Preliminary investigation of a tool for collaborative auditing of public policy argumentation

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Abstract. The very early development stages of a collaborative argumentations system entitled Pacisco is described. At this point particular emphasis is on the interface and interaction design of the analytic functionality. Three examples of open-access collaborative argumentation systems currently available on the Web are examined briefly to provide a context for the development of a new system. The approach of Pacisco is differentiated from its predecessors as encouraging detailed comprehension and auditing of debate rather than establishing outright victory for one position. The argumentation schema employed is based on that described by Stephen Toulmin in 'The Uses of Argument' (1958), but modified to enable chains of reasoning to be captured. To provide a context for development of the prototype, four fundamental requirements are identified; integrate well with other web systems, allow only anonymous contribution, be intrinsically secure, be transparent. How these requirements should be represented in the design is indicated. The proposed development process is described briefly.

Introduction

Effective collaborative argumentation in the sphere of public policy debate is a tantalizing possibility offered by the World Wide Web as an enabler of vigorous participatory democracy. Effort is underway to bring this about, e.g. the work on a 'World Wide Argument Web' (Rahwana 2007).

The project described here with the working title 'Pacisco' is intended to explore human interaction and interface design issues in computer supported collaborative argument analysis; in particular making the auditing of public policy debates accessible to the untrained but interested user. The vision is for a web based forum in which detailed auditing of argument pro and contra public policy can be engaged with by all stakeholders (citizens, experts, government, lobby groups, etc.) on an equal footing. That is, to become informed as to the current status of any controversy and to intervene by posting their own arguments in support or opposition to established positions. Wikipedia is a good model for this endeavor.

The success of such a system hinges on the ability of untrained people to analyze and construct argument in a relatively formal way. An initial prototype has been constructed that will be evolved through trial with volunteer testers to identify and provide effective support (appropriate interface design, help text, tutorials and/or augmented grammar checking). This should demonstrate either that adequate performance is possible *or* give a strong indication that it is not. The bar for this challenge has been set by the experimentation of Adelman et al. Using a Toulmin based argumentation system with 22 users over a six week period produced mixed results on improving analysis and understanding of the Toulmin formalism, but strong indication of perceived difficulty in generation (Adelman et al. 2007).

There have been a number of attempts to create comparable systems on the web, currently exemplified by Debatabase (IDEA) hosting expert curated debates that anyone can contribute to in the manner of Wikipedia, and Riyarchy (Riyarchy Inc.), described as a collaborative argument tree to which anyone can contribute. Of the two, Debatabase appears to be the most active with a substantial number of live debates. Riyarchy on the other hand appears only to hold 'demonstration' debates. The company behind it has commercial aspirations for its sibling product, DebateWithMe (Riyarchy Inc.). We will examine here only their analytic functionality (i.e. the initiation of and contribution to debates) but not their evaluative functionality (i.e. establishing the relative merit of the arguments made). At this stage of Pacisco's development, consideration of its evaluative functionality is deferred until the plausibility of its analytic functionality has been demonstrated.

Both of these systems are largely text based, though using graphical layout devices to make argument structure apparent. In Debatabase arguments are initiated as debating motions ("This house would …"); a short paragraph of free text, heading up a list of subsidiary points at issue expressed as succinct single sentences. Each point at issue contains two bodies of unstructured text; the 'point' or 'counterpoint' that protagonists are invited to improve, subject to 'curation' by an expert.

In Riyarchy the starting point is a topic expressed as a title, e.g. "Same-Sex Marriage". This is followed by elements labeled 'pro' and 'anti' consisting of

titles followed by unstructured bodies of text ending with links to 'refutations', the whole thing organized as a hypertext tree.

These contrast markedly with the 'classic' collaborative argumentation approach of Issue-Based Information System (IBIS) (Werner and Rittel, 1970) currently exemplified on the web by bCisive (Critical Thinking Skills BV). Here a diagrammatic notation is used to capture relations between predefined types of information (e.g. situation, question, option, reason, objection, evidence, etc.). Additionally the intention of IBIS inspired systems is for synthesis; the combining of ideas to produce a successful outcome, while that of Debatabase and Ryarchy is analytical combat; the definitive defeat of alternatives leaving one position triumphant.

