Argument schemes and visualization software for critical thinking about international politics

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Abstract. Critical thinking about international politics often involves reasoning about the beliefs, goals, appraisals, actions, and plans of actors such as countries, governments, politicians, etc. We analyzed arguments in interpretive reports about international politics, in order to develop a prototype argument diagramming tool for this domain, AVIZE (Argument Visualization and Evaluation). The purpose of AVIZE is to aid users in the construction and self-evaluation of real-world arguments in the domain of international politics. AVIZE provides a set of argument schemes as cognitive building blocks for constructing argument diagrams. Most of the schemes are related to concepts from the field of automated plan recognition in artificial intelligence. While some currently available argument diagramming tools provide schemes, they are not tailored to the domain of international politics. This paper describes the argument schemes for this domain and the design of the argument diagramming tool.

Keywords: Argumentation schemes, argument mapping tools, argument visualization tools, educational argument modeling systems, AI planning and plan inference

1. Introduction

Critical thinking about international politics often involves reasoning about the beliefs, goals, appraisals, actions, and plans of actors such as countries, governments, politicians, etc. We analyzed arguments in interpretive reports about international politics, in order to develop a prototype argument diagramming tool for this domain, AVIZE (Argument Visualization and Evaluation). The tool is designed for creating arguments based upon evidence of varying plausibility collected from sources of varying reliability. In the era of "fake news", such a tool could be of use in on-line environments for citizen engagement [4] and in educational settings [12,13]. In addition, it could be useful to an analyst of international affairs as new information is learned that changes the acceptability of a previously created argument. AVIZE provides a set of presumptive argument schemes [19] as cognitive building blocks for constructing argument diagrams. While some currently available tools provide argument(ation) schemes, e.g., subsets of the ones listed in [19], they are not tailored to the domain of international politics. Finally, AVIZE helps the user to evaluate his arguments by enabling him to visualize arguments and counterarguments for a position. This paper describes the argument schemes[1] we defined for this domain and the design of AVIZE.

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[1]A preliminary analysis of some of the argument schemes was presented in [7].

2. Argument schemes

This section describes the argument schemes included with the AVIZE tool,[2] which are based primarily upon our manual analysis of arguments in an article on the Russian government's strategy for increasing Russia's global influence [20]. Analysis of arguments in the 33-paragraph article revealed fifteen instances of eight schemes, illustrated in Table 1. Analysis of several other articles, including one on alleged Russian interference in the 2016 U.S. presidential election [1], revealed instances of three additional schemes that are included in AVIZE's scheme set. Note that Table 1 does not show the discourse structure of text segments in that article as might be represented in a theory of discourse coherence such as Rhetorical Structure Theory (RST) [10]. To reconstruct the arguments it was necessary to go deeper than the surface text level; it was necessary to consider the intended meaning of the text, to disregard presentation order, to identify implicit premises and conclusions, and to ignore or abstract over some text segments. The goal of our analysis was not to develop a document annotation system for use in machine learning experiments on argument mining as in, e.g., [11,16]. (The design of annotation systems for machine learning is much more highly constrained than necessary for our goals.) The current schemes may be refined after experience in use of AVIZE, and it is likely that additional schemes will be added over time. (For more information on the intended use of AVIZE, see the next section.)

The argument schemes are described in Tables 2 and 3. Examples of certain schemes (i.e., those that were not illustrated in Table 1) are from [1]. The schemes in Table 2 involve making sense of an Actor's observed actions, while those in Table 3 are for planning the Protagonist's actions. Since many of the schemes refer to adversarial situations, Protagonist and Actor are used to distinguish participants, e.g., the U.S. and Russia, respectively. For the sake of clarity to AVIZE's users, the descriptions of schemes are phrased as simply as possible, i.e., avoiding awkward (but more precise) locutions such as 'did/does/will do' and 'Act or Acts'. For similar reasons, *Inferred Positive/Negative Appraisal* is described as two schemes, despite their analogous descriptions. Another problem when providing descriptions of schemes is deciding how to divide information among the premises. For example, the three premises (1) *Actor has Goal*, (2) *Actor does Acts* and (3) *The Acts are consistent with Goal*, could be combined into one or two premises in the description of the *Plan Inference* scheme. If the granularity were too fine, users might find it laborious to construct an argument; if it were too coarse, a user who wished to dispute part of a premise would have no way of explicitly showing which part is in dispute.

