



Breaking down negotiations

Analyzing negotiations using the Coloured Trails Game & the NegotiAct

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A Thesis Submitted to EEMCS Faculty Delft University of Technology,
In Partial Fulfilment of the Requirements
For the Bachelor of Computer Science and Engineering
January 26, 2025

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An electronic version of this thesis is available at <http://repository.tudelft.nl/>.

Abstract

Within the field of negotiations, a recent publication is a paper called the NegotiAct[9], which analyzed existing coding schemes of negotiations and introduced an improvement on them that promises a viable way to analyze negotiations in depth. In this research, my goal is to develop a workflow for gathering information and analyzing it with the NegotiAct. To this end the Colored Trails Game [7] is used to design an experiment that simulates real-life negotiations. The Colored Trails Game is a game where each player, through negotiating tries to maximize their own score under limited resources. The game at its core offers the opportunity for both cooperation and competitiveness.

In the experiment a total of 15 participants took part and it was run a total of 20 times, resulting in 3 hours and 10 minutes of recordings. Encoding them with the NegotiAct resulted in the discerning of a total of 87 offers made, 24 offers accepted, 26 offers rejected, and 16 requests for offer modifications. Based on this coherent mapping it can be concluded that the Colored Trails Game is a suitable choice for the workflow of gathering data to be put through the analysis of the NegotiAct.

1 Introduction

Negotiations are always necessary since everyone has needs and wants, yet they might not always have what they require or desire. Negotiating is part of everyone's life, it is not only negotiating about salary, or the price of vegetables on the open market, negotiations can range from topics like "Children asking their parents for sweets at the checkout while shopping in a supermarket" to "Hostage-taking and assertion of the hostage-takers' claims with the police, e.g. getaway car"[8]. As such it is of high importance for us to be able to understand and analyze negotiations, their progression, and outcomes.

This research focuses on creating an experimental workflow to analyze negotiations. This will be done by performing an experiment, in which participants play the Color Trails Game[7], and later analyzing the negotiations recorded from the experiment using the NegotiAct[9]. As the objective of this research is to develop a workflow for analyzing complex negotiations, the subquestions I will be trying to answer are the following:

- Can the Colored Trails Game be used to simulate real negotiations?
- Are the NegotiAct labels a useful metric for analyzing negotiations?
- Can the NegotiAct be used to effectively label and analyze negotiations in the context of the Colored Trails Game?

The definition of negotiation I will be using in this experiment is "Negotiation is a process in which parties interact to settle a mutual concern to improve their status quo."[1]. As for the Colored Trails Game it is defined by Grosz et al. (2004) [7] "(the game) is played by two or more players on an NxM board of colored squares with a set of chips in colors chosen from the same palette as the squares", where players are each assigned a different goal they need to reach which is known only to the respective player. After the goals have been assigned, players, at random, receive a set of colored tiles. The goal of the player is to maximize their score. The best way to do this is by reaching their goal, for which they require different colored chips to traverse the board from their starting location.

The players do not always have all the necessary chips to reach their goal, so they will have to trade with the other players. This is where they will negotiate about resources and the part which will be recorded for analysis. The NegotiAct[9] will be used to encode the resulting negotiations as it is "a fundamental step in studying negotiation processes"[12]. The NegotiAct provides a detailed coding scheme made to analyze negotiations, which contains 47 distinct codes, separated into 7 categories, such as "Offers" and "Socio-emotional statements".

1.1 Previous Work

Overall there is a lot of research done in the field of negotiations, however work that deals with it in the context of the Colored Trails Game is not substantial. Notable previous work in the field includes an experiment using artificial agents to play the colored trails game in order to analyze the effects of theory of mind and its usefulness in negotiations[3]. Another noteworthy experiment employing the Colored Trails Game, which was conducted with people, rather than artificial agents was used in order to create artificial agents based on the findings[5], it however focuses largely on what the offers made were, and trying to simulate them, rather than analyzing the negotiations process. Additionally, as previously mentioned the NegotiAct[9] which describes a comprehensive coding scheme for negotiations, will be used to analyze the data resulting from the experiment.

2 Methodology

This section explains how the experiment was designed in order to gather varied and unbiased data about negotiations. This includes what the data collected outside of the experiment is and how and why the Colored Trails Game[7] was employed. Then I detail how the experiment was run and how the data was collected.

