Populating an Online Consultation Tool

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Abstract. The paper addresses the extraction, formalisation, and presentation of public policy arguments. Arguments are extracted from documents that comment on public policy proposals. Formalising the information from the arguments enables the construction of models and systematic analysis of the arguments. In addition, the arguments are represented in a form suitable for presentation in an online consultation tool. Thus, the forms in the consultation correlate with the formalisation and can be evaluated accordingly. The stages of the process are outlined with reference to a working example.

Keywords. Argumentation Schemes, eParticipation, Practical Reasoning

1. Introduction

Current web technologies are fuelling an interest among citizens to participate in policy making as well as among governments to enable citizens to participate as input to decision making. Alongside the rapid growth of blogging and social networking sites, there has been a surge in policy making sites. For example, in the US, *RegulationRoom* is an academically hosted facility that provides guidelines for effectively commenting on proposed legislation.[2] The United Kingdom's Cabinet Office *Public Reading* website unfolds a proposed bill, allowing online readers to look at and comment on specific portions of legislation.[3] Whilst these initiatives support democratic participation, many issues arise about analysing, evaluating, and responding to the large quantity of data that is gathered. In this paper we describe an approach to address some of these issues by introducing formal structure. Arguments in natural language texts about policy proposals are manunally extracted and formalised with respect to a semantic model; along side the formal analysis, the arguments in natural language are presented on a survey website, the Structured Online Consultation Tool (SOCT), for gathering public opinions on the proposals. As the natural language arguments are associated with formal arguments, we can evaulate and automatically process them. The approach facilitates policy analysts in structuring their justifications of policy proposals and automatically evaluating opinions submitted to the tool.

For our purposes, we consider the following phases in sequence:

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[2] http://regulationroom.org/ Accessed August 26, 2011.
[3] http://publicreadingstage.cabinetoffice.gov.uk/ Accessed August 26, 2011.

- *Argument gathering*: Arguments about what to do on an issue are extracted from source documents.
- *Resolve problem formulation issues*: Issues concerning, for example, the facts and causal theories are resolved with respect to formal semantic model.
- *Argument selection*: To determine the government's proposal, evaluate the arguments for various policy proposals that are generated from the semantic model.
- *Issue survey and analyse results*: The policy proposal is presented to the public in an online survey.
- *Policy refinement*: Given the results of the survey, the model and the arguments can be revised, generating new arguments.

In this process, the formal semantic model provides a basis for organising, distinguishing, and reconciling the opinions from the original documents, for constructing initial arguments, and for evaluating these arguments. It disciplines the policy analysts' analysis of the source material by providing a structure into which the arguments from the source must be cast, thereby clarifying alternatives and drawing out implicit information. Furthermore, the model represents the range of arguments found in the source materials along with their systematic inter-relationships. The semantic model supports and makes transparent the policy analysts' evaluation of given arguments in light of the responses to the survey, which may endorse, oppose, or introduce further particular elements of the arguments. Finally, a formal model specifies a computer program that can generate arguments and their relationships, allowing in-depth representation and automated reasoning.

For developers, a key consideration in designing and building online tools for opinion gathering is the trade-off between the amount of structure provided by the tool and its ease of learning and use by the target audience. Since the target audience is the general public, the interactive system ought to be as straightforward to use as possible, for example as in e-petitions.[4] However, such simple polls yield an "all or nothing" response, making meaningful analysis of specific points of disagreement difficult. Other tools that structure argument can be complex [5] or without a semantics, e.g. Debatepedia[5].

We see a clear need for usable online survey tools that have an associated semantic foundation. In section 2, we outline the elements for the exercise, which is discussed in section 3 with a worked example. Section 4 concludes the paper.

2. Elements of Analysis

In this section, we outline the materials, argumentation scheme, and semantic structure. For source materials, we have responses to an EU Commission Green Paper consultation on "Copyright in the Knowledge Economy".[6] The responses constitute a corpus of 372 documents of varying point of view, length, and organisation. For this study, we analysed two contributions - Association of European Research Libraries and the UK Publishers Association.

In public policy discussions, participants recommend and justify what should be done. Argumentation schemes are stereotypical patterns of inference in which the

[4] http://epetitions.direct.gov.uk/ Accessed August 26, 2011.

[5] Debatepedia http://www.debatepedia.org Accessed August 26, 2011.

[6] http://ec.europa.eu/internal_market/copyright/docs/copyright-infso/greenpaper_en.pdf

premises give rise to the presumptive truth of a claim; the schemes are associated with characteristic critiques [6]. The argumentation scheme used in this paper is the practical reasoning argumentation scheme (PRAS) [1], wherein the proponent justifies an action:

> **PRAS**: In the current circumstances (R), action Ac should be performed, since this will bring about a new set of circumstances, the consequences (S), in which some goal (g) is realised. Goal g is desirable as it promotes a particular social value (v).

The scheme is associated with critiques, each of which indicates a way in which some other argument could attack the proposed argument such as challenges to the truth of a premise, a rebuttal to the conclusion, claims that the circumstances are atypical so the scheme cannot be used, the availability of other actions, and different rankings of values. Arguments from the source material ought to adhere to this scheme.

