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## The Art of the Possible. Towards a Cognitive Model for Political Action Choice<sup>1</sup>

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### Abstract

The consideration of political action by individuals is constrained by what those people consider possible, in terms of not only their immediate actions but also in terms of what changes in the world those individuals believe could occur because of their, or others', actions. However, there are two major complications to this picture: (a) people are heavily influenced by others they are in social contact with in terms of both goals and assessment of possibility, and (b) since what people do is influenced by what world-changes they consider possible, **and people know this**, what can change is influenced also by what others think others around them think is possible. Politics thus involves complex processes at several levels, including: the spread of goals and possibility assessments throughout a local social network, and adjustments in what people think about others' possibility judgements. An implementable cognitive model suitable for building into an agent-based model is proposed, drawing on existing cognitive structures to simulate social contact, goal-directed action choice, negotiation and social norms.

**Keywords:** cognitive modelling, political action

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## 1. Introduction

This paper represents the view of a computational social modeller, not an expert in political theory or literature. This is therefore somewhat of an outsider's view of what might be appropriate. It outlines a proposal for a possible cognitive model that directly addresses the question of action choice in political situations – ones where the actions of one actor (or actors) constrain what is possible for others, that is where some have power over another or over what may transpire.

I will start with some example situations to highlight the core elements of the proposed model. Both of these are highly simplified accounts of such situations, involving only a few of the different political viewpoints that might be involved, but they do highlight some important factors that (I argue) do need to be taken into account but are amenable to computational simulation.

In the discussions below, I will use a style of diagram that directly corresponds to the cognitive representations that might be used in a simulation of actors<sup>2</sup>. They represent states of the world (the nodes) and what transitions between these states (the arrows) are believed to be realistic possibilities. The transitions between states are labelled by the events or agent actions that may cause the transition. These actions are not necessarily those of the actor with the beliefs illustrated, since many transitions depend upon the actions of others (otherwise politics would be redundant). The states of the world come with their valency for the agent – that is, how desirable the agent considers them. However to keep the diagrams simple I will usually leave valency out, since it is clear by context.

This is an extension of the possible world semantics (PWS) of Kripke (1963). In standard PWS, nodes represent possible states of the world and directed arcs the possible transitions between those states. Here this is slightly extended to allow the accessible labelling of nodes and arcs, which can be explicitly reasoned about by the actors. Each actor may have a different "map" of what the relevant possible states of the world and the connecting actions are (and, very relevantly, who they think can do those actions). Of course, their mental maps may turn out to be wrong, and be updated by future events, but this snapshot of maps does form a coherent and powerful model for how such political decisions are made.

In the paper below I seek to show that this kind of reasoning is especially important for political reasoning and action.

## 2. Examples

The following examples are not tied to any particular observed situations, but are rather abstract examples to demonstrate the plausibility and potential explanatory power of the modelling approach.

### 2.1 EXAMPLE 1. PROTEST

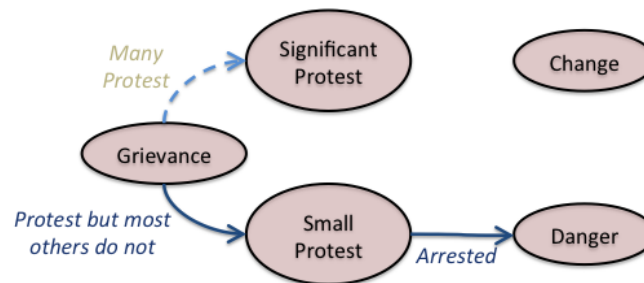
Whether people protest does not only depend on the existence of a legitimate grievance and the danger in protesting (if any), but crucially on (a) whether they think protesting could change anything and (b) whether they think others will protest. Whether others protest is based on similar considerations. If people think that the effect of any protest will likely be blocked by those opposing change (i.e. there is no real possibility of contributing to any change) and the danger is high, any protest will be poorly attended despite the existence of a legitimate grievance. If people believe that there is a possibility that protest might have some effect then whether they protest will depend on their willingness to face any danger but also

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<sup>2</sup> For a history of the many people involved in the development of this style of representation, see the appendix of (Edmonds and Hales 2004).

