

In the first part of the chapter 11, the text book explains the concept of Utilities and Preferences. Regarding our project, there are a lot of different descriptions what the revolting citizens- and the suppressing police agents could do. We need to define our own description and understand the individual agent's preferences regarding the possible outcomes of their decisions.

## **A. Questions regarding the theory in the textbook**

Referring to Chapter 11.1 & 11.2 in the textbook.

**A.1 Explain the figure 11.1 on page 224 as described in the book, either with an own example or with the example from our project. Your description should contain an explanation of what is meant with *self-interested agent*, *spheres of influence*, *type of interaction*, *best decision possible about what action to perform*, *organization*, *outcomes*, and *preferences*.**

Self interested agents, agents have their own goals and intrests, sphere of influence, the agents our own agents can interact with and what environment, interactions are what types of interactions can occur between individuals, all actions have an outcome and our agents decide what to do based on their own self interested to achieve their goals, our organizations refers to our agent breeds together and the actions they take. Outcomes are results or consequences of an agents actions and preferences are the wanted or preferred outcomes.

An example could be from our project, our self interested agents have their own goals and desires to do different things like rioting or working hard, their sphere of influence is their friends and also cops and other citizens nearby, the types of interactions come through messages with social media or a cop arresting a citizen.

**A.2 Assume the situation where one agent  $i$  communicates with another agent  $j$  and agent  $i$  asks if  $j$  wants to join  $i$  in a certain activity, for example to go out to an entertainment place. How would 'setting the scene' look like for this type of interaction? Could a *pay-off matrix* be drawn? If yes, how would it look like?**

I asks J

	J = C	J = D
	10	0
I = C	10	5
	-2	0
I = D	-5	0

Cooperate and defect, we have 4 different outcomes {CC,CD,DC,DD} where both cooperate, one cooperates and the other defects, same case but other way around and both defect. For the example of going out, I could ask J to go out and both participants want to go out. This would mean that both cooperating is the most liked and preferred outcome and both defecting is least desired outcome.

In this case both are happy if they go out, if I can go out and J can't, I won't be as happy but still happy, if I suddenly can't go out anymore but J accepts it is the least desired outcome for I because the agent gets sad because he can't make it and if both can't make it is neutral since I at least doesn't miss out on anything anymore, very hypothetical.

The payoff could be something like  $i(CC) > i(CD) > i(DD) > i(DC)$

$j(CC) > j(CD), j(DD) > j(DC)$

For the project this would of course be modified with another case like going out to riot but the outline is the same however the numbers would probably look different.

## B. Questions regarding research articles

Referring to the three articles (nr. 1-3), see Course Activities Week 16:

The three articles describe different agent-models of civil violence. Our civilian-agents try to live everyday lives, exercising their human rights. Our plan is to change the behavior of police-agents from acting according to a constitutional state to protecting the power of a totalitarian leader, and to see if and when some of the citizens start an uprising.

**B.1 Look for class diagrams, agent specifications or behavior descriptions within the articles. Focus on the citizen- and police-agents and their interactions and describe:**

- The spheres of influence of the agents

In Ismaili Salwas model the citizens can check their own income and based on this become happy neutral or unhappy. They can perceive their environment and check for dead bodies and this too can make them unhappy. The cops follow a similar process where they check their benefits, if they are low and citizens are revolting, they will defect. They also could perceive their environment and look for bodies too since they too have an emotional threshold. All happy military agents will check for rebelling citizens and they can either kill or jail them. Civilians can also see other rebels around and are affected by them

Epstein and Lemos both follow a very similar structure to each other since Lemos uses a lot of the same variables and strategies as Epstein. Citizens can perceive their environment and look for rebelling citizens and cops and these other agents affect the individual in many ways. They have hardship and perceived legitimacy of the regime and can look at nearby cops and citizens turning this into a ratio.