AVIZE provides a list of critical questions, shown in Table 4, for each scheme listed in Tables 2 and 3. The critical questions can be posed to challenge arguments created from a scheme. In addition to the questions in Table 4 every scheme includes two critical questions: *How reliable is the source of each premise? How likely is each premise?* Unlike the schemes, the critical questions were derived primarily by introspection and consideration of critical questions listed in [19] and [3]. Note that most of the critical questions for the schemes described in Table 2 require the Protagonist to infer the Actor's state of mind, i.e., goals, beliefs about the effects of acts, motivations, preferences, and assessment of benefit-to-cost. (Here the term 'benefit-to-cost' is used to suggest any kind of assessment of the consequences of actions, including the degree to which the action promotes or demotes some value [2].)

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[2]The software is designed so that any argument schemes in appropriate XML-format can be used by the tool.

Table 1

Analysis of arguments used in [20]

Argument scheme (paragraph)	Conclusion	Premises (*with text excerpts for illustration*)
1 Plan Distraction (para 1)	R does not want US to oppose R actions in Europe, Mid E & Asia	R has used actions in Syria to divert attention from R's actions in Europe, Mid E & Asia (*... Putin has kept international attention riveted on Russian operations in Syria while escalating military deployments and political operations across Europe, the Middle East, and Asia.*)
2 Coercion (to not do) (para 1)	R is trying to coerce US to not oppose R actions in Europe, Mid E & Asia	R has threatened US if US opposes R (see CQ 2.1) (*Putin's global strategy relies on creating the impression that a U.S. challenge to Russian expansion would be met with a conventional military or even nuclear Russian response.*)
2.1 Critical Question (para 2–3)	Is threat over?	R has continued to act to compel US to accept R actions (*Putin has not changed his approach ... He has instead continued to make forward military deployments and used increasingly aggressive rhetoric ...*)
3 Resist Coercion (para 1–3)	US should (resist R coercion to not) oppose R actions in Europe, Mid E & Asia	If US does not resist, it will have negative consequences (*Putin will be able to diminish U.S. influence globally ... if the outgoing and incoming administrations do not resist him.*) R does not want US to oppose R actions in Europe, Mid E & Asia (see argument 1) R is trying to coerce US to not oppose R actions in Europe, Mid E & Asia (see argument 2) R is incapable of carrying out threats (see para 14–20)
4 Plan Deception (para 4–5)	R does not want US to oppose R expanding military influence in Mid E	R's alleged goal is to fight terrorists in Syria (*Putin has used Russian military operations in Syria as cover to deploy ... units into the Middle East*) R's actions are inconsistent with alleged goal (*These advanced anti-aircraft and anti-ship systems can only be directed against American forces*) R's actions are consistent with goal of constraining US military ops in Mid E (*Constraining American activities is the primary purpose for most of these deployments*)
5 Inferred Plan (para 6)	R has plan to expand R military influence in Europe	R has increased R deployments in Baltic (*Putin has also increased the intensity and tempo of military deployments in the Baltic region, ...*) The deployments are consistent with increased R military influence in Europe (*... signaling his intention to continue challenging the U.S. and its NATO allies in Europe*)
6 Coercion (to not do) (para 7)	R is trying to coerce US to not oppose R military expansion in Europe	R has threatened a tactical or nuclear strike in Europe if US opposes R military expansion in Europe (*deployment of the Iskander system ... demonstrates Russia's ability to conduct a ... nuclear strike in Europe ... Putin hopes to intimidate or coerce the U.S. into ceding influence in Eastern Europe ...*)

Table 1

(Continued)