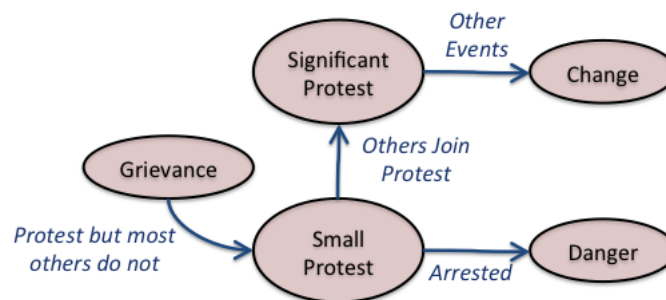
whether they think others will protest. If everybody thinks others will protest they may all come out to do so. If everybody thinks others would not join a protest, then they will not. This is particularly the case if they think they may only be in danger if there are only a few on the protest.

To make this clearer, let us draw some of the states of the world and the transitions considered possible by this citizen. Say these citizens live in a strong dictatorship. Maybe this person’s mental map looks a bit like that of **Figure 1**.



**Figure 1.**  
 A Citizen's View of Possibilities in a Strong Dictatorship

Here the citizen believes that a small protest is possible but then there is a possibility they would be arrested and thus put in danger. This person does not believe that even if a protest of significant size were possible that this would lead to any change, even given that they would likely be safe in such a protest. Since they reckon that many others share this reasoning, they would doubt that many would protest. This reinforces the conclusion that the only possible outcome of protesting is danger so there is no protest.



**Figure 2.**  
 A Citizen's View of Possibilities in a Weakened Dictatorship

Contrast this with the situation where the citizen thinks there is a possibility that significant protest could lead to change. In this case, even if this person thinks that a significant sized protest is not possible, they might risk arrest and protest, since they can reason that change is possible in the following manner. If others share their view that significant protest might bring about change and they see people joining a small protest they may see the possibility of a large protest and, even relatively timid people join it since they may

be safe then but still might achieve change. The result might be then a significantly sized protest and maybe change. In a safe country where one does not risk arrest by protesting the size of the protest will be of less concern and the existence of protest driven largely by the judgement as to whether there is a chance of causing change.

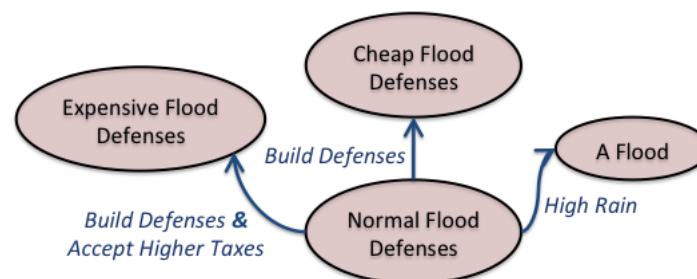
The government might well take steps to prevent change in this circumstance in three ways: ensure people are aware that there is a real possibility of being arrested if there is a small demonstration, emphasise that things will not change regardless of protest, and try to encourage the perception that even if a few protest most will not. Further they might try to socially denigrate few protesters by portraying them as "extremists" or otherwise antisocial. It is notable that many of these steps are matters of persuasion/propaganda as well as actions of force.

Those agitating for change might try to persuade people that change is possible if enough protest and that it is likely that many will protest. If they can persuade enough people to join the protest that others will feel relatively safe in joining in they might obtain a significant protest, since the bigger the protest the less dangerous it will appear to join it. Further, they will know that the social experience of joining with others on a social experience may help persuade people of the possibility of change. Their problem is getting enough to protest if it is perceived as being pointless, that few people will join and thus would be vulnerable to individual arrest.

