The Principled Violation of Policy: Norm Flexibilization in Open Self-Organising Systems

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Introduction

- **Rules and norms** in open systems attempt to guarantee its well functioning and prevent selfish (e.g. free-riding) or unsustainable (e.g. tragedy of the commons) behaviour.
- **Sanctioning** structures prevent and punish non-compliance enforcing conformity.
- To what extent sanctioning strategies really have **beneficial effects** in socio-technical systems?
- In what extent full norm compliance is a desirable outcome and at what **cost**?
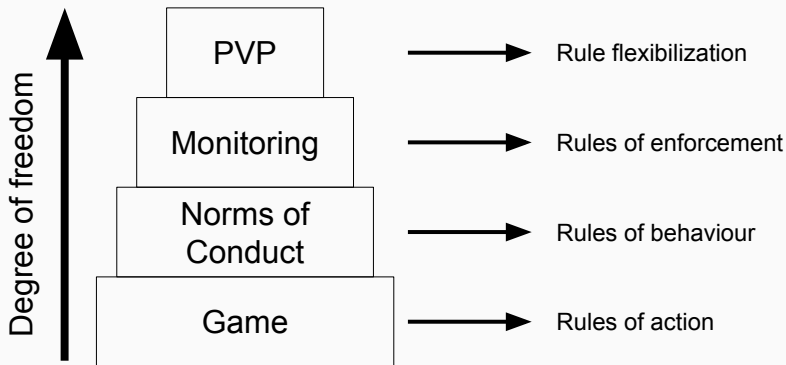
Figure 1: Layers of rules involved in the design of CAS simulations.

Definition

The active and intentional decision of an agent of not applying a policy to which it is entitled.

In norm-governed systems, PVP is the **potential to suspend or relax controlling and retaliation mechanisms**, at the adjudicator's discretion.

Experiments

Figure 2: Model's scheme of decisions

Generation and Need   **Demand and Provision**   **Allocation and Appropriation**
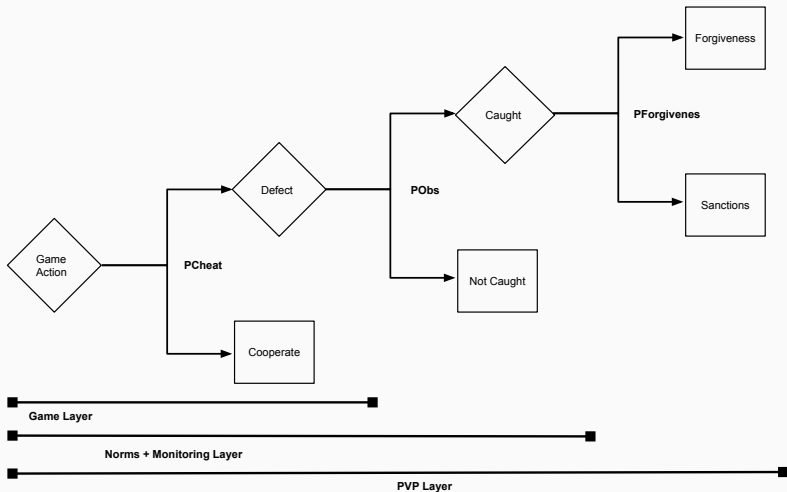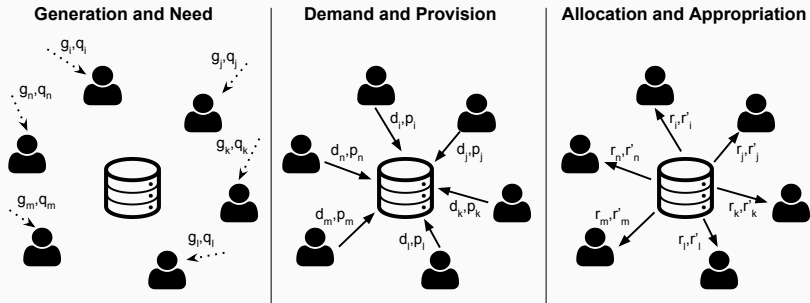
Figure 3: The LPG' Game

- Agents produce and consume resources
- Cooperation to a common-pool is voluntary
- Inidividual resources are allocated from the common-pool

1. Agents must provide its whole generation to the common pool
   (i.e. $p_i = g_i$)
2. Agents must demand only what they need ($d_i = q_i$)
3. Agents must appropriate only what was assigned to them ($r_i = r'_i$)

- **Penalty:** At a given turn, if an agent violate any of the norms **and** a sanction is issued by an observing agent, the violator should not receive resources from the common pool for m rounds;
- **Mandatory Non-Repudiation:** once a sanction is issued, it can not be rejected and should be applied immediately;
- **Selective Non-Application:** an observing agent has the flexibility to apply or not a sanction, given a violation (this being the definition of PVP).

