dialogue analysis

In this and the following chapters I will discuss my findings of the chat dialogue analysis. I will first discuss the STAC corpus of Afantenos et al. (2012, 2015) and after that I will discuss the ways of making a trade attempt, the negotiation patterns and the ways of rejecting an offer.

The research of Afantenos et al. (2012, 2015) has until now focused on the annotation of the data and the development of a multi-party dialogue model. In Afantenos et al. (2012) the researchers elaborated on their manner of annotating the chat dialogues. In this article, they discuss some of the ways of negotiating a trade in Settlers of Catan. In Afantenos et al. (2015) the researchers made a discourse parsing model based on the STAC corpus. They didn’t look at the contents of the utterances but only focused on the way turns are structured in a multi-party dialogue.

In this thesis I will focus on the contents of the utterances made by people who are playing Settlers of Catan online. I will discuss their way of making a trade attempt, negotiating a trade and rejecting a trade.

4.1 Data collection

As said before, for this study I got access to the STAC corpus of Afantenos et al. (2012, 2015). I took out 20 of the 36 games for the analysis of the chat dialogues.

The data contained both text files and glozz files, which were the annotations done by Afantenos et al. (2015). I only used the text files for this research. The text files had a difficult mapping of the text, as all of the text was arranged next to each other. An example:

212 : gotwood4sheep : anyone got clay or wheat? 213 : ljaybrad123 : some resources would be lovely... 214 : william : no 215 : ljaybrad123 : no

I rearranged the text so that is was more clear to see who said what and when. I placed all of the chat dialogues in OneNote, with a tab for every game and a page for every turn. This was because every turn had a different text file.

The researchers of the STAC corpus state in their article that All dialogues also have a dialogue act style annotation in which each EDU is assigned a particular type (it can be an offer or counter-offer, an acceptance or refusal, or other) (Afantenos et al., 2015, p931). The glozz files were annotated but contained more information about the turn structure than the actual contents of the turns. This is why I annotated the data myself.

<table>
<thead>
<tr>
<th>Color</th>
<th>Act</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Offer</td>
<td>Player saying he wants a resource</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Player saying he has a resource to trade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Player saying he wants to trade with a specific player</td>
</tr>
<tr>
<td>Purple</td>
<td>Negotiations</td>
<td>Discussions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Counter-offers</td>
</tr>
<tr>
<td>Red</td>
<td>Refusal</td>
<td>Players saying &quot;no&quot; or &quot;sorry&quot; after an offer has been made</td>
</tr>
<tr>
<td>Green</td>
<td>Acceptance</td>
<td>Players making clear that it is okay for the other player to start the trade</td>
</tr>
<tr>
<td>Blue</td>
<td>Blocking a trade</td>
<td>Player making clear that the other player should not trade with a specific player</td>
</tr>
</tbody>
</table>

For further analysis (section 4.2), I also categorized the negotiations into offers, counteroffers and questions. As I haven’t seen the game being played, I am unsure that a trade really happened when
someone accepted an offer. But when a player accepted a trade in the chat, I counted it as a successful trade attempt. I am also unsure whether other trades have been made without the players talking about it, as there is a separate interface for trading in the game where people can do offers.

4.2 Chat analysis

As said before, the chat dialogues are taken from the STAC corpus. I have colored the utterances in the chat as trade attempt, negotiations, rejection, acceptance and blocking a trade. A total of 20 games were used for the analysis. In these 20 games there were 9648 utterances, 560 trade attempts, 196 successful trades, 8 blocks and 181 turns. Here are the specifics per game:

Table 5. Specifics per game.

<table>
<thead>
<tr>
<th>Game</th>
<th>U</th>
<th>TA</th>
<th>ITA</th>
<th>ETA</th>
<th>ST</th>
<th>%ST</th>
<th>N</th>
<th>BA</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>711</td>
<td>38</td>
<td>5</td>
<td>33</td>
<td>13</td>
<td>34%</td>
<td>21</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>G2</td>
<td>701</td>
<td>47</td>
<td>15</td>
<td>32</td>
<td>15</td>
<td>32%</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>G3</td>
<td>503</td>
<td>31</td>
<td>4</td>
<td>27</td>
<td>13</td>
<td>48%</td>
<td>13</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>G4</td>
<td>489</td>
<td>21</td>
<td>6</td>
<td>15</td>
<td>4</td>
<td>20%</td>
<td>8</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>G5</td>
<td>480</td>
<td>30</td>
<td>19</td>
<td>11</td>
<td>15</td>
<td>50%</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>G6</td>
<td>491</td>
<td>26</td>
<td>5</td>
<td>21</td>
<td>9</td>
<td>35%</td>
<td>9</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>G7</td>
<td>397</td>
<td>31</td>
<td>2</td>
<td>29</td>
<td>13</td>
<td>42%</td>
<td>15</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>G8</td>
<td>468</td>
<td>33</td>
<td>12</td>
<td>21</td>
<td>8</td>
<td>24%</td>
<td>17</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>G9</td>
<td>474</td>
<td>34</td>
<td>7</td>
<td>27</td>
<td>12</td>
<td>35%</td>
<td>13</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>G10</td>
<td>890</td>
<td>58</td>
<td>16</td>
<td>42</td>
<td>18</td>
<td>31%</td>
<td>32</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>G11</td>
<td>595</td>
<td>29</td>
<td>10</td>
<td>19</td>
<td>10</td>
<td>34%</td>
<td>15</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>G12</td>
<td>446</td>
<td>27</td>
<td>7</td>
<td>20</td>
<td>6</td>
<td>22%</td>
<td>9</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>G13</td>
<td>621</td>
<td>39</td>
<td>9</td>
<td>30</td>
<td>16</td>
<td>41%</td>
<td>16</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>G14</td>
<td>356</td>
<td>20</td>
<td>2</td>
<td>18</td>
<td>8</td>
<td>40%</td>
<td>8</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>G15</td>
<td>391</td>
<td>22</td>
<td>9</td>
<td>13</td>
<td>8</td>
<td>36%</td>
<td>13</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>G16</td>
<td>327</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>18%</td>
<td>7</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>G17</td>
<td>336</td>
<td>22</td>
<td>6</td>
<td>16</td>
<td>12</td>
<td>55%</td>
<td>13</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>G18</td>
<td>328</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>38%</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>G19</td>
<td>362</td>
<td>17</td>
<td>2</td>
<td>15</td>
<td>8</td>
<td>47%</td>
<td>7</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>G20</td>
<td>282</td>
<td>17</td>
<td>3</td>
<td>14</td>
<td>5</td>
<td>29%</td>
<td>7</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Tot.</td>
<td>9648</td>
<td>561</td>
<td>148</td>
<td>413</td>
<td>198</td>
<td>33%</td>
<td>250</td>
<td>8</td>
<td>181</td>
</tr>
</tbody>
</table>

