Aristotelian Dialectic and Formal Dialogue Systems for Argumentation

Douglas Walton CRRAR
University of Windsor
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Hamblin-style Rules

• Krabbe (2013, 76-77) models the core structure of the Aristotelian dialectical game using Hamblin-style rules (Hamblin, 1970, 1971) of the kind used in (Walton and Krabbe, 1995) to model dialogues.

• There are locution rules, defining the speech acts that can be used at each move, structural rules that define the order of turn taking and what speech acts are acceptable as responses, commitment rules that define which propositions go into each arguer’s commitment sets at each move made, and rules for winning and losing, defining what sequences of moves by each party count as winning or losing the game.
## Names of Some Standard Argumentation Schemes

<table>
<thead>
<tr>
<th>Argument from Witness Testimony</th>
<th>Argument from a Verbal Classification</th>
<th>Argument from Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argument from Expert Opinion</td>
<td>Argument from Appearances (Perception)</td>
<td>Argument from Threat</td>
</tr>
<tr>
<td>Argument from Analogy</td>
<td>Argument from Positive Consequences</td>
<td>Argument from Generally Accepted Opinion</td>
</tr>
<tr>
<td>Argument from Precedent</td>
<td>Argument from Negative Consequences</td>
<td>Direct <em>Ad Hominem</em> Argument (Personal Attack)</td>
</tr>
<tr>
<td>Practical Reasoning (Goal-based Reasoning) to Action</td>
<td>Circumstantial <em>Ad Hominem</em> Argument</td>
<td>Argument from Correlation to Cause</td>
</tr>
<tr>
<td>Argument from Evidence to a Hypothesis</td>
<td>Abductive Reasoning (IBE)</td>
<td>Argument from Commitment</td>
</tr>
<tr>
<td>Argument from Ignorance (Negative Evidence)</td>
<td>Argument from Sunk Costs</td>
<td>Slippery Slope Argument</td>
</tr>
</tbody>
</table>
Outline

• It is shown how the standard dialogue typology used in current argumentation studies fits even better than one might have thought with Aristotle’s structure of dialectical argument.

• Starting from the finding that Aristotelian dialectic can be minimally modeled as a core formal dialogue structure (Krabbe, 2013), the paper goes on to show that it can be even more fully captured by a set of ten features surrounding the core.

• These findings bring out some new aspects of how Aristotelian dialectic fits with and is a predecessor to current formal dialogue systems for argumentation.
### Argumentation in a Dialogue Format

<table>
<thead>
<tr>
<th>Turn</th>
<th>Proponent</th>
<th>Respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Video games do not lead to violence.</td>
<td>Why do you think so?</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Smith says so, and she is an expert.</td>
<td>Do you think he could be biased?</td>
</tr>
<tr>
<td>3.</td>
<td>What evidence do you have for saying that?</td>
<td>Her research is funded by the video game industry.</td>
</tr>
<tr>
<td>4.</td>
<td>What evidence do you have for saying that?</td>
<td>It was shown by a 2001 investigation of the Parents’ Defense League.</td>
</tr>
</tbody>
</table>
## Standard Dialogue Typology

<table>
<thead>
<tr>
<th>TYPE OF DIALOGUE</th>
<th>INITIAL SITUATION</th>
<th>PARTICIPANT’S GOAL</th>
<th>GOAL OF DIALOGUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persuasion</td>
<td>Conflict of Opinions</td>
<td>Persuade Other Party</td>
<td>Resolve Issue</td>
</tr>
<tr>
<td>Inquiry</td>
<td>Need to Have Proof</td>
<td>Verify Evidence</td>
<td>Prove Hypothesis</td>
</tr>
<tr>
<td>Discovery</td>
<td>Need an Explanation</td>
<td>Find a Hypothesis</td>
<td>Support Hypothesis</td>
</tr>
<tr>
<td>Negotiation</td>
<td>Conflict of Interests</td>
<td>Get What You Want</td>
<td>Settle Issue</td>
</tr>
<tr>
<td>Information</td>
<td>Need Information</td>
<td>Acquire Information</td>
<td>Exchange Information</td>
</tr>
<tr>
<td>Deliberation</td>
<td>Practical Choice</td>
<td>Fit Goals and Actions</td>
<td>Decide What to Do</td>
</tr>
<tr>
<td>Eristic</td>
<td>Personal Conflict</td>
<td>Hit Out at Opponent</td>
<td>Reveal Deep Conflict</td>
</tr>
</tbody>
</table>
Any Matches with Aristotle?