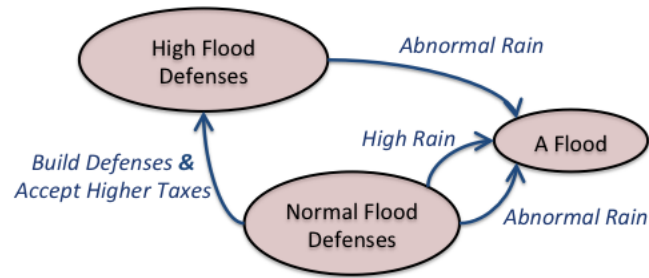
## 2.2 EXAMPLE 2. A POLITICAL DIALOGUE

This example is loosely derived from a report on the Maaswerken negotiation process (van Asselt et al. 2001) designed to achieve a consensus about flood prevention measures in the Maas river basin. Here there are some possible flood prevention measures: building dykes and extending flood plains. Clearly, the Netherlands, with their tradition of working towards a consensus, is very different from one in a dictatorship where suppressed conflict might be the norm.

For both citizens and government it is overwhelmingly important to prevent getting to the state possible floods anytime in the future. The citizen thinks it is possible to prevent this by getting to one of the high flood defence states since even High rain will not then cause floods (**Figure 3**). The government thinks there is a possibility of abnormal rain that the citizen does not think possible (**Figure 4**). Hence, the government does not think that attaining to the state of High flood defences will prevent the possibility of getting to possible floods in the future. Other things being equal the citizen prefers not to accept high taxes and the government does not want to build high flood defences.



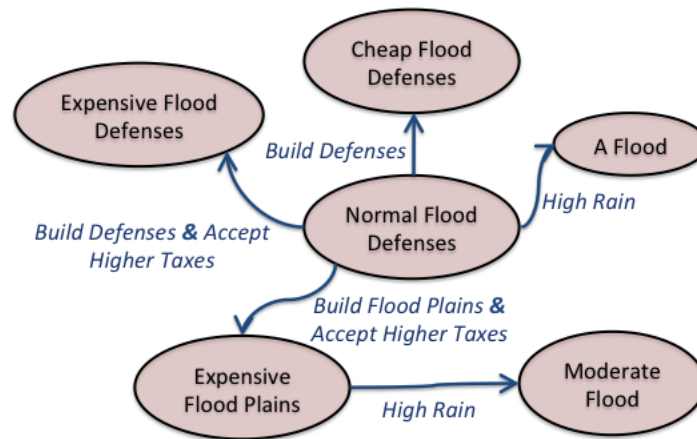
**Figure 3.**  
Citizen's View (simple)



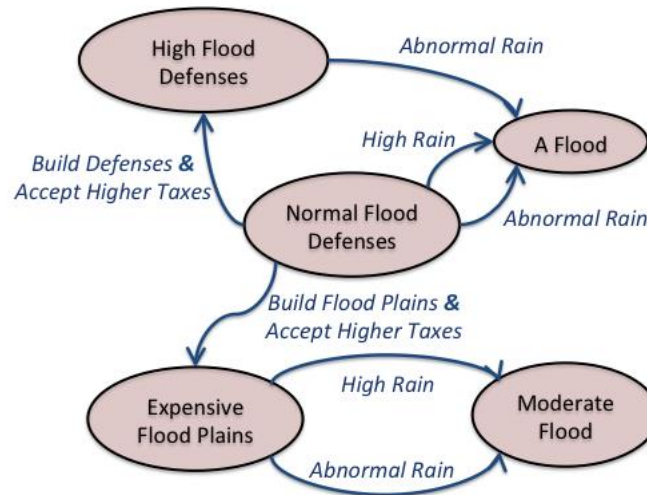
**Figure 4.**  
 Government's View (simple)

In this case, there is quickly a stalemate since in the government's view building high flood defences would not prevent any possibility of flooding because abnormally high rain would overwhelm them. The citizens would prefer high flood defences even at the cost of higher taxes because they think it would prevent the possibility of flooding (since they do not believe in the reality of abnormally high rain).

However if the view of both parties is expanded to include a new possibility, namely flood plains, which are environmentally attractive and will mitigate (but not prevent) flooding, then the outcome can be very different. These expanded views are shown in **Figure 5** and **Figure 6**.