Table 5 shows that 33% of the trade attempts were actually a success. This means that 33% of the negotiations resulted in a trade. There are some games where there were more successful trades than others. This can be because of the personality of the players, one may be more inclined to trade something and help others than other players are. There is also the factor of the game itself, as in some games people don’t need to trade much because they got enough resources from their tiles in the game.

Table 5 also shows that the last few games were somewhat shorter in turns than the previous games. This is because some of the games were practice games and therefore finished faster or didn’t finish at all. I have analyzed these games, as they did have many utterances which I could analyze.

Furthermore, there were a total of 560 trade attempts of which 148 were implicit. The implicit trade attempts were trade attempts that can also be seen as a gathering of information from the other players. The other 412 trades were explicit, where players did an actual offer and stated what they wanted in return.
In the following sections and chapters I will model the ways of making a trade attempt and the ways of negotiating with two, three or four players.

4.3 Trade attempts

As is shown in Table 5, there were a total of 560 trade attempts in the 20 analyzed games. Only 33% of those trade attempts were also a success. The annotations are as follows:

TRADE ATTEMPT – when a player asks for a resource or is offering it
REJECT – when a player rejects an offer
QUESTION – when someone wants to have some more information or is referring to another player
ACCEPT – when a player accepts a trade (the trade attempt is than a success)
NEGOTIATION – when players are negotiating a trade
CONFIRM – when a player confirms a question or a trade attempt

There are a few ways which players use to make a trade attempt/offer. This mostly changes as the game takes longer. The first example of how a player makes a trade offer is the following:

294 : Cardlinger : anyone wheat for clay?
295 : Cardlinger : ty Euan :)
296 : Joel : strangely i have no wheat
297 : jon : no wheat
298 : Joel : and also no clay
299 : Cardlinger : sorry i have wheat, it's clay i fancy

Cardlinger does the trade attempt as he is asking: “anyone wheat for clay?”. Most of the games have a few of these utterances. Both Joel and Jon reject the offer, as neither of them has wheat, but the problem lies in the utterance of Cardlinger itself. It is not clear whether Cardlinger requires wheat or clay, it could go both ways. The problem gets clear when Joel says: “and also no clay”, indicating that he was not sure whether Cardlinger required wheat or clay. Cardlinger does a repair utterance in which he explains that he has wheat and requires clay.

As said, this is not the only game in which this happens. After a few times, the players make sure that their trade attempt is clear. Like in the following example:

423 : gotwood4sheep : anyone got ore?
424 : gotwood4sheep : can offer sheep or wheat
425 : gotwood4sheep : would have had ore, but...
426 : tomas.kostan : nope
427 : ljaybrad123 : ah robber...
428 : ljaybrad123 : nope
429 : gotwood4sheep : william?
430 : william : oh, sorry no. too low right now

Gotwood4sheep makes his offer clear. He asks if anyone has ore for him and that he can offer sheep or wheat. There are no misunderstandings and the other players reject the offer without someone having to make a repair utterance. This way of making a trade offer is used very often and is the fastest way of establishing a trade. Sometimes the trade is established in two utterances, after the trade offer has been made:

27 : Gaeilgeoir : anyone have clay? I have ore
28 : inca : i've got one

Gaeilgeoir does the trade offer, he has ore and he wants clay. Inca states that she has one. There is no more talk about the trade whatsoever, so the trade has been established.
There are three other ways which players use to make a trade offer. They either ask for the resource they want or they ask if people want a resource they have or they specifically ask another player if they want to trade. Here is an example of someone wanting to part with a resource:

192 : amychar1 : anyone want a sheep
193 : amychar1 : ?
194 : IG : sry
195 : sabercat : for what?
196 : amychar1 : wheat preferably
197 : sabercat : dont have that :D
198 : amychar1 : anything else is fine
199 : sabercat : wood?
200 : amychar1 : yer sure
201 : sabercat : then go ahead

Amychar1 asks if anyone wants sheep, as she probably has lots of it and does not have use for it. IG refuses the offer, but sabercat wants to negotiate by saying “for what?”. Depending on the resources the other player has this way of trade offering can take a bit longer than the previous one. Here is an example of a player wanting a resource:

321 : sabercat : okay, do you people have ore?
322 : amychar1 : nope
323 : dmm : nope
324 : IG : what are you offering?
325 : sabercat : how much do you have?
326 : IG : 1
327 : IG : actually, sorry, im going to hang on to it

Sabercat asks if the other players have ore. Amychar1 and dmm both refuse by saying they don’t have any ore. IG starts negotiations by saying “what are you offering”. This is again a way of trade offering that could take a bit longer, depending on the resources the other player has. In above example, the trade doesn’t even happen because IG does not want to part with his ore. I have called this way of trading an implicit trade attempt as the player can also use it as a strategy to gather information about the resources that are in the game. The player can use a monopoly card to get all the resources of his choice from every player. Implicit trades don’t happen very often, only 26% of all the trade attempts are implicit.