Argument	Conclusion	Premises
7 Increasing Boldness (para 8)	R has plan to expand R military influence in Asia	R deployments in Mid E and Europe have not been opposed (*Putin is watching how the U.S. and its allies react to deployments in the Middle East and Europe . . .*) R wants to increase R military presence in Asia (*. . . in order to gauge his ability to increase the Russian military presence in Asia*) R is capable of increasing R military presence in Asia (*The Russian Ministry of Defense announced in May that will build new military infrastructure there . . .*)
8 Coercion (para 9)	R is trying to coerce US to not challenge R global military expansion in Asia	R has coupled deployments in Asia with threats (*Putin has coupled these deployments with nuclear rhetoric and signaling in order to coerce the West to acquiesce to or even partner with Russia.*)
9 Inferred Plan (para 10–12)	R has plan to undermine US influence and support	R partners with countries that oppose US (*. . . Putin aims to split the solidarity of U.S. allies while empowering countries that oppose U.S. interests in an effort to reduce support for U.S. operations globally.*)
10 Inferred Plan (para 13)	R has plan to reduce NATO influence in Europe	R wants to reduce NATO influence in Europe (*Putin aims to reduce . . . NATO influence in Europe . . .*) R has supported anti-EU and pro-R political parties in Europe (*. . . by continuing to support anti-European Union and pro-Russian political parties in European governments.*) R's actions are consistent with reducing NATO influence in Europe (*. . . in order to reduce . . . cooperation with the U.S. and potentially create resistance to future NATO activity.*)
11 Resist Coercion (para 14–20)	US should (resist R coercion to not) oppose R global military expansion	R is trying to coerce the US into not opposing R global military expansion via the threat of war (*Putin has expanded Russia's military capabilities... by pairing the deployment of Russian military forces with aggressive rhetoric to preclude a U.S. response.*) R is not capable or willing to carry out the threat (*Russia is neither able to win nor interested in fighting a full-scale war.*) If the US does not resist then US national interests will be harmed (*Putin aims to leverage these positions to force the U.S. and its partners to form a pragmatic partnership with Russia at the expense of key U.S. national interests rather than risk a military confrontation.*)

Table 1

(Continued)

Argument	Conclusion	Premises
12 Practical Reasoning (para 21–24)	US should use sanctions and deterrence to prevent R military expansion	Sanctions and deterrence can prevent R military expansion (*Russia's failing economy will further aggravate ongoing problems with Russia's military ... Putin's increased pressure on EU countries and the U.S. to lift sanctions reflects the effect that sustained economic pressure can have on preventing Russian military expansion ... It is [not] ... beyond U.S. capability to address [Russian nuclear threats] through its own deterrence efforts ...*)
13 Avoid Negative Consequences (para 25–26)	US should maintain NATO alliance	If US does not maintain NATO alliance it will destabilize Europe and have serious consequences for US military (*If Putin manages to destabilize Europe by undermining the credibility of NATO, it will have serious symbolic and material consequences for the U.S. military.*)
14 Avoid Negative Consequences (para 27–28)	US should oppose R global expansion	Other countries, e.g. China and Iran, will be more aggressive in challenging US otherwise (*Other world powers will take note of how the new administration responds to Putin when considering their own capacity for disrupting U.S. operations and influence ... It is likely that China and Iran will be more aggressive in challenging the U.S. if the new administration allows Putin to use similar deployments to force policy concessions.*)
15 Practical Reasoning (para 29–33)	US should support NATO and European allies, signal US opposition, and impose economic sanctions to protect its interests	These actions will deter R global expansion (*Commitment to the protection of U.S. allies in Europe is the lynchpin of deterring Russia's global expansion ... The U.S. and its allies have an opportunity to deter Putin from further expansion in the Middle East and Asia through ... signaling ... The U.S. also has non-military options at its disposal. Economic sanctions.. provide a real incentive for Putin to restrain military action ...*)

3. AVIZE design

The purpose of AVIZE is to aid users (e.g. college students or analysts preparing interpretive reports) in the construction and self-evaluation of real-world arguments in the domain of international politics. Unlike tools developed for text processing research, AVIZE is not designed for use as a corpus annotation tool. Unlike many educational argument modeling systems, AVIZE is not designed for helping users to analyze and visualize arguments in existing documents. AVIZE is designed to support critical thinking by a process in which users must evaluate evidence from a variety of sources such as print or broadcast news organizations; construct arguments in their own words; and consider potential challenges to their argument and defend their argument against those challenges.

The interaction design goals are to allow users to employ AVIZE with little or no training, to efficiently assemble argument diagrams using argument schemes for this domain, and to easily spot strengths and weaknesses of their arguments through visual means. The tasks that AVIZE is designed to support are shown in detail in Fig. 1. Note that the tasks need not be performed in the order shown and some are optional.