Pacisco aims for the middle ground, on two counts. Firstly the representation of argument is more finely structured than the combative examples but less so than the IBIS inspired. Secondly Pacisco does not attempt to settle an argument as a zero-sum game; that is for the mind of the hearer after engaging with the debate, and even then perhaps only when forced to make a decision (vote, etc.). Instead it intends to enable comprehension and auditing of debate, i.e. confirming that there are no obvious lacunae in the structure of the argument, e.g. unsubstantiated assertions, tautologies, errors of fact or logic, etc.

Pacisco

The argument structure employed in Pacisco is essentially that described by Stephen Toulmin (2003). It has been extended somewhat to allow chains of reasoning to be captured; essentially the Toulmin structure has been made recursive with each of the elements: grounds, warrant, backing and rebuttal, being treated as claims with their own potential supporting or rebutting arguments.

The Toulmin schema has been chosen as it appears to offer an intuitively understandable way of identifying the parts of an argument and their function. Originally developed from analysis of forensic argumentation it is essentially *practical*.

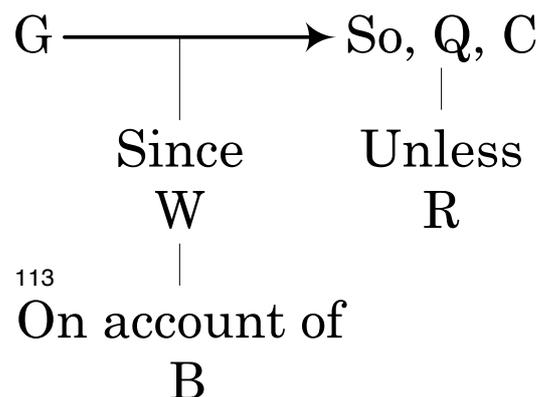Toulmin described his schema succinctly in the famous diagram (Fig. 1).

Fig. 1 Adapted from Toulmin (2003 p.97) 'G' replaces the original 'D' for datum.

Here 'G' is the grounds on which the claim 'C' is based, justified by warrant 'W' with backing 'B'. The warrant's strength of application to this case is qualification 'Q', with exceptions rebuttal 'R'.

In Pacisco the claim, grounds, warrant and qualifier are explicitly named. An additional entity is introduced: the case. This acts as a container for grounds and warrant and is assigned as intending to affirm or rebut its associated claim. Toulmin's backing and rebuttal are implicitly the recursive cases associated with the grounds and warrant claims.

A claim is required to be an atomic proposition; i.e., a statement capable of immediate interpretation as bearing a truth value. Atomic propositions are expressed as declarative sentences, as defined by Hodges (1977 p.19).

"… a grammatical English sentence which can be put in place of '*x*' in

   Is it true that *x*?

So as to yield a grammatical English question."

Grounds and warrants can be compound propositions, composed of atomic propositions joined by logical connectives (initially: negation, conjunction, disjunction, exclusive disjunction, implication and strict implication) together with a 'hypothetic' operator to indicate ambivalence as to the truth-value (both the necessity for, and naming of particular connectives will be part of the investigation).

Toulmin's 'backing' and 'rebuttal' elements are not explicitly represented in the Pacisco structure. Instead, all atomic propositions utilized in grounds and warrants are themselves regarded as claims to be supported or rebutted in their own arguments

As the argumentation structure is essentially recursive it requires termination. This is supplied by allowing cases associated with a claim to be declared 'self-evidently true', 'self-evidently false' or to contain a reference to an external resource by which data is introduced into the argument. The diagram in Fig. 2, utilizing elements of the UML static structure notation summarizes the structure.

Other liberties taken with the Toulmin model are that an argument can have multiple cases (grounds, warrant and qualifier tuples) and a case may have multiple warrant and qualifier combinations.

Fig. 3 From Friends of the Earth's UK website.

This extract may be rendered into the Pacisco structure as follows.

Argument 1:

    Claim: Nuclear power is a solution to climate change.

    Rebutting case 1.1:

      Grounds: NOT We need more nuclear reactors.

      Warrant: If something is not needed then it is not part of a solution.

      Qualifier: Always

    Rebutting case 1.2:

      Grounds: Nuclear energy is expensive.