The last way of trading is when a player specifically asks another player to trade. This is mostly the case when a player sees another player getting a resource he wants. The player can ask that other player if he wants to trade that resource. A player can also ask for another player to trade if he knows that he has a resource the other player wants. Here is an example:

454 : rennoc1 : so dave, what did you have to trade for clay?
455 : Tomm : I covert rennoc's clay.
456 : Tomm : I could offer things?
457 : Dave : wood?
458 : Tomm : Ore?
459 : Dave : clay rennoc
460 : Dave : I have ore to trade (or wheat, always wheat)
461 : rennoc1 : tomm, do you have ore?
462 : Tomm : Yes, yes I do
463 : rennoc1 : ok

Rennoc1 knows that Dave wants clay and asks him what he has to trade for clay. In this example rennoc1 has a luxury position, as both Dave and Tomm want to have his clay. Rennoc1 can now choose one of the players to trade with.
In this paragraph I have shown that there are four ways of making a trade attempt:

1. A player says he wants a resource (*Anyone have ore?*)
2. A player says he wants to part with a resource (*Anyone need ore?*)
3. A player giving a specific offer (*Anyone want ore for wheat?*)
4. A player asking a specific other player for a trade (*Player 2, do you want ore? I will give you wheat.*)

These are the four most common trade attempts I have seen that can be made during a game of Settlers of Catan when the players are speaking via chat. In Chapter 6 I will show how this is implemented in the existing online implementations of Settlers of Catan.
Chapter 5
Negotiation patterns

In this chapter, I will discuss the negotiation patterns that are used while people are playing Settlers of Catan. In Chapter 2 I have discussed the research on persuasion in CMC and have discussed that it is significantly harder to persuade people online than it is in face-to-face communication. The negotiation patterns will give more information about exactly how hard it is to persuade someone into a trade while playing online Settlers of Catan. The contents of the negotiation patterns will also give more information about persuasion strategies that are used during the game.

To determine the negotiation patterns, I have used the same annotations as I mentioned above and have also numbered the players A, B and C. A is the one who does the actual trade attempt, B and C are the other players. In most cases, it is also A’s turn to roll the dice in the game. In this turn, A can build settlements and cities and he can trade resources with other players. For every game I have determined when the negotiations took place and what the players did to negotiate a trade with each other.

Negotiations normally start after an offer or trade attempt has been done. When a player asks for a resource or says he has a resource to trade, the other players can negotiate to establish the trade. As I have shown, there are different ways of making a trade attempt. A player can ask for the availability of a resource, a player can say he is providing a resource, a player can give an explicit offer in which the resource he wants and the resource he can give is clear and lastly a player can ask a specific other player to trade with him. All of these ways of trading have an impact on the negotiations that follow. There is also a difference in negotiations when there are three or four players in the game.

5.1 Negotiations with two or three players

In the twenty games I have analyzed there are fifteen that are played with three players. Let us first look at the negotiations after a player asking for a resource. Here is an example of a simple trade:

141 : Gaeilgeoir : Anyone have wood available? TRADE ATTEMPT
142 : inca : Got one, do you have clay? CONFIRM + OFFER
143 : Gaeilgeoir : yep ACCEPT
144 : inca : cool ACCEPT

In this example Gaeilgeoir asks for wood from any of the other players. Inca says she has wood and immediately asks for clay. Gaeilgeoir accepts, Inca accepts and the trade is established. So the simple way of trading after this trade attempt is:
A trade attempt, B confirm+offer, A accept, B accept.

In this example the total offer is done by Inca as she asks for clay. This is not always the case:

265 : ljaybrad123 : anyone have wood to pare? TRADE ATTEMPT
266 : william : no wood REJECT
267 : gotwood4sheep : l CONFIRM
268 : gotwood4sheep : what for? QUESTION
269 : ljaybrad123 : sheep? ANSWER
270 : gotwood4sheep : ok go on then :) ACCEPT

Ljaybrad123 asks if anyone has any wood to trade. William immediately steps out of the negotiations by saying he doesn’t have any wood. Gotwood4sheep confirms that he has wood and asks ljaybrad123 what he has to trade. In this case, the one who made the trade attempt also
completed the offer by saying he can trade sheep for the wood he wants. Gotwood4sheep accepts this and the trade is established. In this case the trade goes as follows: 
\(A_{\text{trade attempt}}, B_{\text{reject}}, C_{\text{confirm+question}}, A_{\text{answer}}, C_{\text{accept}}\).