2.1 Experimental Design

This subsection explores the importance of different factors, such as personality, theory of mind, and the number of participants per game. It also explains possible confounding variables and the steps taken to eliminate them.

The experiment's objective is to collect data on negotiations, thus the Colored Trails game is going to be used to encapsulate the person-to-person negotiations

around each party's available resources. In order to avoid unnecessary complexity and better capture of the negotiations on a personal basis, the games are played one-on-one. The board, goals and starting chips are predetermined as a way to avoid the randomness in the resource distribution, doing this will also help us analyze the game setting as an equal and incomplete information game. Afterwards participants are asked to fill out a form asking them questions, such as what their overall satisfaction with the outcome of the game was, if they enjoyed it and if there were any moments they remember which had an impact on the course of the negotiations, which might be helpful to evaluate key moments during the negotiations.

It is important to design the experiment with the intent to capture the negotiations in a semi-competitive and analyzable manner. To this extend possible confounding variables, which could impact the negotiation outcomes should be recognized and possibly eliminated. One such variable is "the sentimental value" of an object where parties might put a value on an object for personal reasons, which will further complicate interactions, to this extent the Colored Trails Game[7] will serve by replacing the objects being negotiated over with literal bargaining chips.

The personality of the participants is another such variable that can impact the negotiations, and particularly in negotiations with 3 or more parties can lead to the forming of coalitions and introduce further complexities [2] which is why the experiment is going to be conducted as a one-on-one. In the case, however of a two-party negotiation setting previous research has shown that specific personality traits exhibited by both parties can have an impact on the negotiation outcomes [13], which is why it could be beneficial to gather personality data in order to analyze the negotiations a step further. This however is not the objective of this experiment and asking participants to provide said personal data could result in further risk to participants, as such it will not be collected.

Another possible confounding variable of note is the level to which the participants can use theory of mind. This can impact negotiations, however, it is quite difficult to observe and establish the "levels" of participants and it has been shown that in order for it to be an advantage in negotiating those levels need to differ by one [4], as such this will not be analyzed.

In order to account for additional factors like relationships, skill level, and age group, participants will also be asked about their age, knowledge of the game, how often they negotiate in their daily lives, and their relationship with their opponent. This will be collected in questionnaires provided prior to each participant. Keeping all previous points in mind 3 levels were designed (Refer to figure 2). In addition, since the game is played with 2 players henceforth they will be referred to as player A and player B. To provide additional help in the process of understanding the game the players were each provided with a cheat sheet, comprising of the rules, the main objective and the scoring system (figure 1), which they get to keep for the rest of the experiment. The scoring system used was the same as another research which

experimented using the colored trails game with humans in order to develop negotiation agents[5].

Colored Trails Cheatsheet:

1. You have received a Goal and an amount of Colored Chips
2. You start at the board space indicated with an "S" (Middle of the board)
3. **Objective:** Maximise your (own) score
4. **How to reach goal:** Have all necessary chips, to be able to "place" them on the board and make a path (including the goal tile) from the start to your goal
5. There is a Player opposite to you. You can negotiate for chips (You do not have to reach a deal)
6. The other player does not know your goal, you cannot place tiles to block the other player (its just a way to keep scores)

Scoring:

Reach Goal: +100 points

Every chip not used for moving: +10 points

Every tile between you and your Goal (Goal not reached): -25 points

Figure 1: Cheat sheet provided to players

2.2 Game Procedure

This part goes over the design of the 3 levels (boards for the Colored Trails Game[7]) that were used in the experiment. This includes an explanation of the design, the goals and chips players will have and what the expected outcome is for each level.

For the first game (figure 2a) it also has the task of introducing the players to the game, the points system and the flow of negotiations. Then each player is assigned a number of chips and a goal, in this case player A is provided with 2 red and 1 green chip and their goal is A5 (bottom left), while player B is provided with 2 green and 1 blue chip and their goal is F1 (top right). By the number of chips it is immediately obvious that it is impossible for both players to win (each player has 3 chips and needs 4 to reach their goal), which is the scenario for the first game, it also shows them that reaching the goal, while the most beneficial is not the main objective and thus the negotiations can end without either accomplishing their goal. It is also important to note that with this distribution of resources it is still possible for both players to improve their score at the same time which makes it possible for the players to reach a mutually beneficial deal.