      Warrant: The cost of a possible solution to a problem should be taken into account when judging its suitability.

      Qualifier: Usually

Argument 1 illustrates multiple *cases*. Depending on the evaluative function they may be thought of as being in a disjunctive relationship, the strength of the argument being that of the strongest case. Alternatively the naïve notion of a claim being strengthened by multiplicity of cases may be acknowledged.

The *grounds* of rebutting case 1.1 are expressed as a negated positive version of the source statement to facilitate similar *claims* being recognised and linked in subsequent *arguments*. With appropriate natural language processing capabilities this requirement could be relaxed.

The *warrants* in both cases 1.1 and 1.2, as is usually the case in informal argument, are not stated explicitly in the source. For Toulmin "… statements of warrants … are hypothetical, bridgelike statements." (Toulmin 2003, p. 98) Whilst the force of an argument depends on the strength of its warrant, it is surprising how tacit this aspect is in normal discourse and considerable cognitive effort is often required to explicate it. Doing so may make it controversial.

Argument 2:
    Claim: We need more nuclear reactors.
    Rebutting case 2.1:
        Grounds: The Government's own model shows we can keep the lights on without nuclear.
        AND The Government's own model shows we can tackle climate change without nuclear.
        Warrant: Government models are reliable. AND Governments should act consistently.
        Qualifier: Always

The claim of argument 2 has been generated from the grounds of case 1.1. The form of its grounds in turn, where the single source statement has been rendered as two distinct propositions in conjunction, has been chosen to make explicit the independence of the informally elided constituents. These become claims in subsequent arguments.
The controversial nature of the *expressed* warrant is immediately apparent.

Argument 3:
    Claim: If something is not needed then it is not part of a solution.
        Case: Self-evidently true

The claim of argument 3 is the warrant of case 1.1. It illustrates the terminating case. However it is still open for protagonists to further substantiate or rebut it.

Argument 4:
    Claim: Nuclear energy is expensive.
    Affirming case 4.1:
        …
    Affirming case 4.2:
        Grounds: There are hidden costs for storing toxic waste. OR There are hidden costs for closing down old power plants.
        Warrant: Where costs are hidden something may be much more expensive than it appears.
        Qualifier: Usually

The rendering of the grounds of case 4.2 might at first appear incorrect; in the source the two propositions are elided together with the word 'and'. However it is not being used in the source as a logical conjunction. The case becomes more robust if disjunction is used instead.
Clearly the task of casting argument into this form requires delicate judgment of the sort regularly employed by lawyers. The extent to which supportive design can assist in developing this in the lay population remains to be seen. However, for Pacisco absolute precision in drafting may not be necessary. Depending on the evaluation mechanism employed, better drafted argumentation may replace poorer as the branches of an argument evolve over time.

The initial prototype

To set an appropriate context for the prototype development a number of assumed requirements for a fully deployed version were made.

Pacisco should:

1.   integrate well with other web systems, e.g. social media

E.g. Twitter might be used to draw people into engagement with a particular argument.

2.   allow only anonymous contribution

To cut through polemic and rhetoric, and to encourage rigor. Protagonists may deliberately seek to strengthen cases that they actually oppose in order to make their rebuttal more comprehensive.

3.   be intrinsically secure

To encourage free speech, those posting supporting arguments that may carry social opprobrium or legal sanction (not necessarily in the hosting jurisdiction), must have their identity untraceable in the database.

4.   be transparent

To maintain confidence in fairness it must be demonstrable that no partisan manipulation of the software and data is possible; practically this means it must be open-source and this should apply to any incorporated components too.

