Appendix 1: Experimental protocol

In this appendix you find the information participants receive during the experiments. It includes of text on the screen of the experiments, as well as some screen shots of the software.). The software used for this experiment is open-source and available at http://commons.asu.edu.

As you will see allowed participants to vote for allowing to sanction each other at a cost. We did not include sanctioning in the discussion of the paper since groups did not vote in favor for using sanctioning. If costly sanctioning would be allowed, participants could click on the number of the avatar they would like to sanction. Two tokens will then be removed from the earnings of the other participant, at a cost of one token to the person who sanction. Costly sanctioning was elected in two of the three rounds in only one group. This was in the treatment of full vision in rounds two and three with communication. We decided to exclude the results of this group and not include costly sanctioning in the analysis. We verified the effect of this omission, and found not a significant effect of excluding this group from the analysis on our conclusions.

Welcome Screen Instructions

Welcome to the experiment. The experiment will begin shortly after everyone has been assigned a station.
Please **wait quietly and do not close this window or open any other applications.**

General Instructions

Welcome. You have already earned 5 dollars by showing up at this experiment. You can earn more, up to a maximum of 40 dollars, by participating in this experiment, which will take about an hour to an hour and a half. The amount of money you earn depends on your decisions as well as the decisions of other people in this room during the six rounds of the experiment.

You appear on the screen as a yellow dot 🟡. You move by pressing the four arrow keys on your keyboard. You can move up, down, left, or right. You have to press a key for each and every move of your yellow dot. In this experiment you can collect green diamond shaped tokens ✦ and earn two cents for each collected token. To collect a token, move your yellow dot over a green token and press the **space bar**. If you move over a token without pressing the **space bar** you do NOT collect that token.

The tokens that you collect have the potential to regenerate. After you have collected a green token, a new token can re-appear on that empty cell. However, the rate at which new tokens will appear depends on the number of adjacent cells with tokens. The more tokens in the eight cells around an empty cell, the faster a new token will appear on that empty cell. In other words, **existing tokens can generate new tokens.** To illustrate this, please refer to Image 1 and Image 2. The middle cell in Image 1 denoted with an X has a greater chance of regeneration than the middle cell in Image 2. When all neighboring cells are empty, there is **no chance for regeneration.**
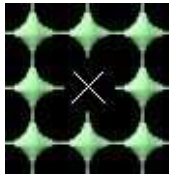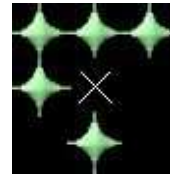
Image 1	Image 2

Your vision is limited in this experiment. The area that is visible to you will be shaded.

Practice Round Instructions

You will now have four minutes to practice with the experimental environment. The decisions you make in this round will NOT influence your earnings. At the At the beginning of the practice round 25% of the cells are occupied with green tokens. The environment is a 13 x 13 grid of cells.

During this practice round, and **only during** this practice round, you are able to reset the tokens displayed on the screen by pressing the **R** key. When you press the **R** key you will reset the resource to its initial distribution, randomly filling half of the cells.