**Figure 5.**  
 Citizen's View (extended)

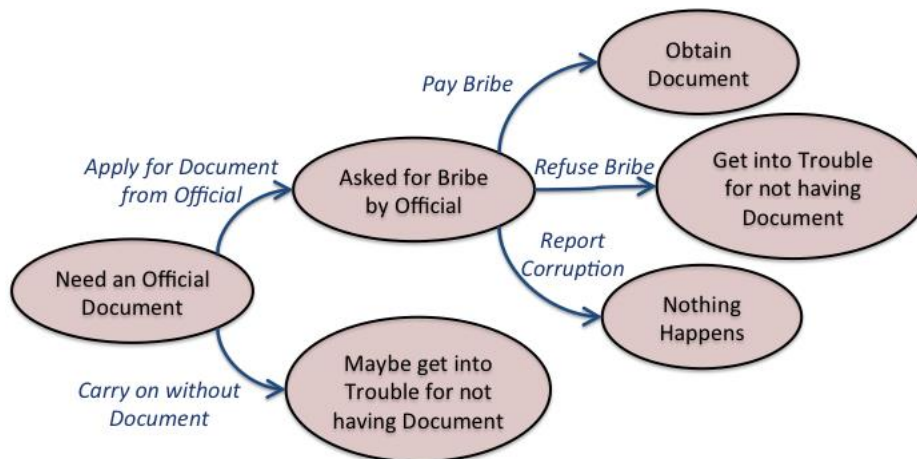


**Figure 6.**  
Government's View (extended)

Now the outcome might be different, namely to accept higher taxes and build flood plains. This is despite the fact that the citizens would prefer high flood defences, which (they think) would prevent all flooding. The fact that citizens and government prefer flood plains to the current position means that they can agree upon that. How such "expansions" or changes in beliefs can occur can make the difference between a political process that comes to a consensual decision and one that does not.

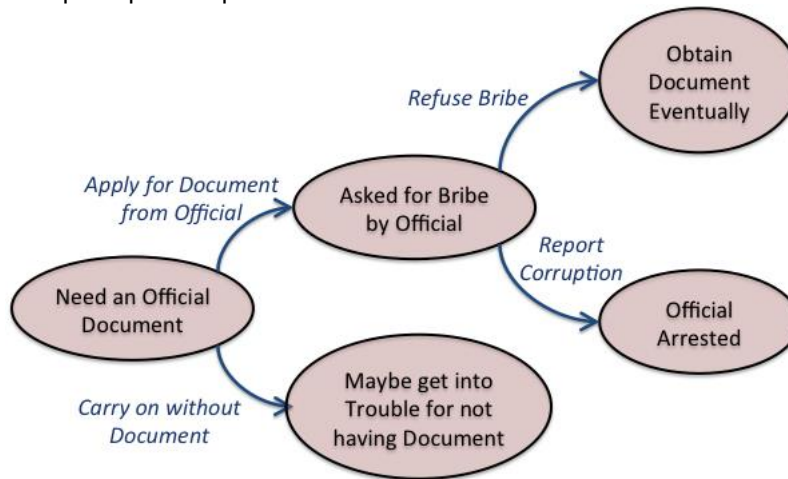
### 2.3 EXAMPLE 3. CORRUPTION

Consider the case of corruption, where a citizen requires some official document. If corruption is not only common, but considered endemic, then the pattern of possibilities might be considered to be as in Figure 7 by a citizen. This citizen assumes that even if the request for a bribe is reported then nothing would happen as the officials to whom this is reported are equally corrupt. In this case there are two rational actions, to do without the document and hope not to be detected, or to pay the bribe and get the document. If the citizen suspects that he can not afford the bribe it might well be better not to apply for the document in the first place.



**Figure 7.**  
 Citizen's View in a Corrupt Society

In a different society, one might believe that one would obtain a document eventually, and that the official risks significant sanction if you reported the request for a bribe. In this case refusing the bribe and maybe reporting the official is the rational course of action. Critically in these cases, it is not whether an official is likely to be arrested when reported that is crucial but whether citizen and official think he is likely to be arrested – it is the perception of possibilities that makes the difference.



**Figure 8.**  
 Citizen's View in a Less Corrupt Society

### 3. Summary of Characteristics

In this section, I summarise the main issues and distinctions to realise the picture of reasoning about action that is implied in the examples above. These will directly relate to the elements in the suggested simulation framework of such political action.