For the second game (figure 2b) the players should already be somewhat familiar with the rules and so the difficulty will increase, this is done with the idea of making the negotiations more complex and being able to provide the participants with more resources to use in the negotiations. As an additional note during the trial runs of the experiments there was a comment that this 7x7 board complexity "was bordering on my (the participant's) computational skills" as such the third

game board was not additionally increased in size. For game 2 player A is provided with 1 white, 1 black, 2 green and 2 red chips and their goal is A1 (top left), while player B is provided with 1 green, 1 white, 2 blue and 2 red and their goal is A7 (bottom left). Here the goals are differently positioned with respect to one other from the first game (just in case the participants realized/revealed the goals in the previous game and saw they were in opposite corners. This scenario makes it possible for each player to reach their goal, but the designed solution (others might exist) is not as simple, which was made this way in order to let the players negotiate more. There exists a mutually beneficial outcome, where both players reach their goal.

The third game (which was designed after the test run of the experiment) meant to introduce something different than the previous 2 (figure 2c), which was a difference in bargaining power. For this round player A was provided with 1 white and 2 black chips and needs to reach F2 (second to last towards the middle in the top right), while player B was provided with 2 white, 1 black, 1 red and 1 green chips and the goal of A1 (top left). At first glance, since the players do not know each other's goal state but know their opponents chips, it becomes immediately obvious that player A is at a disadvantage, while this is the case as they do have less chips, but their goal cell is closer. If no deal were to be made Player B would end the game with -25, while player B would have -40. This was done with the intent to simulate negotiations where there is an offset in the balance of power, which will help in observing and analyzing a wider variety of negotiation situations and as the goal states are not disclosed it also opens up the possibility for a more deceptive type of negotiation, or alternatively a negotiation with no resolution.

Questionnaires

In addition to playing the game players were asked to fill in 2 distinct questionnaires, which could both be found in the appendix (figures 4). The first would be filled out before the game and would ask the player general questions, such as their age, familiarity with the opponent and the game, their estimated experience in negotiations and if they are colorblind. The questionnaire could be completed before every game, however if the group does not change in between games it is only needed once as the answers do not change. This data is useful when making statements about the participants in the experiment.

The second questionnaires prompts each player to provide feedback about their experience with the game as well as point out parts of the negotiation that made an effect on the outcome. This is also where the players provide their scores. This questionnaire is necessary at the end of each game in order to help with evaluating the experiment.

2.3 Data Collection

This subsection explains how the experiment itself was conducted. It details the process in which the participants engaged in during the experiment and how the data about negotiations was gathered.

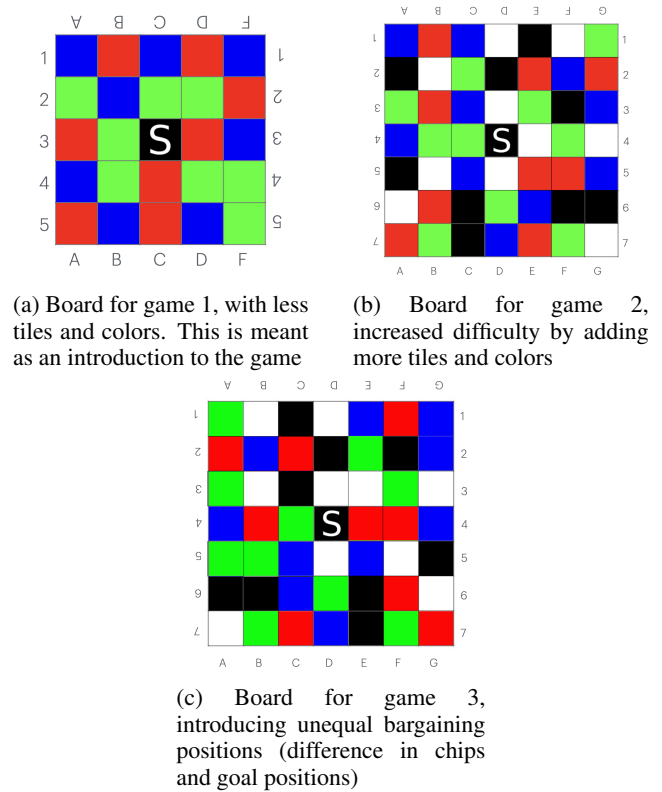


Figure 2: Boards for the 3 games (levels)