Table 2

Plan inference schemes

Scheme: Plan Distraction

Premises:

1. Actor does Acts to divert Protagonist's attention from Other Acts.
2. Actor believes that Protagonist would oppose Other Acts, if not distracted.

Conclusion: Actor does not want Protagonist to oppose Other Acts.

Scheme: Plan Deception

Premises:

1. Actor claims that Acts are for Alleged Goal.
2. Acts are inconsistent with Alleged Goal.
3. Acts are consistent with Actual Goal.
4. Actor believes that Protagonist is likely to oppose Acts, if Protagonist knew of the Actual Goal.

Conclusion: Actor does not want Protagonist to oppose Acts.

Scheme: Inferred Plan

Premises:

1. Actor has Goal.
2. Actor does Acts.
3. Acts are consistent with that Goal.

Conclusion: Actor's plan is to do Acts to bring about Goal.

Scheme: Coercion (to not Do)

Premises:

1. Actor has threatened Protagonist with Consequences if Protagonist does Acts.
2. Actor believes Protagonist would prefer result of not doing Acts to Consequences.

Conclusion: Actor is trying to coerce Protagonist into not doing Acts.

Scheme: Increasing Boldness

Premises:

1. Actor has done Acts, which were not opposed by Protagonist.
2. Actor believes Protagonist will not oppose Similar Acts.
3. Actor wants to do Similar Acts.
4. Actor has resources to do Similar Acts.

Conclusion: Actor's plan is to do Similar Acts.

Scheme: Behavior Pattern

Premises:

1. Actor has done Past Acts to achieve Past Goals.
2. Actor wants to do Acts similar to Past Acts to achieve Goals similar to Past Goals.
3. Actor has resources to do Acts.

Conclusion: Actor's plan is to do Acts to bring about Goals

Example [1]:

Premises:

1. Russia has interfered with elections in other countries.
2. Russia wants to interfere with U.S. elections, for similar reasons.
3. Russia has resources to interfere with U.S. elections.

Conclusion: Russia's plan is to interfere with U.S. elections

Table 2

(Continued)

Scheme: Inferred Positive Appraisal
Premises:
1.   In Actor's view, doing Acts has likelihood of Positive Consequences.
Conclusion: Actor does Acts, in order to achieve Positive Consequences.
Example [1]:
Premises:
1.   Russia believed that if the candidate were helped to be elected, it would be good for Russia.
Conclusion: Russia did things in order to help the candidate to win the election.
Scheme: Inferred Negative Appraisal
Premises:
1.   In Actor's view, doing Acts has likelihood of Negative Consequences.
Conclusion: Actor does not do Acts, in order to avoid Negative Consequences.
Example [1]:
Premises:
1.   Russia believed that publically praising the candidate would backfire (not help the candidate win the election).
Conclusion: Russia did not publically praise the candidate, in order to avoid it backfiring.

Table 3

Planning schemes

Scheme: Practical Reasoning
Premises:
1.   Protagonist has Goal.
2.   Protagonist can do Acts as a way to achieve Goal.
Conclusion: Protagonist should do Acts.
Scheme: Resist Coercion (to Not Do)
Premises:
1.   Actor is trying to coerce Protagonist into not doing Acts via Threats.
2.   Actor is incapable of executing Threats.
3.   If Protagonist does not do Acts it will have Negative Consequences to Protagonist.
Conclusion: Protagonist should do Acts.
Scheme: Avoid Negative Consequences (of Not Doing)
Premises:
1.   Protagonist not doing Acts is likely to have Negative Consequences.
Conclusion: Protagonist should do Acts

AVIZE was designed for a desktop computer-sized display area and to provide a drag-and-drop style of interaction. As shown in Fig. 2, data items and (collapsible) metadata are presented in a (collapsible) panel on the left side of the screen.[3] Collapsible argument scheme descriptions[4] (each which, when opened, includes premises, conclusion, critical questions, and an example) are presented in a (collapsi-

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[3] It is assumed that textual data items (with metadata) to be used as possible evidence were previously manually or automatically collected and placed into an XML-formatted file which AVIZE can then display in the panel on the left side of the screen. The user can select files of collected data to be displayed while AVIZE is running.

[4] Any set of argument schemes in appropriate XML format can be included by recompiling AVIZE.