A trade attempt can also be done when asking if someone needs a resource. Negotiations are a bit different as in this case, the one who does the trade attempt wants to help another player get a resource while parting with theirs. Here is an example of this kind of trade attempt:

344 : Cat : would anyone like wheat?          TRADE ATTEMPT
345 : Thomas : yes please                    CONFIRM
346 : Cat : I need clay or ore               ADD TO OFFER
347 : Thomas : I can give an ore            CONFIRM
348 : Thomas : or a clay                     CONFIRM
349 : Cat : or a sheep!                      CHANGE OFFER
350 : Thomas : impossible...               REJECT
351 : Cat : let's do the clay               ACCEPT OFFER
352 : Thomas : k                            ACCEPT

In this example Cat asks if anyone wants wheat, probably because she has a lot of wheat in her hand. Thomas confirms that he wants wheat. Cat now adds to her offer, saying she needs clay or ore. Thomas confirms that he has either clay or ore to trade. Cat now changes her offer which Thomas rejects. The original offer is accepted by both parties. Changing the offer doesn’t happen very often (four times in total), so if I take that into account the way of trading goes as follows: 
\(A_{\text{trade attempt}}, B_{\text{confirm}}, A_{\text{add to offer}}, B_{\text{confirm}}, A_{\text{accept}}, B_{\text{accept}}\).

The third way of attempting to trade is asking for a resource while saying you want to give a resource. Here is an example of this way of trading:

96 : Chameleon : would eiter of you trade ore for wheat and/or wood       OFFER
97 : skinnylinny : Nope                   REJECT
98 : Nancy : i cld give u a sheep for it?  COUNTEROFFER
99 : Chameleon : Need wood/wheat, sheep I can get                        REJECT
106 : Nancy : sorry cant do that                       REJECT

In this example Chameleon wants to trade ore for wheat or wood. Skinnylinny immediately steps out of the negotiations saying she doesn’t want to trade. Nancy makes a counteroffer, saying she could give sheep. Chameleon rejects this counteroffer by saying he needs wood or wheat and Nancy rejects the total trade. The negotiation went as follows:
\(A_{\text{trade attempt}}, B_{\text{reject}}, C_{\text{counteroffer}}, A_{\text{reject}}, C_{\text{reject}}\).

The fourth way of trading is when a player specifically asks another player to trade. The third player can take a part in this way of trading as I have shown in Chapter 4. Normally, however the negotiations take place only with the two players who addressed each other:

206 : skinnylinny : amy: You want clay?         TRADE ATTEMPT
207 : amycharl : yup                           CONFIRM
208 : skinnylinny : Got any ore?                QUESTION
209 : amycharl : i do                           CONFIRM
210 : amycharl : clay for an ore?               OFFER
211 : skinnylinny : Make it two?                COUNTEROFFER
212 : amycharl : nah, ill just wait             REJECT
In this case skinnylinny asks amychar1 if she wants clay. Amychar1 confirms this after which skinnylinny asks for ore. Amychar1 confirms she has ore and offers that ore for the clay she wants. Skinnylinny makes a counteroffer by asking for two ores after which amychar1 rejects the counteroffer. The negotiation went as follows: \[A\text{ trade attempt}, B\text{ confirm}, A\text{ question}, B\text{ confirm+offer}, A\text{ counteroffer}, B\text{ reject}\].

In all of the examples I have discussed the negotiations where only two people were involved. There are however some cases in which all three players take part in the negotiation. Here is an example:

```
401 : skinnylinny : Who wanted wood?                      TRADE ATTEMPT
402 : sabercat : hope its not necessary though
403 : IG : me                                             CONFIRM
404 : sabercat : I did                                    CONFIRM
405 : skinnylinny : Hmmm
406 : IG : What do you want for it                        QUESTION
407 : skinnylinny : Either of you have sheep?             OFFER1
408 : IG : Sorry                                          REJECT
409 : skinnylinny : Sorry, meant ore                      CHANGE
410 : sabercat : two wood for sheep?                      OFFER2
411 : IG : i got that]                                    CONFIRM
412 : IG : ore for wood                                   OFFER3
413 : IG : ?                                             
414 : sabercat : got ore too                             CONFIRM
415 : skinnylinny : Ore for wood... One each?             OFFER4
416 : IG : sure                                           ACCEPT
417 : sabercat : okay                                    ACCEPT
```

Skinnylinny asks who wanted wood, both IG and sabercat want the wood skinnylinny is offering. Skinnylinny first asks for sheep but changes this via self-correction into ore. Both IG and sabercat say they have ore to trade after which skinnylinny chooses to trade with both IG and sabercat. Note that in this case all players are very friendly. There are some cases in which players try to outbid each other to get the resource they want.

Overall the negotiations take in a large part of the game. While there are a lot of options for all players to do, the general idea of negotiating and trading goes like this:
This tree structure shows the exact way of trading if there are two people involved in the trade. A is in any case the player who did the initial trade attempt and B is the player who reacts to the trade attempt. This can either be that he wants to trade or that he rejects the initial trade attempt. When B does confirms that he wants to trade, either A or B can do an offer. A and B are both free to reject an offer or to change their mind. When this happens, there is no trade happening.

The tree structure also gives some insight in the way of persuading a player into trading. The greatest numbers are that of the patterns: A trade attempt, B confirms → Trade; A trade attempt, B confirms, B offer, A confirm, B accept → Trade and A trade attempt, B rejects → No trade. The first two patterns resulted in a trade, A has in that case successfully persuaded B into trading. In the last pattern there is no trade, so A did not persuade B into trading with him. This can have multiple reasons, in most cases B just doesn’t have the resources which A is asking for. It does however say something that the other 2 patterns do result in a trade. One of those patterns even contains some negotiating, where A and B are agreeing on the trade. This would mean that in 32 of the cases where two people are trying to trade A succesfully persuaded B into trading.