The first thing that was done was to introduce the players and assign each one a number in order to better keep track of the data and let them anonymously fill out the questionnaires associated with the experiment, the numbers are used to connect the questionnaires with the recordings of the game for further analysis. The numbers also make it so that the results and answers cannot be traced back to a participant, as such an HREC is not needed. Afterwards players are split up into groups and then they are asked to fill out the first questionnaire, specifying their group, player number and game number. After all groups are done the organizer explains the rules of the game, what the game is, what the objective is and how the experiment will proceed, the players are additionally asked if they are comfortable being recorded for analysis in the context of analyzing negotiations. After the Colored Trails game has been explained and if there are no further questions the players are shown the game sheet for game 1 (might also be used in the explanations as an example), they then are assigned chips respective to player A and B (decided by the players who is who) and each is provided with an additional sheet displaying their goal state with a little flag (figure 3).

Players are instructed that the goal state is information, disclosed only to the respective player, while the chips are public knowledge and are asked if they have any last questions (not pertaining to the board state or anything that could give them an insight into each others goal). After everything is set up the recording begins and players are asked

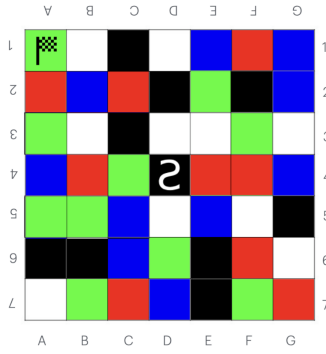


Figure 3: An example of a Board showing a goal provided to player B in game 3

to introduce themselves as player A or B. The players are left alone until the negotiations finish so they do not feel pressured and can focus on the negotiations/game. After a group finishes the recording is stopped and each player is asked to complete the second questionnaire. After that players are either reassembled into new groups or proceed with the same group (depending on participating teams and how many have finished), they are then asked to fill out the first questionnaire (if the group is new) and are noted down as a group (if the group is new), they are then presented with the next level and the process repeats until they have completed the last of the levels. Players are provided with snacks and beverages throughout as compensation for participating. After the experiment is finished the recordings are collected and appropriately named.

3 Results

3.1 Experiment Objective

The experiment's main objective was to capture negotiations in a simple and controllable environment so that they could reliably be replicated with different people under the same conditions. This in turn is supposed to help gather and analyze data as part of a workflow using the NegotiAct[9] as a labeling scheme. In order to evaluate how well the experimental setup performed in this task I will be looking at three criteria.

First is the duration of the negotiations, namely if all negotiations take the same amount of time (or similar). If this is the case and if the outcomes of the games themselves are the same it could mean that the game parameters are too strict and there is no leeway for the negotiations, resulting in linear paths to the solutions, the reverse could also be true, as in if all negotiations take a lot of time to resolve because of variables other than negotiating it could mean that the game is unsuitable in some way. Showcasing the time of the experiment is also important in order to gauge the experimentation time over a larger scale experiment in order to consider this method of data gathering against others.

Secondly, I will be looking at the number of offers being made, accepted, rejected, modified, and ignored which all fall under the "Offers" section of the coding scheme of the

NegotiAct[9]. Differences between groups and games on this aspect will mean that the data collected is more variable in itself as even if all groups reach the same end state it would mean that the path they took to get there was different.

Thirdly I will be looking at the scores, what the desirable outcome is that the scores of the groups, respective to player A/B differ per level.

3.2 Results Overview

In the experiment, 15 people participated, resulting in 7 games for level one, 7 games for level two, and 6 games for level three, for a total of 20 games. The resulting time for all the games was 3 hours and 10 minutes (table 1). There were a total of 87 offers made, 24 offers accepted, 26 offers rejected, and 16 requests for offer modifications. The scores were varied in the first game but for the second and third remained largely the same in between games.