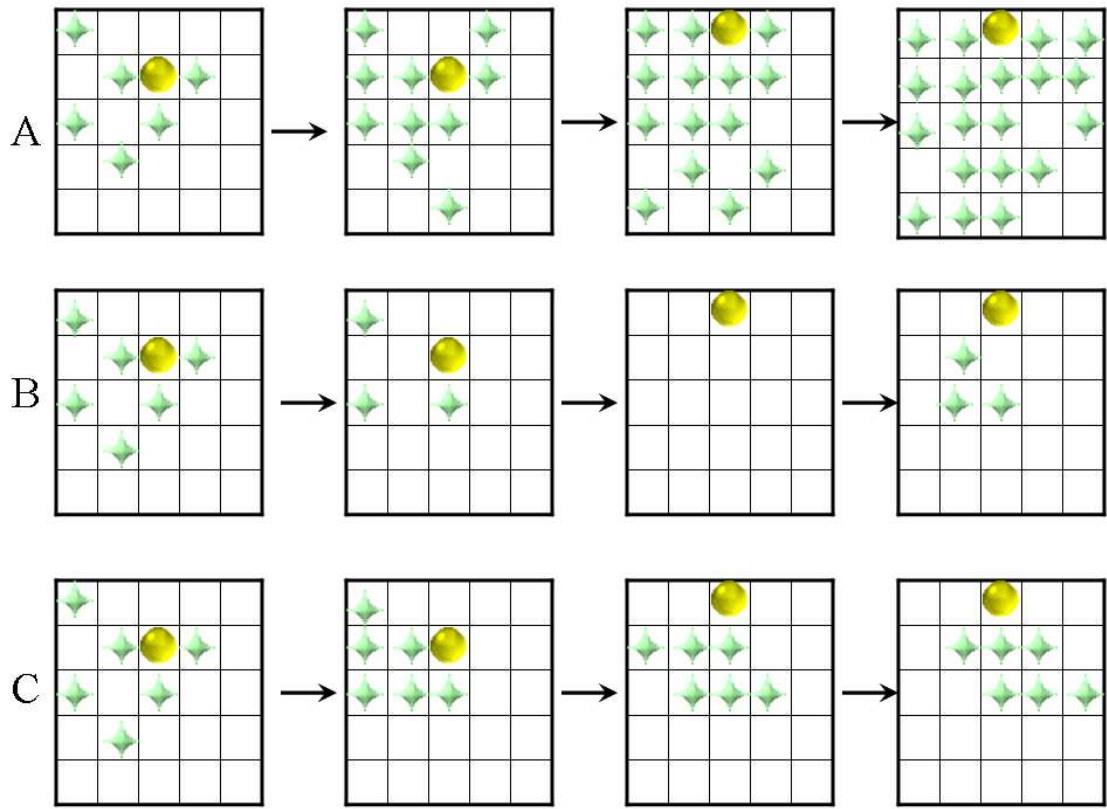Please do not communicate with any other participant.
If you have any questions please raise your hand. Do you have any questions so far?

Before we begin the practice round you need to answer the following questions correctly. You can only continue when you have answered all questions correctly. If an error is made you will need to answer the questions again.

Which of the statements is **incorrect?**
A. Your decisions of where to collect tokens affects the regeneration of tokens.
B. When you have collected all tokens on the screen, no new tokens will appear.
C. Tokens grow from the middle of the screen.
D. In order to collect a token you need to press the space bar while your yellow dot is on a cell with a token.

Which sequence of situations is **not possible**?

A
B
C

If you have any questions please raise your hand.

Round 1 instructions
This is the first round of the experiment. The length of the round is 4 minutes. Like in the practice round you can collect green tokens. This time you earn **two cents** for each token collected. This time you **cannot** reset the distribution of green tokens.
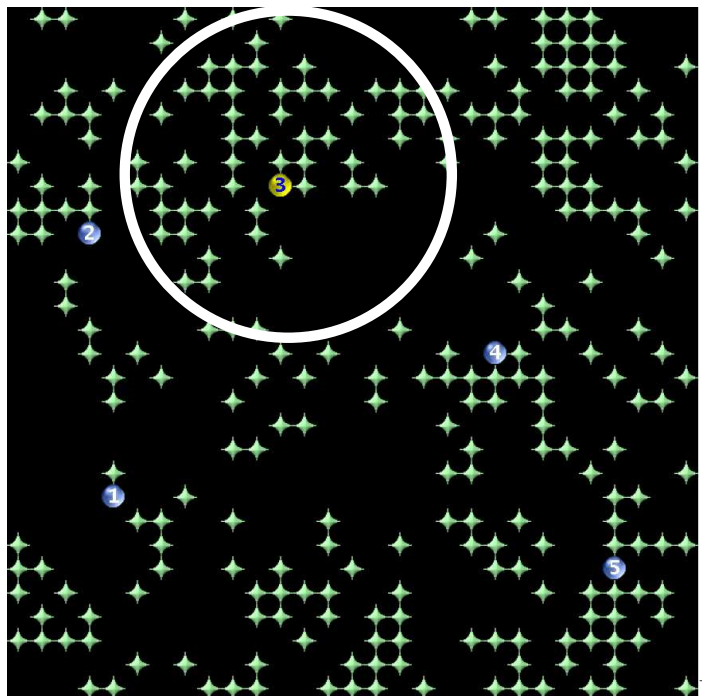
In this round the renewable resource will become five times bigger. You will share this larger environment with four other players in this room that have been randomly selected. One group's resource environment is distinct from the other groups.