Here are the negotiation patterns when three players are involved in the trade:
Figure 3. Tree structure negotiation with three players.
This tree structure shows how trading works when there are three people involved in the negotiation. Again, A is the one who does the trade attempt and it is his or her turn, B and C are the other two players. When B and C both reject the trade attempt, no trade is happening. When either B or C rejects he steps out of the negotiations and they proceed as they are negotiating with two players. When B and C both confirm A’s trade attempt, A does a general offer. A can then either choose to trade with B or C or can choose to trade with both of them, depending on the confirmation of B and C and the resources A has.

5.2 Negotiations with four players

Negotiations and trading with four players is somewhat more complicated. So complicated in fact, that the players themselves rarely do it. Only 70 of the total 560 trade attempts involve four players. As there are only five games in my data which are played with four players this is not a surprising number. The negotiations where four players are involved occur in three different categories which I called the “RRC”, “RRR” and “Other” category. Negotiations in the RRC category happen 14 times in the 70 negotiations with four players and they go as follows:

554 : tomas.kostan : any sheep for sale? TRADE ATTEMPT
555 : gotwood4sheep : i am out, sorry REJECT
556 : ljaybrad123 : nope REJECT
557 : william : i have a sheep to give CONFIRM

In this example, thomas.kostan asks if anyone has any sheep. Gotwood4sheep says he’s out, ljaybrad123 says he doesn’t have any sheep and William says he does have sheep. So there are four people involved in the trade but two of them reject the trade attempt. One of them confirms and after that they proceed the negotiation with the two of them.

The RRR category is one in which all of the remaining players reject the initial trade attempt. Negotiations in the RRR category happen 53 times in the 70 negotiations with four players. Here is an example:

569 : gotwood4sheep : anyone got sheep for 1 wood? TRADE ATTEMPT
570 : ljaybrad123 : nope REJECT
571 : william : not anymore REJECT
572 : tomas.kostan : no sry REJECT

All of the four players are involved in the negotiations, but all of them reject the trade attempt. Probably because not one of them have any sheep.

The last category is the category “other”. These are more complex negotiations, but they happen only three times in the five games with four players. These are the following:

34 : Rainbow : so anybody wana trade sumthng? TRADE ATTEMPT
35 : inca : I'm OK just now REJECT
36 : Kittles : i dont know what i have ---
(...)
39 : ariachiba : I can give you sheep in exchange for wood... OFFER
40 : Rainbow : i dnt have wood REJECT
41 : Rainbow : i have clay COUNTEROFFER
42 : Rainbow : sheep ADDCOUNTEROFFER
43 : inca : I have wood OFFER2
44 : Rainbow : n wheat ADDCOUNTEROFFER
45 : Kittles : i can trade clay wood for clay OFFER3
46 : Rainbow : ok ACCEPT
In this example all of the players are involved. The negotiation takes place in the first turn, this is why Rainbow opens the negotiations with the question if anyone wants to trade something. Inca immediately rejects but still offers her wood later on. Ariachiba makes the first offer, which is rejected by Rainbow. Rainbow gives a counteroffer by saying she does have clay or sheep or wheat. Inca now gives her offer of her wood and after that Kittles does the last offer, which Rainbow accepts.

The next example is also a negotiation between all four players:

```
725 : tomas.kostan : any wheat to spare? TRADE ATTEMPT
726 : gotwood4sheep : yup CONFIRM
727 : ljaybrad123 : nope REJECT
728 : gotwood4sheep : whatcha got QUESTION
729 : william : loads CONFIRM
730 : tomas.kostan : wood :) OFFER
731 : gotwood4sheep : 1 for 1? OFFER2
732 : gotwood4sheep : or 2 for 2? ADDOFFER2
733 : tomas.kostan : 2 for 2? ACCEPT
734 : gotwood4sheep : deal ACCEPT
```

In this example, thomas.kostan asks if anyone has any wheat. Gotwood4sheep and william both confirm that they have wheat, ljaybrad123 rejects the trade attempt. Thomas.kostan seems to ignore the confirmation from william and proceeds the negotiations with gotwood4sheep.

The last example is also a negotiation where all four players are involved. In this case, the one who does the initial trade attempt changes her trade attempt to see if someone wants to help her:

```
221 : amycharl : i will give a sheep for a clay TRADE ATTEMPT
222 : amycharl : anyone up for that? --
223 : IG : nah REJECT
224 : sabercat : nope REJECT
225 : amycharl : or a wheat actually CHANGE
226 : dmm : i have neither REJECT
227 : sabercat : (I would, but I have nothing...) REJECT
```

Amycharl does the initial trade attempt after which IG and sabercat reject the trade attempt. After that, amycharl changes her trade attempt to see whether someone wants to trade wheat with her. Dmm and sabercat reject this second trade attempt.

As I have shown in the tree structure of negotiations with three players, there are a lot of possible paths which players can choose when they are negotiating. One can imagine that there are far more paths when it comes to negotiations with four players. In reality however, all four players don’t always get involved in the trade. In most cases if one of the players confirms the trade attempt, the other players don’t get involved anymore.

5.3 Rejections

Rejecting an offer or a trade attempt is a very important part of the game. By rejecting an offer or trade attempt a player can give information about the resource cards he has available. This could help other players when they have the ability to steal a card from another player. Rejecting an offer can therefore be done in different ways. I will discuss these types of rejections in this paragraph.