#### 3.1 GOALS

The above examples already assume what people's goals might be. Here a goal is represented as a state from which people can reason about what actions they might take (to reach it). If one has a goal to get to an airport by a certain time, then one can think about how to achieve this. This is completely different from "indicators", such as happiness, prosperity, amount of food, pain, fairness etc. Although, overall, what people desire in terms of these indicators is pretty clear (if not for themselves then for family or others), they are not something from which one can reason to determine what action to take. Just because one desires more happiness does not mean this helps directly in determining what to do to get it.

Indicators do help in determining goals, but as feedback for learning goals. Thus, one might learn that some experience of some state of the world does change indicators in a desirable direction and so, subsequently, attaining to this state might be adopted as a goal. Similarly, others might suggest goals, which might be "sold" on the basis that it might increase desirable indicators (or decrease undesirable



ones). For example, it might be suggested that everybody works hard and puts up with temporary discomfort in order that a project is attained that will eventually benefit all (e.g. bringing in the harvest). Thus, goals change from time to time and which goals are adopted is a political matter. For a more comprehensive discussion of indicators, goals and goal-directed reasoning, see (Milgram 2001).

Which goals are most important to individuals is often a matter of dealing with immediate problems or constraints in their lives. Thus, even though growing enough food might be a general goal, if it gets cold enough staying warm might rise above this in importance for a while. Thus, in crises preventing an indicator from becoming too bad (too little food, too much unhappiness, too much pain, too great a chance of death etc.) might become an immediate goal. Clearly, by threatening people with a severe deterioration of such indicators one can motivate people to behave in ways one wishes (if one has the power to enforce this), however there are two solutions to such a threat: to comply and avoid the consequences or to get rid of the possibility of the threat.

### 3.2 POSSIBILITY BELIEFS

Key in both of the above examples is which destination states people believe are reachable, i.e. what they think is possible. In the first example, what was key was which actions (causing transitions between states) individuals believe could occur, and which transitions between states were possible. In the second example, the suggestion of new possibilities in terms of new states and transitions enabled a decision to emerge despite the fact that (overall) citizens and the government had different views of what was possible. This structure of beliefs and possibilities was implicit in (van Boven and Thompson 2001) and made explicit in (Edmonds and Hales 2004).

### 3.3 SOCIAL INFLUENCE

Others can suggest both beliefs about possibility and which goals might be adopted. In particular if a person is a part of a group they identify with and they think that a majority of others share certain beliefs then it is particularly likely that they will come to share them. Goals can be adopted if people share their possibility, salience and broad desirability. The effect of participating in a crowd or tight group can be particularly powerful, with people being persuaded of things that they might later reject. For example in such situations one can feel temporarily powerful and immune in a way that is far beyond that supported by an objective evaluation.

### 3.4 REFLEXIVITY

As illustrated in the above examples, what is considered possible is not only what an individual directly considers, but what they consider are other people's beliefs about possibilities. Although not always the case, one of the biggest clues as to what others might believe is what you believe – an individual might thus project their beliefs upon others around them, assuming they think the same things are possible as you think are possible. Of course, occasionally, what happens might be determined by what others think your possibility beliefs are, or what others might suspect your beliefs are. For example, if you think the authorities suspect you believe it is possible to overthrow them you might well act differently than the case where you believe they can not know that you believe this. This inherent and deep reflexivity in human belief about others can thus be critical to what actions are taken.

### 3.5 CULTURE

Although clearly societies develop means to constrain the real affordances available to individuals in terms of which actions are possible (for example making keys so that only people with the keys can open

a door or start a car), another set of constraints is in the assumptions passed down within cultures as to what is considered possible (Sugden 2000)<sup>3</sup>. Not only might this body of cultural beliefs be difficult to question (since one would be brought up assuming them), but such beliefs may be self-confirming (due to the fact they are widespread). For example, if a certain distinguishable group in a population is considered as particularly aggressive then people may actively look for signs of aggression when interacting with them, and by their anticipations prompt the aggression they were expecting. Those who are expected to be aggressive might find that they will be perceived as aggressive anyway and so lose nothing by being aggressive. Thus the culture of expectations might entrench itself over time, providing all with many apparent confirmations of their assumptions. To give a more positive example, if everybody thinks there is a high probability that the corrupt will be found out and prosecuted then fewer people will be corrupt and also the social institutions that enforce non-corruption will have a greater chance of being effective (since they have a manageable number of cases to deal).