Lemos instead of hardship and perceived legitimacy they simply use happiness and this depends on their own income and if they perceive any dead bodies in their vision range making them happy, neutral or unhappy. Cops have benefits instead of income and this makes them either sad or happy and this happiness determines if they stay loyal or defect.

- **The situations and type of interactions in which the agents are involved**

There are a few common interactions and situations that occur are, Cops come upon a normal citizen, cops come upon active citizens, citizens come upon active citizens, citizens start rebelling and cops can also kill in Ismail's example so that is a unique situation as well as the fighting between cops and citizens in Lemos version.

The interactions are cops arresting or killing and citizens interaction with each other and affecting each other by affecting their perceptions so a sort of passive interaction between citizens.

In Lemos model active citizens can start fights immobilizing themselves and the other participant before being arrested, the cops in turn fight back and jail the citizen.

In Epstein's model the cops are able to inspect sites within their given vision range and too can of course arrest citizens, Epstein's citizens do not possess the ability to fight and simply depend on

their grievance and hardship perceptions and the legitimacy of the regime.

Ismali citizens look around at their fellow citizen checking if they are getting arrested, killed or perhaps jailed, the cops can jail as the other cops as well as kill the active disobeying citizens and what they do is decided by their income and emotional threshold that they share with citizens and is determined by nearby dead bodies.

- **The decisions taken by the agents and the outcomes of these decisions**

In ismali salwas project the happy, neutral and unhappy state decides what actions to take next as well as if there are too many agents around who have been killed. If the emotional threshold hasn't been reached, they check their income to determine if they are happy, neutral or sad and these all return to the same state except for unhappy, this state triggers a rebellion action based on what personality the agent has, A or B.

Lemos builds upon Epstein's code and uses the same hardship and risk variables. Using the number of cops and agents around determines perceived risk and this is what makes an agent rebel in both codes if grievance is high enough and risk is low enough, the risk is determined by nearby cops and nearby active citizens, more rebels means a lesser chance of getting arrested. If the agents choose to take action, they turn active and this leads to behaviour changes.

**B.2 What are your suggestions for utility-functions that could be used for the calculation of preferences over the outcomes, needed for the decision making of self-interested agents?**

Agents could have different personalities using a Boolean and based off these Boolean we would set different thresholds. In my task our agents want to go out and preach, using a simple Boolean we can give different agents different personalities so that they need less to do something, if we imagine the talkative Boolean as a counter this would mean that a talkative agent preaches more than other agents and this could be seen as a preference for going preaching a lot.

Ifelse talkative?[

Threshold = 500]

[

Threshold = 1000]

Ifelse preachtimer > treashold

[nextstate = preach]

[nextstate = currentstate]

## C. Questions regarding the implementation in the project

Referring to the citizen- and police-agents:

C.1 Inspired by your answers to B.1 and B.2 above, which spheres of influence, situations, interactions, decisions and outcomes do you propose for the agents in our project? Which utility-functions do you propose? Fill in the following table and add new rows:

agents	Sphere of influence	Situation	Interactions	Decisions	Outcomes	Utility-functions
C	The environment, they can walk around and talk to others at town square	Either they are happy lollygagging or they are unhappy and feel the need to speak at the town square and organize riots, met with friends	Broadcasting information to others at the town square and avoiding collisions with other citizens	To preach and go to the town or to simply walk around avoiding other citizens	Preaching satisfies a need for the citizen and spreads information to others, or does nothing	If threshold >prech_need[ Go to town square Start-preaching Reset prech_need ]
P	Walking around town looking at other citizens and their threat levels and if they are actively rebelling and talking to other cops to group up or	They can find themselves surrounded by rebels trying to avoid them or they cn find single activists that they can arrest	Arrest citizen and talking with cops to group up or scout areas perhaps	To arrest or not to arrest	Less activists or no change to the environment that leads to eventually more activists	Ifelse citizen with activist?="true" [arrest citizen and set jail-time] [not a criminal do nothing]

	come for backup	or organizing themselves with other cops to stop protests				
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