SWEN90004 Modelling Complex Software System

Assignment 2 Proposal

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1 Descriptive Overview

Our group decides to replicate the **Rebellion** model. This model is based on model of civil violence by Joshua Epstein (2002). It describes the how agents behave against central authority in relation to their grievance and power of authority. Where grievance of agents depends on government legitimacy, perceived hardship and risk aversion of each individual. Power of authority is determined by number of police officers, their vision and maximum jail terms. There are two global variables in the model that cannot be directly set in the interface that are k, the factor for determining arrest probability, and *threshold* for agents to rebel.

Users can observe how ordinary people feel about the authority under certain imposed pressure. In addition, social scientists can study how different personalities affect their behaviour to authority.

2 Design of Rebellion Model

There are two categories of members in this model, **agents** and **police officers**.

The states of them are made of two parts. The first part is their location. Police officers can always move to unoccupied patches freely. Where the mobility of agents can be switched on and off in the model.

The second part is the behaviour of members. Police officers only has one state that is arresting active agents (rebelled agents) in their vision. If there are more than one active agents in the vision, they will arrest randomly one

of them. There are three different states for agents, quiet, active and jailed. The state update rule are as following:

2.1 $Quiet \Rightarrow Active$

$$grievance - riskAversion \times estimatedArrestProbability > threshold$$
$$\text{Where } grievance = perceivedHardship \times (1 - governmentLegitimacy) \tag{1}$$

2.2 $Active \Rightarrow Quiet$

$$grievance - riskAversion \times estimatedArrestProbability \leq threshold \tag{2}$$

2.3 $Active \Rightarrow Jailed$

If police officers find active agents in their vision, they will randomly arrest one of these active agents and change their state from **active** to **jailed**.

2.4 $Jailed \Rightarrow Quiet$

If the jailed agents stay in jail after the *maximum jailed period*, they will become quiet.

3 Plan of Implementation

There are two major components in our architecture. Controller and Model. In the model we have Agent class, Patch class and PoliceMan class. In the Controller component, there are Board class and Controller class. Board is representing all patches in the board, in other words, the map for this model. Controller will control the states of all agents and police man.