3.3 Times

Overall the experiment provided diverse times. The overall time being 3 hours and 10 minutes (table 1) would result in a 9 minutes 30 seconds per level on average. The first level had a total of 45 minutes with the minimal time being 1 minute and 25 seconds, the highest being fifteen minutes, and an average of six minutes and twenty-six seconds. The second level had a total of 1 hour and 23 minutes with the minimal time being 4 minutes 30 seconds, the highest being 23 minutes and 15 seconds and an average of 11 minutes and 56 seconds. The third level which was played one less times than the other two had a total of 1 hour, 2 minutes and 20 seconds with the minimal time being 5 minutes and 50 seconds, the highest being 15 minutes and 20 seconds and an average of 10 minutes and 23 seconds.

1	1:25	6:40	7:30	4:20	3:30	15:00	6:30
2	24:00	9:45	18:40	5:50	4:30	10:50	10:30
3	10:30	15:20	10:40	5:50	7:00	13:00	

Table 1: All game times (columns as "minutes:seconds") per game/level (rows)

3.4 Offers

This experiment had a total of 87 offers made (offered), 24 offers accepted, 26 offers rejected, and 16 requests for offer modifications. The reason why the total offers made does not match the sum of the others is due to some offers not being directly addressed, but rather participants chose to ask for additional information and clarification and moved past the offers. The first level saw a total of 24 offers made, 9 accepted, 9 rejected, and 4 requests for modification. The second level saw a total of 41 offers made, 9 accepted, 13 rejected, and 9 requests for modification. The third level saw a total of 22 offers made, 6 accepted, 4 rejected, and 3 requests for modification. It is reasonable to note that some teams chose to employ a strategy to lose one game with the promise of the other person helping them out in the next one or leave it to chance, which was well received by the other person in most cases, resulting in a lower amount of offers

for those games. This was due to the nature of the experiment and because players knew in advance if they would be playing with the same person as most times the experiment was organized with 2 people at once or people only agreed to participate with a certain person. Also important to note is that there was a group that chose to privately analyze a level without speaking to their opponent for an extended period which also resulted in less dialog.

3.5 Scores

The results analysis is a bit more difficult as the participants entered their scores, and some of them do not match up. However, combined with the recordings and offers made, we can establish them. It is also important to note once again that most of these games were run between people who were either friends or had a relationship. The first level's catch was that both players needed 4 chips to reach their goal, but each had only 3. In this scenario there were 3 groups chose to go for the equilibrium, which resulted in each player getting -25 points, 3 groups that saw a player offer to "sacrifice" their own score to help out the other participant and thus maximise the overall score, resulting in a -50 / +100 split, and a group that upon realising they can't reach their goals saw one player offer up all their chips in order for the other player to get the maximum possible points, resulting in a -100 / +120 split (table 2).

The second level, where both players could reach their goal but was more complex showed all players finding a deal which let both players reach their goals, with 2 exceptions/outliers (table 3). The first one being the group that preferred to analyse the game state for an extended period of time made a trade where the player who had received extra points due to the other player "sacrificing" a chip the previous round decided to return the favour, resulting in a -15 / +100 split [10]. As for the other group, player B offered once again to "sacrifice" their chips as they could not find a solution. This resulted in player A seeing they could reach their goal with the offered chip and consequently offered the player B the chip they would have left over after reaching their goal, this resulted in both players reaching their goal, even though player B did not realise it, and additionally the player A offered to help the player B in the next game and potentially "sacrifice". This is difficult to both label and analyse and it could once again be the result of the level being too complex, however it does show another way in which negotiations can develop.

For the third level all but one of the groups resulted in a -25 score for both players. The outlier here was the group, which on the previous level player A offered to potentially "sacrifice" at the next level, which is what happened, resulting in a -50 / +100 split [10].

A	-50	-50	-25	120	-25	-25	100
B	100	100	-25	-100	-25	-25	-50

Table 2: The scores for Game 1, respective to players A and B (each column is a group)

A	100	100	100	100	100	100	-15
B	100	100	100	100	100	100*	100

Table 3: The scores for Game 2, respective to players A and B (each column is a group) (* player got to his destination without knowing)

A	-25	-25	-25	-25	-50	-25
B	-25	-25	-25	-25	100	-25

Table 4: The scores for Game 3, respective to players A and B (each column is a group)

4 Discussion

This section contains the limitations concerning the conducting of the experiment and the use of the NegotiAct for analyzing the data and how they were addressed. Additionally, it describes what can be added to the experiment and questionnaires in order to better analyze the data gathered and suggests possible improvements about how the process can be automated.

