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GTR – ENM140 2017

Part 1. Giving useful feedback

The first and the last part of our class on wednesday will be spent on the art of giving and recieving feedback as it is one of the most powerful ways to enhance learning and, I believe, to build strong teams.
We will together investigate a "conceptual model" that informs us on how to give valuable feedback and practice on becoming proficient in using feedback in a useful way.

Look at the separate reading guide "Reading guide - The power of feedback". I recommend that you read the parts of the article by Hattie according to the reading guide.
It's especially interesting if you're curious about learning and the role of feedback to enhance it.

Part 2. Example seminar

- an agent based model used in a game theoretic study of spatial natural resource use

Introduction
It is important to develop spatially explicit models of natural resource use since landscape characteristics and transportation distances affect both the type and degree of natural resource use and the ecosystem services the resource can provide in a spatially dependent way. This in turn is important for how much carbon the resource can bind (as in contrast to how much CO2 it risks to release if it is mis-used) as well as its contribution to biodiversity and other eco-system services it can perform. The main material that will be presented is ongoing work, which means that those parts are not fully explored and have thus not had any significant impact. Presenting these parts serve other purposes than exploring insights from well established research, but all parts will be used during the seminar to understand where the research frontier is now. With this example seminar I aim at achieving four things:
1) Performing an example "student lead seminar" for you to be inspired by (with your own seminar in the weeks ahead)
2) To invite you into a type of modelling project that you could be doing in your modelling project in this course
3) To give you a transparent picture of how research can be performed in one of the many applications areas of game theory by placing you in the "middle of knowledge creation" where I'm currently working on finalising a study
4) Allowing you to practice giving constructive feedback which is important for learning and teambuilding

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Reading guide = Study and preparation guide
Go through steps A-C

A) Study the material A1-A2 (below) while bearing in mind and trying to answer the following questions to yourself:

Questions for A1-A2

Why are spatial aspects important for natural resource use and management?
For the manuscript (Sterner et al. submitted), identify the basic parts of a game: agents, actions, strategies, pay-offs, equilibria
What assumptions are used?

- About the landscape and resource characteristics?
- About the extractors, their decisions and their alternative labor options?
- How could the models be changed in order to capture more realistic villager behavior and a more sophisticated description of a landscape with varying characteristics for the natural resource being used?

Models can always (?) be made to include more details of a certain real world situation or mechanism, the challenge of only including just enough of details and assumptions to capture important characteristics and the major phenomena of interest is hard.
What are your thoughts about striking this balance in this setting of natural resource use?

To be prepared for the seminar please look at the list of questions for the seminar at the bottom of this "study guide".

A1) Watch the following short video about the von Thunen model which lays the foundation for a major part of the work on spatial use of natural resources. von Thunen was one of the first to develop a theory for what will be grown, produced or extracted at what distance from a market place thereby introducing a spatial dimension to natural resource use and management. This link intentionally starts at second 27 (nothing useful before that):
https://youtu.be/yxYjfkOq61I?t=27

A2) Read the manuscript (Sterner et al. submitted) (bearing in mind the questions above and below). But focus on the model of spatially explicit natural resource use. An imagined application of the model is to study extraction of non-timber forest products, but the models can be adopted to describe the use of other renewable natural resources.

B) Design and submit your strategy

In class we will run the same game as the extractors in Sterner et al. (submitted) play. But we will do it together using strategies that you will submit no later than 12:00 on wednesday. The game will be run using the same parameters as given in the “Test strategies scores” excel sheet. We will run it for 1 and for 10 time periods. Corresponding to a one-shot game and a repeated game with the same strategies. The differences between our simulation and the models standard simulation are three:
1) We set fixed strategies to be used for all time periods that will not be changed in any way
2) We probably don’t have exactly the same number of agents as the standard simulation
3) We do not know what the other players are planning to do (i.e. do not tell each other what you strategy is before hand)

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Utility - scoring

After running the game for 10 time periods we will score the strategies in the following three ways. (You can choose to try to perform well in only one of these aspects, in two or in all three):

1) The largest returns to labor for the first time period
2) The largest returns to labor for the last time period
3) The largest average returns to labor for all ten time periods

The 10 highest ranking in each category will be named and recieve a good tasting price =)

Submit your strategy as a vector (by filling in numbers in the underscored blank spaces below) to erik.sterner@chalmers.se before wednesday lunch :

P(1,1) =___ P(1,2)=___ P(1,3)=___ P(2,1)=___ P(2,2)=___ P(2,3)=___ WL=___

Where patch i in ray j is denoted P(i,j) and WL is the non-forest wage work labor option. Doing equally much in each patch would and in non-forest wage labor for example would thus correspond to writing 1/7 on each of the underscored blank spaces above.

NOTE: the numbers are the fraction of the total available labor time left after traveling, the sum of the 7 numbers should thus be 1, you should not yourself subtract the travel distance, that is done by the algorihtm we will use.

C) **Be ready to discuss the following questions** on the seminar (assume that the same parameters as above have been used if nothing else is stated)

Questions for the seminar

Generally speaking; what characterises a non-cooperative and a cooperative Nash equilibria respectively?

How do you think a non-cooperative equilibria would differ from a cooperative equilibria in this game (for say 18 villagers=agents)?

What role does the spatial assumptions, like all villagers behaving the same, villagers only being allowed to extract in one place play? (for non-cooperative villagers)

How could our latest model be changed in order to capture more realistic villager behavior and a more sophisticated description of a landscape with varying characteristics for the natural resource being used?

Models can always (?) be made to include more details of a certain real world situation or mechanism, the challange of only including just enough of details and assumptions to capture important characteristics and the major phenomena of interest is hard. Discuss your thoughts about striking this balance in this setting of natural resource use?

Do you think that this game has a single unique non-cooperative equilibrium? If not, how/in what way could the equilibria differ?

Bonus/in depth questions:

How could you make an implementation of this model?

What type of numerical algorithms could you use to find a Nash equilibrium here?

What implications could your choice of algorithm have?

Are there other type of possible solution algorithms - which?

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Game description

The game will be run with the strategies that you submit, which means an unknown number of strategies (but most probably between 12 and 25). The parameter settings (including the distances) are those given in the excel sheet provided called "Test strategies scores".
In order to test what score different strategies yield for different total amount of labor put into the different patches and the wage labor option for the one-shot game (i.e. one time period) you can either use the equations above or use the excel sheet provided. Note however that the score you will achieve depends to a large extent on what assumptions you make on the amount of labor that will be spent by the other agents in the different patches and on non-extraction wage labor. In the excel sheet the input on your extraction are in the greenish cells while your guesses of what the other villagers will do are in the yellowish. However we will also run the model for 10 time periods to see what happen with the resources as well as you returns to labor for your strategies over time as the forest resource degrades.

Looking forward to meeting you and playing this game with you!
If there are any questions before the class, please email them to erik.sterner@chalmers.se