SWEN90004 Modelling Complex Software System

Assignment 2 Report

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1 Background

The chosen model for our analysis is the **Rebellion** model. This model is based on model of civil violence by Joshua Epstein (2002). The aim of this project is to replicate this model and study how this complex system behaves in different stages and under different settings. It describes the how agents behave against central authority in relation to their grievance and the power of authority.

2 Model

The model includes the following major components:

2.1 Board

Board is the representation of the world in this model. It is set in default to contain 1600 (40×40) patches in total.

2.1.1 Patches

Each patch in the board has two states, *empty* and *occupied*.

2.2 Agent

Agents are the representation of ordinary individuals in this model. Agents have three states, *active*, *quiet* and *jailed*. They are default to be *quiet* at the beginning. Agents will be able to move to any empty patches in their vision when *MOVEMENT* value equals to *true* every tick. They

will update their state after the movement phase according to the following equation.

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

When this equation holds, their state will become *active*, otherwise it will be *quiet*. If active agents are in the vision of cops, there will be possibility for them to become *jailed* by the enforce action of cops. A random jail term between 0 and the maximum jail term allowed will be given to them and they are not able to move or action during that time. However, a patch contains jailed agents are still considered as *empty* when no other agents or cops on it.

2.3 Cop

Cops are the representation of power of authority.

3 Replication

4 Extension

5 Results & Discussion

6 Conclusion