The first way of rejecting an offer is when a player says he doesn’t have the resource the trade attempting player is asking for. Here is an example:

```
253 : Euan : No worries :) Anyone got any clay? TRADE ATTEMPT
(...)
259 : Joel : havent had clay in awhile REJECT
260 : Cardlinger : none, sorry :( REJECT
```
In this example, Euan asks if anyone has any clay to trade. Joel rejects the trade attempt by saying “haven’t had clay in a while” and Cardlinger also rejects the trade attempt by saying he has none. Both Joel and Cardlinger give information by saying they don’t have any clay. The other players now know that Joel and Cardlinger can’t build a village or a street. They also know that if they want clay they can’t steal it from Joel or Cardlinger.

This way of rejecting a trade attempt directly links to the discussed trade attempts in Chapter 4. If a player makes a trade attempt by asking if anyone has any kind of resource, answering this trade attempt will always give away information. Here is an example:

| 588 | Euan : Anyone got a sheep? | TRADE ATTEMPT |
| 589 | jon : no | REJECT |
| 590 | Joel : no | REJECT |
| 591 | Cardlinger : none :( | REJECT |

In this example, it is again Euan who makes the trade attempt by asking if anyone has any sheep. As jon and Joel both react with “no” one can easily make the assumption that they don’t have any sheep to trade as they are asked the question if anyone has any sheep. Cardlinger reacts with “none” which immediately means that he has no sheep cards in his hands. This means that the way of making a trade attempt also helps with getting more information from the other players. The only way of not giving this information is not reacting to the trade attempt. When a player asks for a resource and says he has a resource but he needs it himself. Here is an example:

| 444 | Rainbow : nd sheep | TRADE ATTEMPT |
| 445 | inca : Need mine, sorry | REJECT |

Rainbow makes a trade attempt by saying she needs sheep. Inca rejects the trade attempt by saying she needs her sheep. This move puts Inca at risk because Rainbow can easily steal her sheep if she wants to (by moving the robber for example). This way of rejecting a trade attempt is also directly linked to the “I need a resource” way of making a trade attempt. It is also used when someone makes a specific trade attempt.

A third way of rejecting a trade offer is by simply saying “no”. Here is an example:

| 111 | Katherine : anyone wants to trade wood for clay | TRADE ATTEMPT |
| 112 | Amanda : no | REJECT |
| 113 | Charlotte : no sorry | REJECT |

Katherine makes a trade attempt by saying she wants to trade wood for clay. Both Amanda and Charlotte reject the trade attempt by just saying “no”. They both answer the question of Katherine without giving any further information. This way of rejecting can only be done when a player makes this kind of specific trade attempt.

The last way of rejecting a trade attempt is by saying you have enough of the resource that a player is giving away. Here is an example:

| 332 | Euan : Anyone have an ore for a wheat? | TRADE ATTEMPT |
| 333 | Cardlinger : sorry, I'm all wheaty | REJECT |
| 334 | Joel : same | REJECT |

Euan makes a trade attempt and asks for ore in exchange for a wheat. Cardlinger rejects his trade attempt by saying he has enough wheat (“I’m all wheaty”), Joel says the same. This way of rejecting an offer can only be done when someone makes a specific trade attempt or when a player
offers a resource of his own. When a player uses this rejection it gives away some information; people in the game now know that Joel and Cardlinger have enough wheat. Other players can now either steal something from them or directly ask them to trade their wheat.

5.4 Persuasion and negotiation

When I look at the patterns for negotiations with two players, I see that most longer patterns end in a trade. The longer patterns are the ones in which there is more negotiation involved, instead of a player immediately rejecting or accepting a trade attempt. A paired-samples t-test was conducted to compare the successful trades in the long and short patterns in negotiations with two players. There was a significant difference in the successful trades in short (M=44, SD=0) and long (M=58, SD=0) patterns: df=198.9; t=-4.135; p=.000.

When two players are involved, 61% of the longer patterns end in a trade and in 39% of those don’t end in a trade. As I have explained in section 2.3, persuading someone is much harder online than it is during face-to-face communication (Di Blasio & Milani, 2008; Wilson, 2003). From the negotiation patterns I can see that this is not the case when it comes to playing Settlers of Catan online. Most of the players successfully persuaded the other into trading, which would mean that playing and winning the game seems more important than actually changing your behaviour or opinion.

When I look at the patterns for negotiations with three players, I see the same thing happening. A paired-samples t-test was conducted to compare the successful trades in the long and short patterns in negotiations with three players. There was a significant difference in the successful trades in short (M=11, SD=0) and long (M=69, SD=0) patterns: df=119; t=-15.977; p=.000. When I look at the longer patterns, where more negotiation was involved, 81% of those patterns end in a successful trade where the longer patterns that don’t end in a trade represent a total of 19%. This would mean that A has successfully persuaded B and/or C into trading with him in a large amount of the total negotiations.

The difference between the successful and non-successful trades when three players are involved is even greater than when only two players are involved. This is probably because the trading player (A) has more options to trade with. When A has more options he is more inclined to trade with B or C or even both. This means that even in a multi-party negotiation it is easier for players to persuade someone into trading. It seems that when people are playing a game, the emphasis is on playing and winning the game instead of changing behaviour. The goal is to win the game, not just trading with opponents. The trades are meant to help the player succeed, but it isn’t pivotal to that process. When a trade isn’t established, the game continues on to the next turn.