- Aristotle classified three types of reasoning in the *Topics* (100a27 – 101a4) which he called demonstration, dialectical reasoning and eristic (contentious) reasoning.
- Aristotle classified four types of arguments: didactic arguments, dialectical arguments, examination arguments, and contentious (eristic) arguments *On Sophistical Refutations* (165a40 - 165b12).
- Didactic arguments are ones used for the purpose of teaching. This category of arguments has special characteristics of its own, and although it does not appear to have been discussed widely, it is an important category for the field of education.
Examination Arguments

• Aristotle tells us that examination arguments (*perastikoi logoi*) are based on opinions held by the answerer and known to one who claims knowledge of the subject involved (*On Sophistical Refutations* 165b8-10).

• This type of dialogue appears to fit the kind of cross-examination of an expert witness of the kind commonly found in common law trials.

• Such peirastic arguments are supposedly used by a questioner to test and possibly even criticize the answers of the respondent by subjecting them to careful scrutiny.
Eristic Arguments

• In the same place in *On Sophistical Refutations* (165b8-10), contentious arguments (*eristikoi*) are defined as ones that reason or seem to reason from opinions that only appear to be generally accepted, but are not really generally accepted.

• This suggests that Aristotle is not simply defining eristic arguments as quarrelsome ones, but also ones that bear relation to endoxical arguments, arguments based on generally accepted premises.

• It is interesting that here, eristic arguments identified with sophistry as well as quarrelling.
Any Match Yet?

• In these passages it appears that Aristotle’s distinctions between different kinds of reasoning in different kinds of arguments overlap considerably with contemporary classifications of types of dialogue in current argumentation.

• But in the context of present-day argumentation studies, it is quite hard to see what Aristotle is driving at, and now it represents a systematic approach that could be useful.

• Sometimes he seems to be classifying different kinds of reasoning, while in another passages he is classifying different kinds of arguments.
What are the kinds of disputations that Aristotle has in mind?

• Aristotle in the *Topics* (101a26-30) gives three purposes to which the argumentation methodology presented in the *Topics* is supposed to be applicable, training in disputation, casual conversations and philosophical sciences.

• They are formulated by Aristotle and also other authors of the time as dialectical debates that have a well-defined formal structure.

• What is meant by the word ‘formal’ is that they have what would now be called a dialogue structure (Hamblin, 1970, 1971; Krabbe 2013, 72).

• There are two parties involved called the questioner and the answerer, and each of them has to take turns making moves in a game like sequence according to rules, or what are now called protocols, defining the kinds of speech acts that are allowed at each move in the procedure.
Where could of Aristotle have gotten this brilliant idea?

- Apparently he was not the inventor of such dialectical debates or even the first author to write about them (Slomkowsi, 1997, 12), for his way of writing about them suggests that the terms he uses to describe them were widely used.
- In this kind of stylized debate, the answerer defends a designated proposition called a thesis and the questioner attacks this thesis by putting questions to the answerer.
- During the procedure, an audience can interact with the two primary participants to try to make them follow the dialogue protocols.
The Widely Used Formula

• The questioner begins by posing a problem (*problema*) in the form of a yes-no question.

• At his first move, the answerer has to select one option or the other as the proposition he will defend. This proposition is often called the answerer’s thesis by Aristotle (Slomkowski, 1997, 16).

• The goal of the questioner is to get the answerer to become committed to the opposite of the proposition to the one he originally selected as the proposition he will defend.

• This opposite proposition is called the questioner’s thesis.

• The method of the questioner is to derive conclusions from the previous answers of the answerer by deductive or inductive inferences.

• The answerer’s goal is to avoid being refuted. The answerer is refuted, and hence the dialogue ends at that point, if the opposite of his thesis is so derived by the questioner.
ACADEMIC\textsubscript{1}

- This central core of the Aristotelian game of dialectical argumentation has been shown by Krabbe (2013) to be modeled in a formal dialectical system called ACADEMIC\textsubscript{1}.
- This formal model does not attempt to capture the Aristotelian use of inductive arguments or argument by analogy and is only directed to modeling deductive arguments.
- But it does allow the questioner to argue by \textit{reductio ad absurdum}, the method of refuting the answerer by generating an inconsistency from the answerer’s initial commitments and the additional commitments he incurs along the way.
The Procedure of ACADEMIC