Fig. 2 Structure of the Pacisco argument scheme
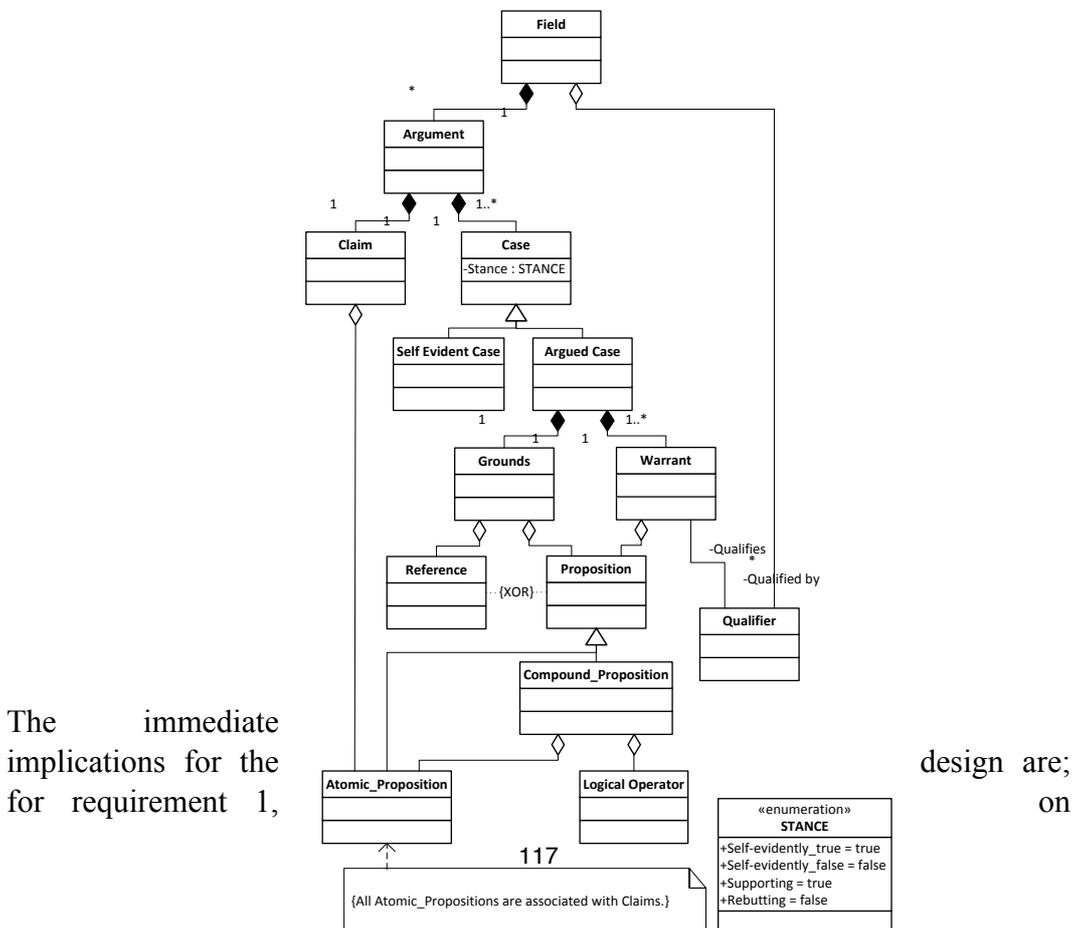
The immediate implications for the design are; for requirement 1, on

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{All Atomic_Propositions are associated with Claims.}

following a link to Pacisco, it should open a page displaying the argument specified in the URL encoded search string that is immediately comprehensible on first visit.

For requirement 2, registration to read content should certainly not be required. To edit content this may be problematic from a security (spamming) point of view. Also entering an argument may require a number of editing sessions before publishing. Maintaining the draft version on the client may be an appropriate option that accords also with requirement 3. There are further linked issues for implementation of the evaluation mechanism that will need addressing should the project proceed that far.

Requirement 4 mandates the use of standards based technology. The prototype has been produced using HTML, CSS, JavaScript and jQuery (jQuery Foundation) in the client and an open-source implementation of XQuery (W3C) on the server. Its supporting manual/help-text has been created in WordPress (WordPress Foundation).

Future work

In its initial instantiation the prototype exposes the argumentation structure directly, the individual components being labeled as; argument, claim case, grounds, warrant, and qualifier. It may well be that a more subtle approach utilizing a template of linking phrases in place of bald labels is appropriate.

It is intended also to experiment with enhanced grammar checking, feeding back to the user the appropriateness of the propositions entered; detecting deixis, inappropriate anaphora, negation, unacknowledged compound propositions, etc. The open source grammar checker After the Deadline (Automattic Inc.) is a candidate to support this experimentation.

Collaborators will be sought to assist with testing, design and implementation, pending initial demonstration of the effectiveness of the approach.

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