Table 4

Critical questions

Plan Distraction	1. In Actor's view, is benefit-to-cost ratio high enough to justify Acts?
	2. In Actor's view, is benefit-to-cost ratio high enough to justify Other Acts?
Plan Deception	1. In Actor's view, is benefit-to-cost ratio high enough to justify Acts for Actual Goal?
	2. Is it possible that Actor does not realize that effects of Acts are inconsistent with Alleged Goal?
	3. Is Actual Goal consistent with other known goals of Actor?
Inferred Plan	1. In Actor's view, is benefit-to-cost ratio high enough to justify Acts?
	2. In Actor's view, is there a preferable alternative plan for achieving Goal?
	3. In Actor's view, is there some other motivation for Acts?
	4. Could the Actor's plan have changed since doing Acts?
Coercion	1. In Actor's view, is benefit-to-cost ratio of threats high enough?
	2. Has the threat been withdrawn?
Increasing Boldness	1. In Actor's view, is benefit-to-cost ratio high enough to justify Acts for Goals?
Behavior Pattern	1. In Actor's view, is benefit-to-cost ratio high enough to justify Acts for Goals?
	2. In Actor's view, is there a preferable alternative plan for achieving Goal?
Inferred Positive Appraisal	1. In Actor's view, is benefit-to-cost ratio high enough to justify doing Acts for Positive Consequences?
Inferred Negative Appraisal	1. In Actor's view, is benefit-to-cost ratio high enough to justify not doing Acts for avoiding Negative Consequences?
Practical Reasoning	1. Is benefit-to-cost ratio high enough to justify Acts for Goal?
	2. Is there a preferable alternative plan for achieving Goal?
Resist Coercion	1. Is benefit of resisting compared to cost of not resisting high enough?
Avoid Negative Consequences	1. Is benefit of not doing Acts compared to cost of not doing Acts high enough?
	2. Is there a better way of avoiding the Negative Consequences?

ble) panel on the right side. The center area is used for constructing arguments. In Fig. 2, by dragging data items from the left panel to the center panel, the user has created a clump of evidence which contains conflicting data items on the theme of a possible Martian invasion of Earth. According to one source, hikers found a Martian space ship in the Nevada desert; however, according to two other sources the alleged spaceship debris can be explained away. Nevertheless, the user decides to create a proposition (by typing into an empty "proposition box" in the argument workspace) that *Martians have landed on Earth* and attaches it to the evidence clump. In this way, all evidence considered (both supporting and opposing) is available for examination.

Suppose that next the user hypothesizes that the Martian landing is part of a Martian plan to take over Earth, and so he creates a new "proposition box" in the argument workspace stating that *Martians have invaded Earth as part of a plan to take over Earth*. In order to build an argument for this thesis, he drags the *Inferred Plan* argument scheme from the right panel (as shown in Fig. 2) onto the argument workspace, causing AVIZE to automatically create a box-and-arrow-style template to contain an instance of that scheme. Then the user drags his thesis proposition onto the conclusion of the template, and the evidence-based proposition that *Martians have landed on Earth* onto the *Actor does Acts* premise of the template. Now he must fill the remaining two premises, the *Actor has Goal* premise and the *Acts are*

- **Select and interpret evidence**

  o Organize textual data items into evidence clumps by dragging into argument workspace in center of screen

    - Previously collected textual data items appear in left panel of screen
    - Each textual data item has associated metadata (source, date, genre, reliability of source, likelihood, comments)
    - Different textual data items (from different sources) in a clump may be weaker or stronger than – or even conflicting with – other items in same clump

  o Create an evidence-based proposition summarizing user's current supposition based on the evidence
  o Attach evidence clump to evidence-based proposition
  o (optional) Add assessment of likelihood and/or comment to proposition

- **Build argument**

  o Create a thesis proposition
  o Select an argument scheme from right panel

    - Argument scheme description appears in list format when opened in right panel
    - Argument scheme appears as box-and-arrow template when dragged to argument workspace

  o Drag thesis proposition onto conclusion of argument template
  o Drag other user-created propositions onto premises of argument template
  o If any premise of template remains unfilled, attempt to fill by

    - Creating an evidence-based proposition (as described above), or
    - Dragging conclusion of another argument in workspace onto premise of template