- **PCheat:** probability of non-cooperative behaviour
- **PObs:** frequency of monitoring for non-compliant events
- **PForg:** probability of not issuing a sanction upon an observed non-compliant event
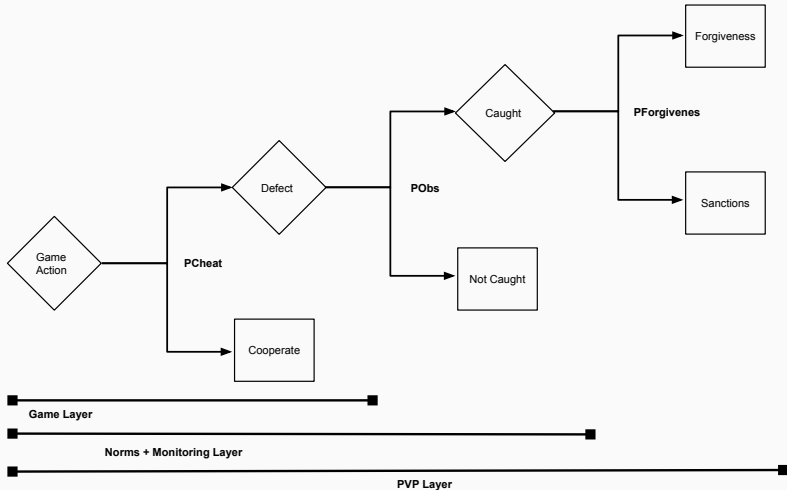
Figure 4: Model's scheme of decisions

Results and Analysis

- $n = 30$ agents
- $g_i = \mathrm{rand}(0, 1); q_i = g_i + (1 - g_i) * \mathrm{rand}(0, 1)$
- Monitoring Cost: 0.05/observation
- Sanction: agent is removed of the game for $m = 10$ rounds
- Random allocator
- Utility function:

$$U_i = \begin{cases} a(q_i) + b(R_i - q_i) & \text{if } R_i \geq q_i \\ a(R_i) - c(q_i - R_i) & \text{otherwise} \end{cases}$$
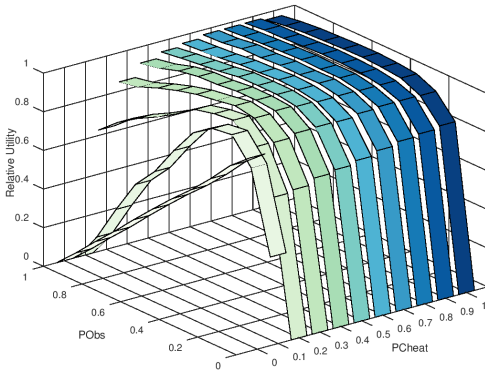
$$\text{with } R_i = r'_i + (g_i - p_i)$$

Figure 5: Relative utility of compliant agents for different combinations of $PObs$ and $PCheat$

If monitoring has costs, depending on the levels of non-compliance ($PCheat$), increasing the monitoring frequency ($PObs$) has small or negative effect on general utility.
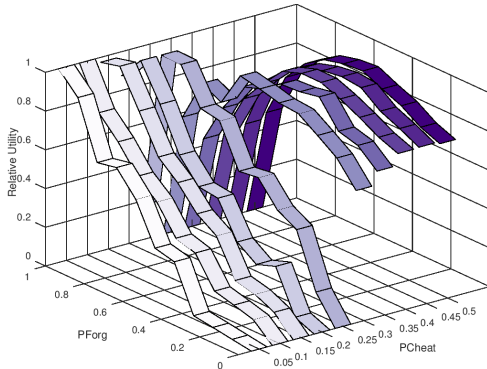
Figure 6: Relative utility for different combinations of $PForg$ and $PCheat$.

In scenarios with low levls of non-compliance ($PForg$), higher utility is achieved by letting eventual non-compliant agents participate of the game, than excluding them through sanctioning.
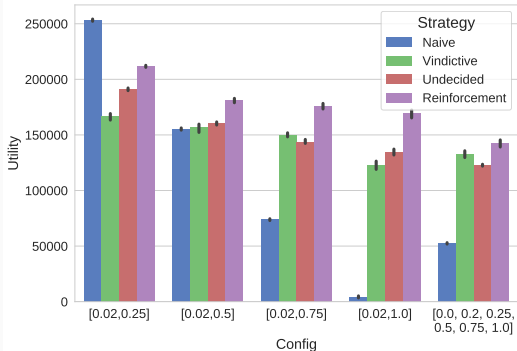
Figure 7: Comparison of utility from different strategies, for various configurations of population. Each configuration label shows the different values of $PCheat$ among the players population.

Compared to fixed policy strategies, flexible strategy (reinforcement, in graph) is able to achieve overall better results, for different scenarios of non-compliance.
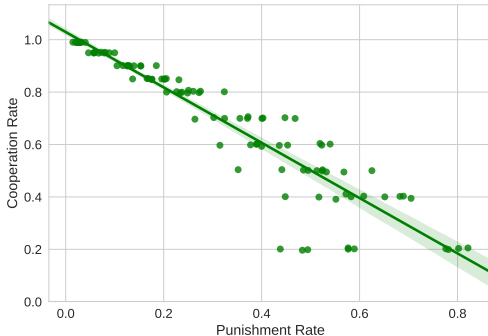
Figure 8: Relationship between cooperation rate (#cooperations/#turns) and punishment rate (#sanctions/#non-compliance)

In scenarios where PVP is learned and exercised, agents with high levels of cooperation receive proportionally less sanctions than the ones who do not cooperate as often.

Conclusion

Final Remarks

- The Principled Policy Violation (PVP) is a pertinent and advantageous mechanism in the development of norm-governed open systems;
- PVP enable solutions that are:

    1. Cost effective;
    2. Tolerant and resilient to accidents;
    3. Adaptable to different scenarios and behaviour
    4. Used as a tool of justice perception and policy justification

- Future steps:

    - Explore *externalities* associated to PVP (e.g. social capital, resentment, shame)
    - Investigate adaptable behaviour
    - PVP as mechanism of social change/revolution in unfair environments

- National Council for Scientific and Technological Development (CNPq), Brazil;
- Diverse colaborators.

Thank you!