4.1 Limitations

The organization of the experiment presents the biggest challenge overall. It requires 2 people to be separated and recorded. Initially, a big enough space, which also offers privacy is required, additionally, parallel runs will require multiple recording devices and possibly several people to moderate it so as to be able to answer questions if needed without disturbing the other groups. The materials required for the experiment are 3 sheets per level per group, a cheatsheet per player, and the chips needed per player for each level.

At first, the experiment was run with the intent to do it 100% in person, however, due to time and space limitations only 8 games were played in person. The other 12 games were played over the communication app with video, voice, and text capabilities, Discord. This helped with hosting the experiment, as well as the recording and privacy of groups during the experiment. Players were gathered together, the rules of the experiment were explained, they were asked to fill out the experiment and were consequently asked to isolate in private calls of 2 to proceed with the negotiations, while one of the players records the conversation and later sends it to me(the organizer). This made the organization of the experiment easier and players did not have to be worried that the opponent could cheat by seeing their goal state (it was initially also printed and distributed). The main concern with this setup is that players are not able to physically exchange chips. A solution to that could be to ask them to write down successful trades so they become semi-permanent, this still does not allow them to physically have chips so it is not a perfect solution.

Another problem relating to the capacity of one person to run this experiment is that the groups had to be smaller, this resulted in most times the same players running as the same group for all the levels, which established the narrative for repeated negotiations and let them develop

the aforementioned "sacrifice strategy" which has been shown to let people reach overall better joint outcomes in negotiations[10] in the end proved to make the score of groups who used the strategy higher overall.

A different issue when tackling this experiment was the gathering of participants. Of the 20 games only 3 were run between 2 people who specified their relationship as "We are acquaintances" in the first questionnaire and all people that participated were in the 20-30 years age group, which resulted in a less variable sample population.

4.2 Labels

The labels for the game recordings were mostly situated in the "Acts of providing and asking about negotiation-related information" category of the NegotiAct. The remaining categories were also present during the negotiations however, possibly due to the nature of the experiment being a game, were not as prevailing. The exception being "Unethical behaviors" which was almost never used. This could once again relate to the participants having prior relations and not wanting to be seen as manipulative, because they engaged in "deceptive strategies"[6].

4.3 Future Research

For future runs of the experiment it might be beneficial to look into combining certain labels and detailing which go together and why. As an example a player prompted with "You could just give me a black tile and I will be good but I assume you won't do that, so...", this segment can at the same time be classified as a substantiation, offer made, positional information and preference information. As such it might not be useful to classify it as only one, as the NegotiAct suggest, but rather use a combination of labels to encode it.

As previously stated personality plays a large role in negotiations [13] as such it could be beneficial to gather data about the personality of participants, possibly before the experiment begins in order to analyze the negotiation data in relation to the personality of each participant.

The game itself can also be improved. Things like adding new levels or introducing randomness could be useful to get more varied data and capture more unexpected conditions. One way this could be done is by encoding a map/board creator for the Colored Trails Game. Another variable that could be introduced is a time limit to the games, this could prompt players to make difficult decisions and also will provide opportunity to use the "time management" code of the NegotiAct.

The workflow using Colored Trails and NegotiAct could also be used to design a model able to describe the outcomes of meetings and graph their progression. Combining randomized levels with the online type of running the experiment (through a communication application) and a speech recognition model could result in a more efficient way to gather, recognize and analyze negotiation data.

5 Conclusions

The goal of the experiment was to capture complex negotiations in a controllable environment, to this extent the Colored Trails game was used as a medium. The experiment presented an average game time of 9 minutes 32 seconds over the 3 levels and 20 games, this means that on average it would take a group around 30 minutes to complete the levels. Other factors such as the time to fill in the questionnaires, introduce the players, form groups, and explain the game rules would usually take around 15-20 minutes on average, depending on the group size. However, it is difficult to gather a large sample of in-person one-on-one negotiations as you need to record each group individually and continuously.