- **Combine arguments**

  o Attach arguments agreeing or conflicting with premise or conclusion
  o Add arguments (or propositions) responding to critical question of argument scheme
  o (optional) Add assessment of likelihood and/or comment to any node in diagram

- **Evaluate arguments**

  o Consider inter-argument relationships (supporting/opposing/answering critical questions)
  o Consider likelihood assessments of arguments and comments

Fig. 1. Task analysis for AVIZE.

consistent with that Goal premise. He enters the proposition that *Martians want to exploit Earth* into the Goal premise. Then he attaches two conflicting pieces of evidence from the left panel to it: (1) *Martian leaders told their fleet that they want to take Earth's coal and iron and use Earthling's to mine it* (which, according to the metadata, was from an intercepted communication), and (2) *We come in peace* (which, according to the metadata, was broadcast to Earth by the Martians). Although the evidence is conflicting,
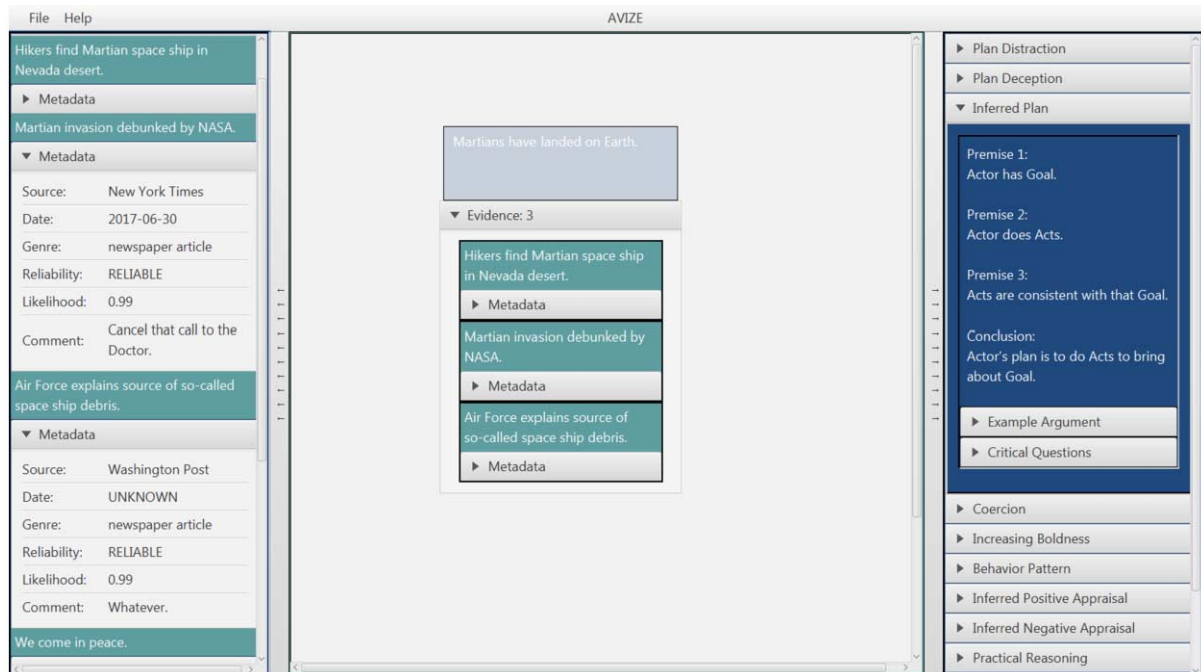
Fig. 2. AVIZE screen after user selects several pieces of data as evidence for/against a possible Martian landing on Earth.

he has decided to credit the first data item over the second one. Lastly, he fills the consistency premise of the template in a similar manner after seeing the data item that *Martians took over Earthlike planet Threa in another galaxy in order to enslave its population and exploit its resources*. The final argument is shown in Fig. 3.