Given a set of arguments, we represent them in a computational model based on the Action-Based Alternating Transition System with Values (AATS+V); AATSs were introduced in [7], extended in [1] to AATS+V in order to represent social values, and used to support reasoning about alternative policy decisions [2]. Textual practical reasoning arguments are formalised in terms of AATS+V. See [2] for a full, formal specification and a range of examples, while here we give an informal presentation, where main elements of the structure are:

- *Q*, a set of *states*, where a state is a consistent conjunction of literals. Current circumstances S and consequences R in the PRAS are states.
- *Ag* is a set of *agents*, Ac_i is the set of *actions* available to a particular agent, ag_i, and *J* is the set of *joint actions*, assuming agents execute actions jointly.
- The *state transition function* defines the state that results from the execution of each joint action in a given state.
- A *goal* is a literal that holds after execution of a joint action, where the negation of the literal holds in a circumstance before execution.
- *V* is the set of *values* relevant to the scenario.
- The *valuation function* defines the status (promoted +, demoted -, or neutral =) that labels the transition between the two states.

3. Example

To carry out the exercise, two analysts worked on the source materials, moving from natural language text to instantiations of the PRAS which are associated with the elements of the AATS+V. The analysts - intern school students - were new to the materials, issues, and techniques; working with them allowed a 'proof of concept' of the analytic process. First, arguments were gathered, for example:

> ***Question 9. Should the law be clarified with respect to whether the scanning of works held in libraries for the purpose of making their content searchable on the Internet goes beyond the scope of current exceptions to copyright?***
> *Answer: Not all the material digitised by publishers is scanned with OCR (Optical Character Recognition) with the purpose of making the resulting content searchable. If the rights holders will not do this, libraries should be able to offer this service. It would have a transformative effect on research, learning and teaching by opening up a mass of content to users which can be searched using search engines. The interests of copyright holders will not be harmed, because the resulting output will act as marketing material for their materials.*

In the problem formulation and resolution phase, the passage was analysed in terms of the PRAS with reference to the AATS+V model. In practice, it appeared to be easiest to first identify a specific, proposed action, and then to identify relevant circumstances, consequences, and values. Statements which do not fit the paradigm, e.g. statements about a business model or counterpoints to other proposals, are not considered. The analysts made each instantiation of an argumentation scheme discrete and self-contained; for example, where two (or more) actions lead to the same consequences, analysts provided two instantiations of the scheme. To represent the knowledge of the passage and adhere to the formal semantic model, implications and assumptions are made explicit in the formal expression such as causal implications, relevant circumstances or consequences, values associated with agents' priorities and interests, or the introduction of agents, actions, and joint action. These can then be used in the survey. A sample of the analysis is:[7]

- *Current Circumstance (q_1)*
  - The law is unclear as to whether libraries are legally allowed to digitise and make Internet searchable those materials in their collections that the copyright holders do not digitise and make searchable. ($\neg$a)
  - No increased marketing for copyright holders' materials. ($\neg$b)
  - Not all material is digitised and made Internet searchable. ($\neg$c)
- *Joint Action (j_1) of Ac_i and Ac_j*
  - Legislators clarify the law so that libraries are able to digitise works they hold for the purpose of making content Internet searchable (Ac_i)
  - Libraries digitise the works they hold and make them Internet searchable (Ac_j)
- *Agents*
  - Legislators (ag_l)
  - Librarians (ag_j)
- *Consequences (q_2)*
  - The law is clarified, legally allowing libraries to digitise and make Internet searchable those materials in their collections that the copyright holders do not digitise and make searchable. (a)
  - Increased marketing for copyright holders' materials. (b)
  - All material is digitised and made Internet searchable. (c)
- *Goal*
  All material is digitised and made Internet searchable. (c)
- *Values Promoted*
  - Open access to research (v_s)
  - Balance interests of different parties (v_t)
- *Values Demoted*
  - None as the copyright holders' interests are helped by c.

Given instantiated arguments, we select an argument to feed into the SOCT for presentation online to the public [3], such as the argument above. While the SOCT is under development to serve the requirements of the AATS+V and to make use of a range of argumentation schemes, some of the intended interactive functionalities can be seen in *Parmenidies*, a prototype tool for creating and presenting policy consultations as web-based surveys. Using the tool, the user is presented with each element of the instantiated

[7] q_1 is a state; a, b, and c are propositional variables; Ac_i and Ac_j are agent's actions; ag_i and ag_j are agents; and v_s and v_t are values

PRAS and given the opportunity to agree, disagree, or supply additional information. The results are stored in a database. The results of the survey provide policy analysts with a database of fine-grained, structured judgements on the policy proposal. A full version of the survey along with other surveys is available.[8]

4. Conclusion

The SOCT closely relates to the phases of the process outlined in section 1. The arguments which are used to construct the survey are extracted from the source material and formalised in terms of the semantic model. Use of the model structures and homogenises the extraction method, facilitates the exposure of presumptions, and supports the generation of the logical space of arguments. However, the formal representation is only visible to the policy analyst; the users of the SOCT are presented only with statements and led through screens where they can reject particular elements of an argument or can introduce novel elements. In this way, explicit and presupposed information from the source is systematically examined. Given feedback, the policy analysts can identify critiques, modify the model, identify additional presumptions, and construct alternative arguments. Using the semantic model, analytic process, and the SOCT makes policy formulation and evaluation formal, systematic, transparent, and amenable to automated processing. In future work, we will richly populate the SOCT, expand the palette of and connections between argumentation schemes, and conduct a large-scale evaulation.

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