• There are two participants, the questioner and the answerer.
• At the first move, the questioner poses a problem by asking the answerer to accept one of two contradictory statements.
• The statement accepted is now identified and set into place henceforth as the answerer’s thesis.
• The questioner’s thesis is now set in place as the remaining proposition in the problem that is the opposite of the answerer thesis.
• The questioner asks the answerer to accept propositions and the answerer has to reply whether she accepts the given proposition or not.
• In order to win the game, the questioner must deduce his own thesis using only propositions accepted by the answerer as premises.
• Each party has to reply when told, “It’s your turn”.
• Immediately as soon as a party fails to respond by taking its turn, it loses the game (Krabbe, 2013, 75).
Formal Dialogue Systems CD₁ and CB

- Krabbe (2013) has shown how the central part of the critical discussion type of dialogue, corresponding to the argumentation stage and a small part of the opening stage, can be formally modeled in such a way that it fits with the central core of Aristotle formal dialectic.
- CD₁ (for critical discussion) is a Hamblin style formal model that has rules structured after the format of Hamblin’s main formal dialogue (1970).
- Krabbe (2013, 81-83) has also shown that another Hamblin-type system called CB, which is parallel to and highly comparable to ACADEMIC₁, has special features of strategic argumentation.
- One is called a dividing strategy. According to this strategy, the questioner should present premises separately for the answer is acceptance so that the answerer cannot easily foresee where the line of questioning is going.
- Another is called a spreading strategy, that works by inserting many intermediate steps in the derivation. Again the rationale is that the answerer should not easily foresee that the line of argumentation is moving toward proving the opposite of his ultimate conclusion.
Going Beyond the Core Structure

• Let’s call ACADEMIC the formal core structure of Aristotelian dialectic.
• In addition to the core structure there were other characteristics of Aristotelian dialectic informally described in the Topics.
• These additional features describe rules for the practice of dialectic that were applied in practice to reflect how these Greek academic debates actually took place.
• We now proceed to identify ten such features.
Features 1 and 2

• The first feature is that, according to the account of this procedure given by, there were rules of “fair play”, presumably enforced by the audience (Slomkowshi, 1997, 15).

• The second feature is that if the answerer does not accept the conclusion that was deduced by syllogism, he is supposed to give some sort of explanation called a “solution” (Slomkowshi, 1997, 15).

• It is interesting to note here that explanations as well as arguments are involved.
The third feature is explained by Krabbe (2013, 75) as follows: when the answerer is asked to choose which one of two opposite propositions it will accept, it may alternatively choose to ask for clarification or object to the question by pointing out an ambiguity.

The fourth feature, which is closely related to the third, is that pointing out an ambiguity in a question is allowed. These two responses are connected because pointing out a linguistic ambiguity in the formulation of the question would typically be a request for clarification of the usage of language of the question.
Features 3 and 4

• The third feature is explained by Krabbe (2013, 75) as follows: when the answerer is asked to choose which one of two opposite propositions it will accept, it may alternatively choose to ask for clarification or object to the question by pointing out an ambiguity.

• There could be two kinds of responses here, but they are connected, because pointing out a linguistic ambiguity in the formulation of the question would typically be a request for clarification of the usage of language of the question.

• The fourth feature is that the answerer is allowed to contest the validity of an argument, but this option is not formalized in ACADEMIC$_1$ (Krabbe, 2103, 75).
**Features 5 and 6**

- The fifth feature is the allowing of inductive reasoning in addition to deductive reasoning. Inductive generalizations of the kinds that are subject to exceptions could also be used.
- This feature brings out an important characteristic of Aristotelian dialectic: that universal generalizations were not the only inference rules allowed as means to infer conclusions.
- The sixth feature is the rule that if the answerer does not accept a conclusion derived by inductive reasoning, he is supposed to give a counterexample.
- Neither of these kinds of moves is allowed in ACADEMIC$_1$. 
Defeasibility

• Feature 5 and 6 are very interesting from a point of view of recent developments in argumentation theory, because they make it evident that more than just deductive logic (syllogistic reasoning) was involved in the way these dialogue games were actually played.

• One can see from these two rules that there is room for defeasibility by allowing for counter-examples to generalizations.
The Seventh Feature

• The seventh feature is that a problem of the kind to be argued about dialectically cannot just be any pair of propositions where one is the opposite of the other.

• In the *Topics* (a11, 104b1-5), Aristotle tells us that a problem has to have aporetic content, meaning that the disagreement needs to be one that is subject to puzzlement.