The answer to "Can the Colored Trails Game be used to simulate real negotiations?" is yes as the experiment yielded adequate negotiation data of above 3 hours of negotiations in 20 games. It comprised of most of the codes detailed in the NegotiAct, with the exception of Unethical Behaviour, partially due to prior relationship between participant and the nature of a monitored environment as people tend to act in a more helpful manner when observed[11]. In addition the experiment succeeded in gathering sufficient data for analysis and can thus indeed be useful in the field. There are ways, however in which the experiment can be improved in order to be more accomodating and provide more points for analysis, which will be further elaborated on in the "Discussion" section of the paper.

The point of the second subquestion "Are the NegotiAct labels a useful metric for analyzing negotiations?" was to highlight the disadvantages and advantages of using this particular coding scheme. The NegotiAct[9] was developed with the objective of capturing negotiating patterns, essential to the understanding of negotiations. In it the authors looked at alternative coding schemes and their pitfalls when analyzing negotiations before reaching their end result. However it does present its difficulties in relation to encoding(analyzing) certain parts of the conversations. As an example there were a couple of cases in which a person made an offer in a playful manner, knowing that the other party would not agree, which could both be labeled as humor and an offer being made. While the NegotiAct itself recognises sarcasm as humor, in the context of developing an automated process to determine such codes it is important to have a model which could recognise contextual cues and emotion used in the conversations[14]. To this end the answer to this subquestion is both yes and no. The NegotiAct does indeed provide a useful way to encode the conversations and later show results pertaining to the negotiations, as an example the "offers" category was used to showcase the dynamic nature of the negotiations in the experiment, resulting in 153 segments encoded as part of the "Offers" category through the 20 games. However, some segments were too ambiguous and a mix of codes is needed.

Combining both the Colored Trails[7] and the NegotiAct [?] together provided its series of difficulties as well. This is the reason that Can the NegotiAct be used to effectively label and analyze negotiations in the context of the Colored Trails Game?" was so important. The NegotiAct was initially

used to analyze tapes relating to logrolling, the recognition of compatible issues and crafting contingent contracts, in order to show its efficiency. In the context of a "game theory game" however it proved difficult to accurately encode conversations relating to factors such as the "board state" or the "nature/objective of the game" as many participants also engaged in conversation about the game of colored trails itself, which could be assigned to "Nonpersonal chit-chat", however its nature being related to the state of both parties it was more fitted as a "Procedural Discussion" even though those topics themselves did not match the elaboration and examples provided for the category. Overall the NegotiAct provided a strong basis for analysing the results and if the Colored Trails game is indeed used as a method for gathering data there are modifications to certain codes which might be useful when analysing the results, using the NegotiAct as a speech coding basis.

6 Responsible Research

The experiment was run using human participants. As such it needs to be approved by the board of ethics, however after discussing it with my professor we agreed that because there is not enough time from the side of the course I should run the experiment while minimizing participant risk and additionally all data gathered for the experiment will be used purely as part of the analyzing process of this research paper and will be deleted afterward. Here I will be talking about the possible risk points regarding the experiment and how they were addressed. The way this part is structured is based on answering questions provided by TUDelft as part of the Human-Computer Interaction course, namely Prompting questions for the "Human Research Ethics" and "risk assessment" part of the course. The experiment was run only by me, there were no third parties with access to the data and no data was received by third parties other than the participants themselves. Among the participants were all adults able to consent and were not vulnerable in the context of this experiment. Participants were not asked to share personal information, other than their age so that the risk of re-identification is minimized, which is also why this experiment does not analyze the results against participants' personalities. They were additionally assigned "player numbers" which were used to identify the recordings later on, and participants were asked to refer to each other only with "player A" or "player B". The participants were recruited through a personal network of friends and were informed that they would be participating in an experiment used for my "Research Project" paper for TU Delft. Participants were offered drinks and snacks as reimbursement for participating in the experiment so as to not induce bias for participation. The research does not include methods that could result in the re-identification of participants and will not be providing the data sets to AI models. The research does involve collecting voice recordings and did involve collecting ages, which will all be deleted upon the resolution of this study.

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A Appendix: Questionnaires used within the experiment

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Questionnaire 2 Colored Trails Experiment

* Indicates required question

Game:

☐ 1

☐ 2

☐ 3

Group: *

Your answer

Player: *

☐ A

☐ B

Figure 4: Questionnaire 1: data about participant