Each of you has been assigned a number from 1 to 5. These numbers will remain the same throughout the experiment but you will **not** be able to identify which person in the room has been assigned which number, so your anonymity is guaranteed.

The other four players will appear on the screen as blue dots with a white number embedded in the dot. On the top right corner of the screen you can see how many tokens each player has collected. On the top left corner of the screen you can see a clock that displays the remaining time in the round.

[*In experiments with limited vision the following is added:*
Since you can only see the resource within your vision you may neither see all the other participants nor all the resource units. The figure below indicates the vision range compared to the whole environment

]

Do you have any questions so far?

[Rounds 2 and 3 are the same as round 1]

Round 4 Instructions
Round 4 is the same as the previous two rounds with two exceptions.

Before the next round starts you can anonymously communicate by text messages for four minutes with the other participants in your group. You can use this opportunity to discuss the experiment and coordinate your actions to improve your earnings. You may not promise side-payments after the experiment is completed or make any threats. You are also not allowed to reveal your real identity. We are monitoring the chat traffic while you chat.
During the next round you will have the option to reduce the earnings of another participant at a cost to your own earnings.
- If you press the numeric key 1-5 corresponding to another participant, you will reduce the number of tokens they have collected in this round by two tokens. This will also reduce your own token amount by one token. The decision whether or when to use this option is up to you.
- When you reduce the number of tokens of another participant, they will receive a message stating that you have reduced their tokens. Likewise, if another participant reduces your number of tokens, you will also receive a message. These messages will be displayed on the bottom of your screen.
- If your tokens are being reduced or you are reducing another participant's tokens, you will receive some visual cues. When you are sanctioned your yellow dot will turn red briefly with a blue background. The participant sanctioning you will turn purple with a white background.
- You may sanction other participants as long as there are tokens remaining on the screen and while both you and the other participant have a positive number of tokens collected during the round. **Each time** you press the numeric key corresponding to another participant your token amount is reduced by **one**, and their token amount is reduced by two. **Note**: You can only remove tokens from a participant that is visible to you.

The length of this round is four minutes.

If you have any questions please raise your hand. Do you have any questions so far?

Before the next round begins you must complete the quiz below. You can only continue when you have answered all questions correctly. If an error is made you will need to answer the questions again.

Each time I press the numeric keys between 1-5 my tokens will be reduced by:
- 0 tokens
- 1 token
- 2 tokens
- 4 tokens

Each time I press the numeric keys between 1-5 the number of tokens of the corresponding participant is reduced by:
- 0 tokens
- 1 token