As I have shown in the different tree-structures, there is a clear distinction in the way people are trading with each other. On the one hand, there are the short patterns where A does a trade attempt and B or C immediately rejects or accepts the offer. In these cases, there is not much negotiation involved. On the other hand, there are also longer patterns. Those longer patterns contain more negotiation between players. When there is more negotiation involved the trades are more often successful than not. This means that in most cases, A successfully persuaded another player into trading with him. This is different from what I have seen in previous research, where it was much harder to persuade someone into changing their opinion while chatting online. In this case, where people are playing a game, the emphasis seems to be on playing and winning the game instead of changing behaviour. This means that my first hypothesis (H1: Negotiations in Settlers of Catan will rarely end in a successful trade) is not supported by my findings.

In Chapter 2, I have also discussed some persuasion strategies. I have shown that there are two recurring themes when it comes to persuasion strategies: rational vs. non-rational strategies and reward vs. punishment strategies (Wilson, 2003). I have stated that people will use the reward vs. punishment strategies when playing online Settlers of Catan, because these have a greater effect in CMC (Wilson, 2003).

If I look at the negotiations in the chat dialogues, I see that this does not happen. Here is an example:

352 : tomas.kostan : still no ore? TRADE ATTEMPT
In this example, thomas.kostan attempts a trade when he is asking for ore. William immediately steps out of negotiations by saying he doesn’t have ore. Gotwood4sheep confirms he has ore by saying what he wants for it. Thomas.kostan now tries to persuade him into trading by first offering sheep and then even two sheep. Thomas.kostan uses a persuasion strategy of a rational nature. He doesn’t play on gotwood4sheeps emotions or rewards or punishes him, he just offers a rational two sheep for the ore he wants. Unfortunately, gotwood4sheep doesn’t seem to be persuaded in this example.

The example displayed above is the most frequently used form of negotiation in an online setting. In most cases there is not much persuasion involved as both players have their own strategy for winning the game. Persuasion isn’t necessary in most cases. Only when a player really needs a resource from another player, he will use a rational persuasion strategy to persuade the other player into trading. Rewarding or punishing a player does not seem to happen in the chat, although it is possible to punish someone who didn’t trade with you by placing the robber on one of his tiles. Overall, people will persuade each other in the game by offering some other or more resources. Again the emphasis seems to be on the game itself, rather than on persuading players. These findings support my second hypothesis (H2: Players are using persuasion strategies to persuade someone into trading while playing Settlers of Catan). The findings do not support my third hypothesis (H3: The most used persuasion strategy is a reward and punishment strategy).

In section 2.3 I also discussed the research of Guhe and Lascarides (2014a, 2014b). The researchers claim that when people are trying to persuade during Settlers of Catan they have two aims: More trades and fewer opponent trades. In all of the chat dialogues I have analyzed, I have rarely seen these utterances. People actually do not aim for more trades or want to help others by saying “if you accept this, you can build that”. Blocking of trades also rarely occurs when people are actually playing the game. In the 20 games of 9648 utterances, only 8 of those utterances were to block another player from trading with someone. The research I did shows that there is only one aim when it comes to persuasion in Settlers of Catan: Getting the resources you want to win the game. These findings do not support my fourth hypothesis. (H4; When persuading another player into trading, a player will use arguments that either aim to get more trades or aim to have fewer opponent trades).

The second research of Guhe and Lascarides (2014b) I discussed in section 2.3 focussed on the personality of players. A player who is more genuine and has more gullible recipients has a better chance of winning the game. Because I don’t have any insight in the personality of the players, I cannot confirm or reject this statement. I did not have access to the players themselves to do a questionnaire on their personality and see whether the observations of Guhe and Lascarides (2014b) are indeed true. I did however see that there are some players who did more trade attempts than other players. Unfortunately, I do not have the information to see if these players were more genuine or had more gullible recipients.
Chapter 6
Trading on existing platforms

As I have shown in Chapter 4 and 5, there are different ways of doing a trade attempt and negotiating while playing Settlers of Catan online. In reality however, people don’t really discuss the trading like they did in the STAC corpus. Those people were asked to discuss the trading for research purposes. The people that I have played with online on PlayCatan and AsoBrain don’t talk much, they only use the interface to trade with each other. This is why it is important that people have the right instruments to play the game. In this chapter I will try to see if every one of the in Chapter 5 and 6 described ways of trading and negotiating is possible on PlayCatan and AsoBrain. I will start with discussing the trade attempts on PlayCatan and after that I will discuss the trade attempts on AsoBrain.

6.1 Trading on PlayCatan

In Chapter 4 I have modelled the different ways of making a trade attempt. I have distinguished four different ways of doing a trade attempt:

1. A player says he wants a resource (Anyone have ore?)
2. A player says he wants to part with a resource (Anyone need ore?)
3. A player giving a specific offer (Anyone want ore for wheat?)
4. A player asking a specific other player for a trade (Player 2, do you want ore? I will give you wheat.)

These kinds of trade attempts happen very often during the chat dialogues so it would be obvious that the existing online Settlers of Catan implementations give the option to make any one of these trade attempts. Here is the trading interface from PlayCatan:

Figure 4 shows me trying to trade with the other players. I am offering sheep (the bottom green card) for clay (the top brown card). After I click on the “offer trade” button, the other players see that I have made a trade attempt and can react the way they want to. In this interface it is only possible to make this kind of trade attempt, so I can only give a specific offer of the resource I want to part with and the resource I want. The interface does not allow me to ask for a specific resource or to offer a specific resource. It also does not allow me to only trade with one specific player.