Thus human institutions are not only distinguished by the visible structures of power (legal rules, sanctions etc.) but significantly also the less visible structure of the raft of cultural assumptions about what is possible, what people will think possible, what is expected, social norms etc. that hold. It is perhaps these assumptions that, taken as a whole, best characterise the different “political mentalities” that seem to be common within each country.

Of course, there is rarely only one such set of cultural assumptions that exist in any country, but rather an “ecology” of different assumptions. For example, different classes, sexes, ethnic groups, religions etc. might share and pass on different sets of assumptions.

#### 4. Towards a Computational Cognitive Model

The basic cognitive model I am proposing should be somewhat clear from the above discussion. It combines elements that are already present in previous social simulation models. This style of model is not designed to be parsimonious but rather descriptive in style (Edmonds and Moss 2005), though if my arguments that beliefs concerning possibility are key to determining political action are right, it is difficult to see how a simpler model would suffice.

##### 4.1 CORE STRUCTURES

A working model of the simulation following the above suggestions is not available here, but rather a closer specification of what it would consist of. The framework is an ambitious one going beyond the current state of the art, however all its elements have been included within past simulations, so their combination in the way discussed below is entirely plausible, and I hope that future versions of this paper would include working examples.

The basic elements of this model are:

**BELIEFS.** The agent’s beliefs are encoded as a set of states of the world and transitions between them that the agents considers relevant and possible. This is represented as set of nodes and directed links between them. The nodes represent the possible world states and the links possible transitions between them. Transitions are labelled with the conditions for them occurring which will be typically a combination of events and actions that might occur by the agent or others. States might also be labelled to enable communication about these between agents. Actions or events occurring would trigger a change in the state of the world, which may or may not correspond with what an individual’s model of the world said would happen.

<sup>3</sup> Indeed (Elkins & Simeon, 1979) consider political culture as the set of assumptions held.

**CURRENT STATE OF THE WORLD.** One of the possible states will be the one that corresponds to the individual's perception of the current state of affairs. This perception might be misconceived or biased, for example when an individual thinks many more will come out in protest that actually occurs.

**FUNDAMENTAL INDICATORS.** As discussed under the goals subsection these are some kind of comparable indication of how desirable (or far from undesirable) states are from the point of view of the agent. They are associated with the states in the cognitive model. The simplest way to do this is via floating point numbers<sup>4</sup>. These might well be built into the agent and relate to its basic well being (e.g. lack of pain, status with peers, amount of money etc.)<sup>5</sup>. There might typically be more than one relevant dimension of such indicators<sup>6</sup>. Indicators will be updated from the world (i.e. an external change such as getting hungry) or due to a change in the world state.

**Environmental/scarce resource frustrations.** Each of these dimensions is associated with a threshold for each individual; such that if the indicator drops below this, redressing this particular becomes a priority for the agent. Thus an indicator dropping below its minimum can change the current goal of the agent to a state where this indicator is improved (e.g. if one gets hungry then eating becomes a goal unless there is another overriding objective). The values given to these indicators are not directly effectible by the agents themselves but only by changing state of the world via actions (e.g. eating).

**CURRENT GOALS.** Given the: current values of the indicators, the current state of the world, and what transitions are considered possible by the agent, the agent may determine which state of the world is their current goal (if any). This goal helps determine what actions will be taken. The situation is complicated because achieving many goals requires coordination with others (e.g. protesting together). The agent then tries to achieve this state via its actions, including negotiating with others for them to take appropriate contributing actions (or withholding from taking actions that might prevent the goal being achieved).

**ENVIRONMENT.** The agents are embedded into an environment that gives meaning to their perceptions of which world state they are in, and which may determine the values of their indicators. In most political situations the most important parts of this are the other actors and their actions – a wide range of other actors will impact upon the world states relevant for any individual, whether they know them or not. Additionally, there may be a real set of states of the world and transitions, upon which the perception of the agents is based – a "Ground Model" (e.g. whether it really is possible to build dykes that prevent floods under any weather conditions), but often there is no accessible ground model of truth. Some beliefs may simply be individual and others determined by the beliefs of others (e.g. whether most consider that they inhabit a democracy).