- 2 tokens
- 4 tokens

The background of your yellow dot turns blue. What does this represent?
- You collected a token
- Another participant is subtracting two tokens from you
- You are subtracting two tokens from another participant
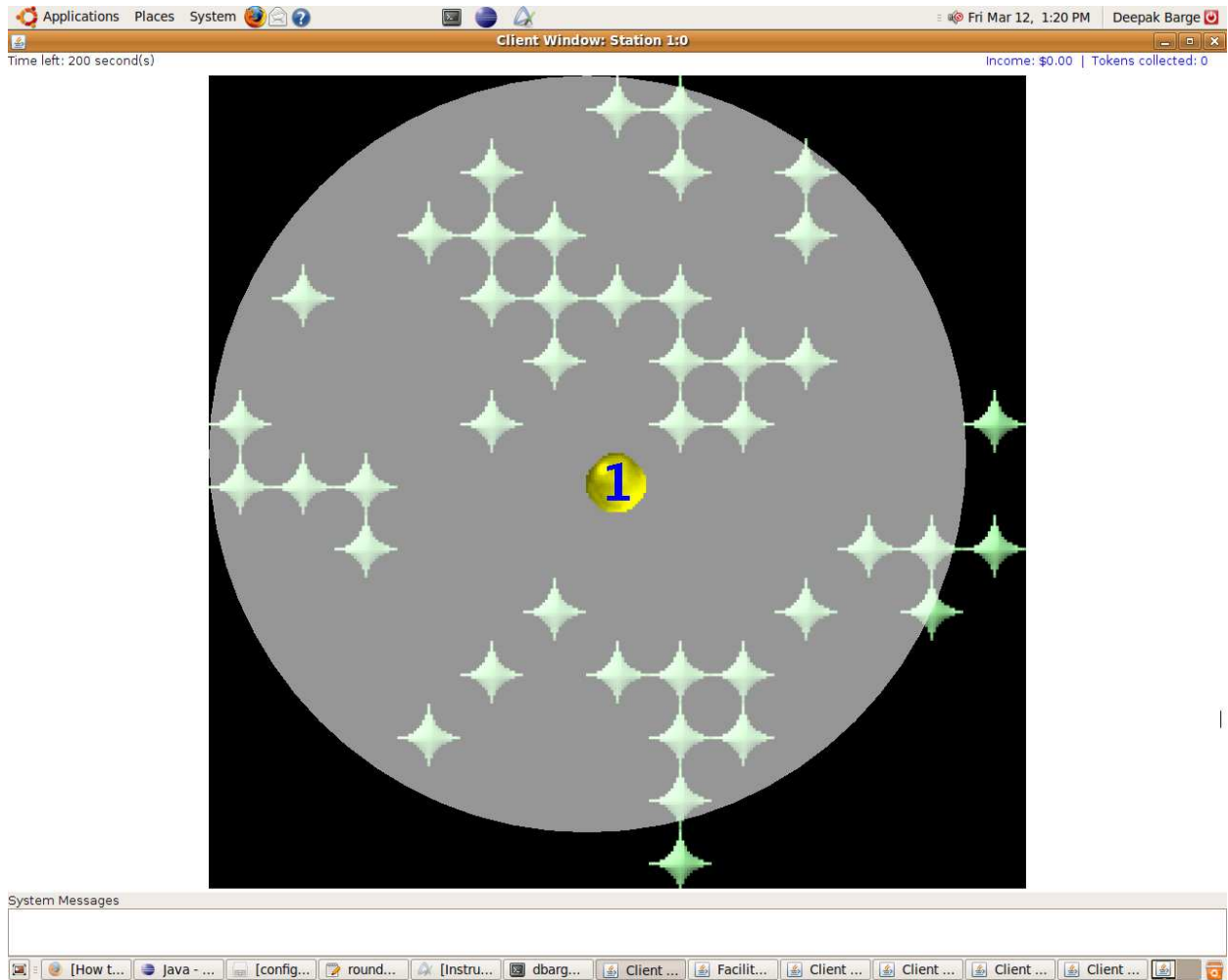- You are moving too fast

Every time I press the numeric keys between 1-5:
- Two tokens are subtracted from my tokens collected this round
- One token is subtracted from my tokens collected this round
- The background of my yellow dot turns blue momentarily
- My yellow dot is paused for two seconds

[Rounds 5 and 6 are the same as round 4]

Screenshots of experimental environment with limited vision

Practice round

Chat screen

Screen during harvesting of tokens of group with limited vision from perspective of player 5.