Using drag-and-drop operations, a user can combine arguments to create a network of supporting and opposing arguments, as shown in Fig. 4. Arguments may be "chained", i.e., the conclusion of one argument can serve as the premise of another argument. Multiple arguments for the same conclusion can be linked together. Critical questions can be invoked from a menu by clicking on an argument scheme name in the diagram. Premises and conclusions may be challenged by counter-arguments. Note that counter-arguments and critical questions are linked to other arguments via different icons (a shield and question mark, respectively). In this diagram, the evidence (and its metadata) has been collapsed. However the number of pieces of evidence for the lowest level premises is still shown. Lastly, a user can attach a numeric assessment of likelihood and/or a comment to any node, and can toggle the display of these. In addition to the numeric display, likelihood is automatically depicted by color on a scale from red (0.0) to blue (1.0). In Fig. 4, the user has assessed that the premises of his argument are highly to moderately likely (0.9, 0.5, 0.8) and that a possible counterargument has a low probability (0.3). Also, his argument has been weakened by the answer to a critical question.

4. Related work

Many computerized argument diagramming or mapping tools have been developed, e.g., Compendium [19], Rationale [14,17], Online Visualization of Argument (OVA) [15], and LASAD [9]. Unlike these,
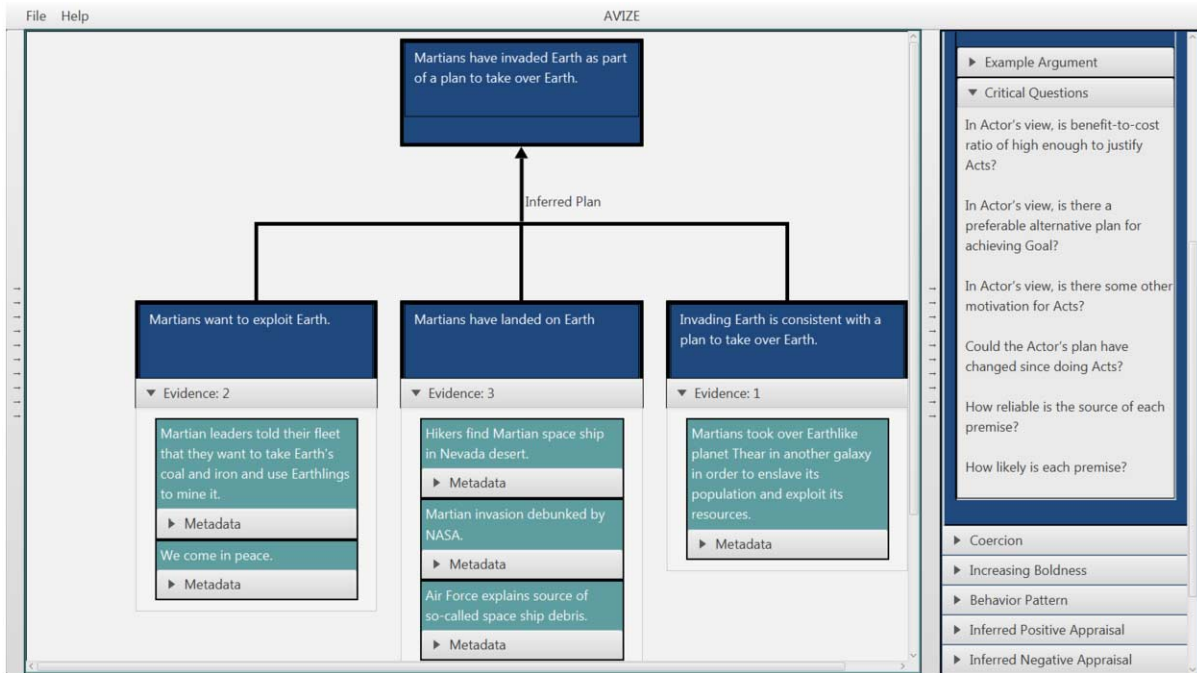
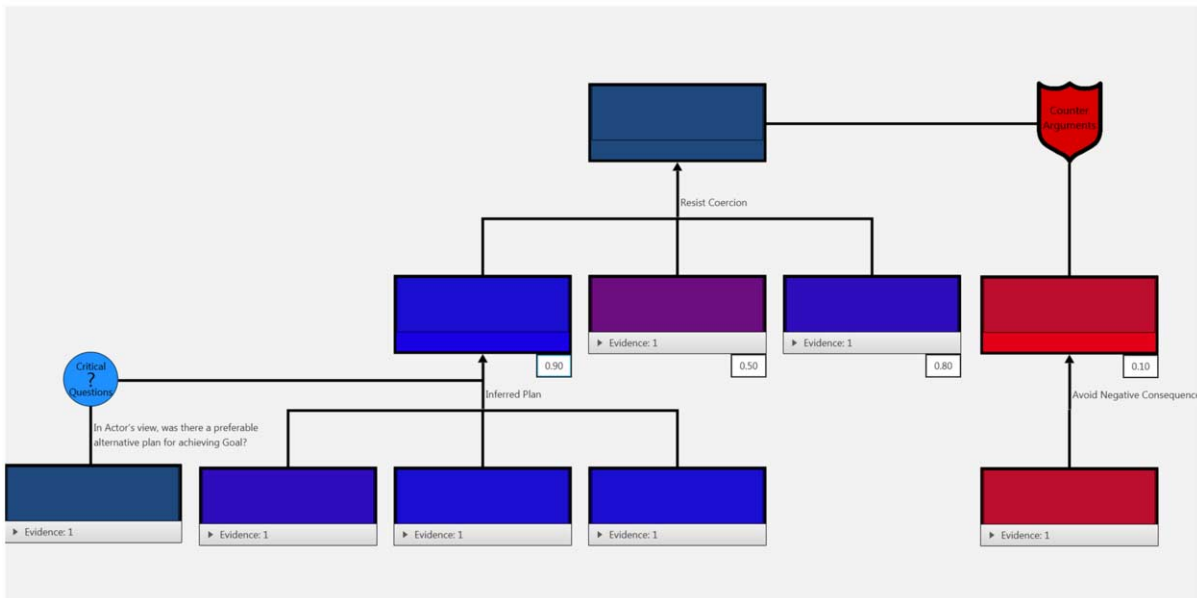Fig. 3. AVIZE screen showing argument about Martian plan to invade Earth.