**ACTION PLANS.** Since in many political cases, in order to obtain many goals, immediate reactive actions and not sufficient but coordinated plans of action are necessary, plans of action with a degree of commitment may need to be remembered. However, these are subject to continual comparison against alternative plans and evaluated as to their likelihood of being completed.

<sup>4</sup> In general, it is only essential that enough of the states can be compared to determine which is better when faced with a choice. Not all pairs of states need to be comparable; indeed, for many possible pairs it may not be meaningful to compare them.

<sup>5</sup> For any particular modelling task, these dimensions will probably be fixed, but one kind of subtle political action involves the introduction of a new dimension, e.g. amount of freedom, which provides another dimension under which nodes can be judged. However, it is probably difficult for a third party to "create" effective minimum thresholds for another. Thus unless an agent comes to value the dimension a lot (e.g. it becomes part of their self-image which takes time) then this dimension might only be used to compare states if all other, more entrenched, indicators are at satisfactory (above threshold) values.

<sup>6</sup> It is not necessarily true that all states are associated with all indicators, so some states might be comparable using some indicators but not others. However, it is simpler to give a value for all indicators to all states. Another extension might be to add some uncertainty or fuzziness to these values.

Social Influencers. Some of the other actors will be influential upon an individual in terms of their beliefs. These may be personal social contacts, or people with power or status (such as leaders, TV presenters, etc.). The web of influence may be represented by a social network or just be implicit in the structure of the environment (e.g. neighbours). For example, social norms prevalent among these influencers may determine whether a particular goal is acceptable or what actions are permissible in the current situation (Conte, Andrighetto, Andrighetto, in press). It is probably sensible to distinguish friends from other influencers.

## 5. Basic Processes

The following computational processes will need to occur in either a cyclic, event-driven or a parallel fashion<sup>7</sup>.

**CURRENT STATE.** The agent needs to determine which state (that they believe in) the world is in (or they are in). This may be the result of external observation, but also might be based on which previous state they perceived was current, updated by the events and actions they believed to have occurred in the intervening period.

**BELIEF UPDATE/CREATION.** Beliefs may need to be continually updated/revise, created or discarded. This is primarily from two sources: (a) observation of the external world, including the traces left by others there and (b) as a result of communication from others. The former requires some inference and/or induction from what is observed. The later may be more direct in terms of statements of what is true and/or possible. However, it does not mean that belief acceptance is straightforward or “rational”<sup>8</sup>. One persuasive and possibly realistic scheme for belief acceptance/revision is Thagard’s theory of “explanatory coherence” (Thagard 1989), where beliefs are accepted or rejected according their total coherence with an actor’s existing beliefs<sup>9</sup>.

**INDICATOR UPDATE.** The current levels of each agent’s indicators need to be updated. Often this is concerning the ground model and the agent’s situation therein. However, indicators can be socially grounded so that their update depends on the states of other agents, e.g. reputation or status.

**GOAL SELECTION.** Given a agent’s situation, beliefs and indicators a goal needs to be selected in the form of deciding upon a state the agent will try and reach next. This has to be a state that the agent believes is accessible from the current state, even if this might involve events and/or actions by others that cannot be guaranteed (e.g. one only enters a lottery if there is a possibility, however remote, that one could win). If different goals are considered accessible then the selection of a goal state might involve weighing up the benefit (in terms of improved indicator values), risk (perceived probability of events and actions outside the agent’s control of occurring) and cost of actions. As mentioned above, attention might be restricted to indicators whose value has dropped below the minimum acceptable to the individual.

**ACTION NEGOTIATION.** The individual may enter a sequence of communications with other agents to see if they might collectively agree on a joint plan of action that is coherent with everyone’s goals. This is composed of an: exploratory series of offers, suggestion of joint plans, and their acceptance by necessary participants. See (Edmonds and Hales 2004) for details about how this works within the context of a

<sup>7</sup> The order these occur in can be important. Thus it may be that these have to effectively occur in parallel, with time represented at a fine enough grain so that the necessary sequences of decisions represented.