In Chapter 5 I have discussed how people negotiate in the chat dialogues. People need to confirm a trade attempt or need to be able to make a counter offer. Some of them also change their minds at the last minute. Here is the trade interface of PlayCatan when some other player makes a trade attempt:
Figure 5 shows player 2 making a trade attempt. He wants sheep and is offering wheat for it. At the bottom of the screen, you can see different buttons which can be used to answer the trade attempt. The answers are:

- **Accept**
- **Reject**
- “I want more.”
- “Sorry, I don’t have that.”
- “I need that myself.”
- “I want something different.”

The trade attempting player sees a text balloon pop up whenever the other players click one of the buttons. As seen above, the only way of making a counteroffer is saying “I want more” or “I want something different”. The trade attempting player then needs to make a different offer which can either be accepted or rejected. There is no way of constructing your own counteroffer, as is done in the chat dialogues. Changing your mind can always be done by rejecting the trade offer.
6.2 Trading on AsoBrain

Trading on AsoBrain is a bit different from trading on PlayCatan. There are more possibilities when it comes to trade attempts. Here is the interface for making a trade attempt:

When clicking on the trade button, Figure 6 appears as a pop up. In this pop up you can make the trade attempt. You can either ask for a resource (your demand), offer a resource (your offer) or make a specific trade attempt when you fill in both your demand and your offer. At the bottom of the screen there is the possibility to chat with your opponents. The answers from your opponents are on the right side of the pop up. The only way of trading that isn’t possible is trading with a specific player.

When a player makes a trade attempt, all of the other players get the following pop up:

Figure 6. Trade attempt AsoBrain.

Figure 7. Trading answer on AsoBrain.
This pop up also has more possible moves than PlayCatan. The options are the same: accept offer, reject offer, saying you don’t have the resource, asking for another offer or asking for more resources. But in this pop up it is also possible to make a counteroffer and to cancel trading when you change your mind.

As I have shown, both PlayCatan and AsoBrain have some things to change when they want the game to be played on their platform. PlayCatan needs to change some things when it comes to trade offering, it has to be possible to just offer a resource you want to part with or to trade with a specific player. It would also be a great asset if PlayCatan would make it possible to enter a counteroffer when a player is doing a trade attempt. AsoBrain on the other hand has some more possibilities. On AsoBrain you can offer one resource you want to part with, demand a resource or make a specific trade attempt. It is even possible to make a complete counteroffer. The only thing that isn’t possible is trading with a specific player.

AsoBrain offers more possibilities that makes the online gameplay similar to the way it was played in the STAC corpus. PlayCatan has some things to change if they want it to have the same possibilities as people need to play the game.
Chapter 7  
Conclusion and Discussion

In this chapter, I will give an overview of my findings and I will discuss the limitations of my study. I will also do some suggestions for future research on this subject.

In this thesis, I have discussed the negotiating and trading in an online implementation of Settlers of Catan. I had four hypotheses when I started the thesis:

H1: Negotiations in Settlers of Catan will rarely end in a successful trade.  
H2: Players are using persuasion strategies to persuade someone into trading while playing Settlers of Catan.  
H3: The most used persuasion strategy is a reward and punishment strategy.  
H4: When persuading another player into trading, a player will use arguments that either aim to get more trades or aim to have fewer opponent trades.

During my research, I have only found support for H2. I have not found any support for H1, H3 and H4.

I have discussed how people negotiate a trade while playing an online implementation of Settlers of Catan. I have shown that when there is negotiation involved in a trade, a trade often is successful. When there is less negotiation involved a trade rarely happens. Previous research showed that persuading someone online is much harder than it is face-to-face. As I have no data of face-to-face interaction while playing Settlers of Catan, it is hard to see whether this is indeed the case while playing this game. The data in this thesis however shows that persuading an agent into trading while playing Settlers of Catan is not that hard, as many negotiations end in a successful trade. This means that when people are playing the game, they are more occupied with winning or playing the game than the fact that they are persuaded in trading. Also, trading and persuasion is part of the game, which means that persuasion will always take place when people are playing Settlers of Catan.

I have also discussed the persuasion strategies that people use. Players of Settlers of Catan will use persuasion strategies of a rational nature instead of one based on rewarding and punishing. This is also because the players are involved in a game, so using arguments that are based on the game they are playing is often the case. However, this could also have something to do with the fact that most of the players don’t know each other when they played the game. Players who are friends or family will maybe be more inclined to using rewarding or punishing strategies to persuade a player into trading with them.

The research of Guhe and Lascarides (2014a, 2014b) discussed the two aims of people persuading an agent while playing Settlers of Catan: more trades and fewer opponent trades. In all of the chat dialogues I have analyzed, I have rarely seen these utterances. People actually do not aim for more trades or want to help others by saying “if you accept this, you can build that”. Also the blocking of trades rarely occurs when people are actually playing the game. The research I did shows that there is only one aim when it comes to persuasion in Settlers of Catan: Getting the resources you want to win the game.

Guhe and Lascarides (2014b) also looked at the personality of players while playing the game. A player who is more genuine and has more gullible recipients has a better chance of winning the game. Unfortunately, I did not have access to the players themselves to do a questionnaire on their personality and see whether the observations of Guhe and Lascarides (2014b) are also true when it comes to human players. This is something for another research.

Other than not being able to ask the players about their personality, there were some other things I could not do in this study. For example, I didn’t have the information about who won the game or how many victory points someone had at certain points in the game. I also did not have the
information about what resources the players actually had, to see whether they were indeed lying during negotiations. All these things can be interesting to research in the future, to see how much the game actually influences the negotiations.
References