Fig. 4. AVIZE screen illustrating network of supporting and opposing arguments.

AVIZE was not designed for use as a corpus annotation tool or to help users to analyze and visualize arguments in existing documents. AVIZE is designed for helping users to construct and challenge their own arguments based upon evidence of varying plausibility from sources of varying reliability. Another key difference is that AVIZE provides presumptive argument schemes (with critical questions) tailored to the domain of international politics.

Most of the argument schemes of interest in this paper are closely related to the field of automated recognition of an agent's plan in artificial intelligence and natural language processing [5]. The earliest work in that field used heuristic rules describing the relationships among an actor's beliefs, goals and actions to infer his plans. Due to its computational complexity that approach to plan recognition has been supplanted with probabilistic approaches. However, the heuristic rules for plan recognition resemble aspects of the argument schemes we have identified in Table 2. Furthermore, a Behavior Pattern argument could be described as inferring plans created by cased-based-reasoning, i.e., by adapting old plans [8]. Some modern AI planning systems incorporate appraisal theory into planning, e.g. [6]. Incorporating that perspective, an Increasing Boldness argument involves not only reasoning about an actor's plan, but also the actor's beliefs about the protagonist's response to the plan; and Inferred Positive/Negative Appraisal involve reasoning about an actor's appraisal of the effects of certain acts.

Table 3 presented schemes for arguing about what the Protagonist should do, i.e., sharing the perspective of automated planning in AI. Two of the schemes, Practical Reasoning and Avoid Negative Consequences (of Not Doing), are similar to Practical Reasoning and Argument from Negative Consequences, respectively, e.g. as described in [19]. Our Coercion scheme (in Table 2) is related to Argument from Threat [18]; its counterpart, Resist Coercion (Table 3), is a more specific version of Avoid Negative Consequences. Bex et al. [3] present a unified scheme for practical reasoning, which can be used either for practical reasoning (planning) or abductive reasoning (plan inference).

5. Conclusion and future work

We have described the argument schemes and design of AVIZE, a tool for constructing arguments, represented as diagrams, in the domain of international politics. The set of argument schemes was identified by analysis of arguments in representative documents and descriptions of the schemes are tailored to this domain. A prototype version of AVIZE has been implemented as a Java application and has been released as open-source software.[5] Note that any sets of data and argument schemes, in appropriately XML-formatted files, can be accessed by AVIZE. Thus, the tool itself is not limited to use in this domain. No formal evaluation of AVIZE has been performed yet. In future work, we would like evaluate the effectiveness of AVIZE in educational settings. Also, future versions may add support for collaboration and debate among multiple users.

Acknowledgements

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