<sup>8</sup> That is, not necessarily rational in the sense of adhering to some normative scheme of rationality, e.g. economic rationality or Bayesian learning.

<sup>9</sup> In later work, Thagard extends this to include the coherence between goals and beliefs, so that beliefs that are in dissonance to one’s goals (e.g. travelling and climate change) might be dismissed regardless of their evidential base.

working simulation of such negotiation processes. This is especially important in this context since most political actions are in the context of cooperation or opposition where goals are socially co-dependent (Conte and Sichman 1995).

**ACTION CHOICE.** Given the assessment of the above, and action (or action plan) is executed.

**STATE UPDATE.** Given the actions of the agents (and possibly external factors) the state of any Ground Model needs to be updated.

## 6. Initialisation

Politics always has a history. This poses a problem for the simulator because they have to start their simulation at some particular point. There are basically two approaches to this: (1) running the simulation from some null or random state for some period of time until the effects of the initialisation seem to have disappeared (2) initialising the ground model, agents' beliefs etc. to represent some kind of specific situation<sup>10</sup>. Both have different disadvantages: approach (1) may result in artificial situations that have never been observed (and maybe would never be observed), approach (2) is onerous and might require a very details initialisation, for which one may only have partial data and thus requiring much guesswork.

If one has access to stakeholders or their accounts it might be possible to elicit their beliefs or extract some of these, as in (Hare et al. 2002a, Taylor 2003, Bharwani 2004) or by analysing the narrative texts as in (Urquhart 2012). One interesting possibility is that of eliciting such data by engaging participants in role-playing games (Hare et al. 2002b, Bharwani 2006).

## 7. Concluding Discussion

This kind of model can be seen as an answer to the critique of theoretical models of politics that were "too neat" in (March & Olsen 1984). In that they made a strong critique of theories that either were reductionist or "too efficient" in terms of functionally reaching desirable societal goals. In that paper they came against the barrier of how much complexity might be included in a political theory, however agent-based modelling breaks this limitation, allowing complex mixes of social, normative, institutional, individual and economic processes to be investigated together, without premature simplification. In this way individuals embedded within their societies (neither over- nor under-socialised) can be posited, explored and (ultimately) confronted with empirical data (Granovetter 1985).

### 7.1 THE USE OF THIS KIND OF MODEL

A simulation constructed using such a cognitive model will not be a predictive model in a probabilistic sense. That is, it will not estimate probabilities of sequences of events occurring. However, it would allow the mapping out of real possibilities, including those that would not have been considered otherwise. In this sense it is a possibilistic model. This can be a fruitful source of hypotheses for further empirical research<sup>11</sup>, or in the design of "early warning indicators" of developing socio-political processes (e.g. growing inter-community tension).

### 7.2 PROSPECTS FOR VALIDATION

Scenarios constructed from the outputs of such models can be presented to stakeholders and other domain experts as a test of their plausibility. Also one can form a list of kinds of situation that one would expect to be possible given certain initialisations (e.g. those derived from case studies) and then the

<sup>10</sup> One can also have a mixture of approach (1) for some aspects and (2) for others depending on what is practical and/or known.

<sup>11</sup> For a more detailed discussion of model types and purposes, see (Edmonds et al. 2013).

simulations inspected to check for their occurrence. However, this kind of model does have a distinct advantage in that not only the outcomes but also the process by which they develop within the simulation is suitable for inspection and critique. A particularly strong result is if unexpected outcomes emerge from a model and these turn out to be confirmed by domain stakeholders/experts that allows for a “cross-validation” of both micro- and macro- levels of a simulation (Moss and Edmonds 2005).

The fact that any such model can only be partially validated is not an obstacle for it being attempted, nor indeed for its utility. It is likely that good models of political processes will only emerge after many iterations of model building and empirical research. What is important is that the process is begun and that it is accessible to critique, re-implementation and improvement by other researchers as part of an open and long-term joint scientific effort (Edmonds 2010).

## 8. Further Development

I hope that the ECPAM'2013 conference will provide a chance to confront the computational structures I present with some of the known case studies and political theory and enable a more sophisticated model to emerge, one that is more rooted in evidence.

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