• *Its subject is something about which either men have no opinion either way, or most people hold an opinion contrary to that of the wise, or the wise contrary to that of most people, or about which members of each of these classes disagree among themselves.*

• The seventh feature is the aporetic feature of puzzlement,
The 8th Feature

• The eighth feature is the use of endoxical propositions. In *On Sophistical Refutations* (165b4), Aristotle defined dialectical arguments as “those which, starting from generally accepted opinions (*endoxa*), reason to establish a contradiction”.

• In book one of the *Topics* (a1, 100b21-23), Aristotle defines endoxical propositions as those which “appear to be correct to everyone or the majority or the wise - that is to say, all of the wise or to the majority or to the most famous and distinguished of them”.

• An endoxical proposition is also one that has some standing, representing a view that should be taken seriously.

• Barnes (1980, 500) translated the word *endoxon* as a “reputable opinion”, suggesting that an *endoxon* should be seen in the Aristotelian sense as referring to an opinion that is more than just a commonly held belief.
The 9th Feature

• The ninth characteristic of Aristotelian dialectic is its use of the *topoi* or topics listed by Aristotle in the *Topics*.

• But we will have more to say below about the role of the topics.
The 10th Feature

• The tenth characteristic of Aristotelian dialectic is that one can identify certain strategies that give the participants advice on how to construct a persuasive argument.

• For example, the demonstration of the thesis to be proved to the other party should not be too obvious to the other party nor should it be too remote (Topics a11 105a 7-9).

• If it were to be too obvious that problema would not really be aporetic, but if it were to be too remote, this could involve difficulties for dialectical training (Slomkowski, 1997, 17).
Deliberation Dialogue

• Aristotle does not see deliberation as a dialectical model of argumentation that would fit his account of dialectic, but he does give a very clear account of the characteristics of deliberation in the *Nichomachean Ethics* 1112a20-1113b25 that fits very well with contemporary models of deliberation in AI. (*Nichomachean Ethics* 1112b10, as quoted in (Walton, 1998, 167)).

• *Deliberation is employed in matters which, though subject to rules that generally hold good, are uncertain in their issue: or where the issue is indeterminate, and where, when the matter is important, we take others into our deliberations, distrusting our own capacity to decide.*

• This account of deliberation fits in very well with the recent modeling of it in AI, where the defeasible nature of argumentation is stressed, and where deliberation is seen as a type of multiagent argumentation.
Examination Dialogue

• From a point of view of argumentation theory, it makes sense to see examination dialogue as being a distinctive type of dialogue in its own right, separate from persuasion dialogue, even though the two types of dialogue have common elements and appear to be very closely related (Walton, 2006).

• Very generally speaking, according to the way we generally use the term ‘examination’, and examination would appear to be careful and critical scrutiny of the evidence or known facts in a case by testing them.

• This kind of examination is carried out by the asking of questions, or in scientific pursuits, the putting forward of hypotheses that can be confirmed or refuted by the evidence.

• Examples would be a physician examining a patient, or a lawyer examining a witness in a trial setting.
Information-seeking

• On this view of the matter, a normative model should conceive examination dialogue as having two goals, the extraction of information and the testing of it for reliability.
• Having the first goal suggests that examination should be classified as a species of
• The first goal is achieved by the examiner putting questions to the respondent in order to obtain information about something.
• The second goal is achieved by using critical argumentation used to judge whether the information presented is reliable, or even by trying to show that it is unreliable.
Peirastic Arguments

• Guthrie (1981, p. 155) drew a distinction between two subtypes of examination, peirastic and exetastic arguments.
• On his way of drawing the contrast, peirastic arguments use testing or probing questions to extract information from a respondent, while exetastic arguments probe even more deeply into the respondent’s answers by examining them critically and even trying to refute them using counterarguments (Guthrie, 1981, p. 155).
• The interpretation of exetastic argument as having a critical aspect of use of counterargument can be found in the *Rhetorica Ad Alexandrum* (1427b12-1428a17).
Peirastic v. Exetastic

• The peirastic type of examination could represent the familiar kind of testing procedure used in education. The teacher presumably already has the information asked for in her question, but she needs to determine whether the student can answer the question.

• The exetastic type of examination dialogue could be typified by the cross-examination of a witness in court. In cross-examination, the attorney may typically try to show that answers of the witness are inconsistent.

• How peirastic and exetastic dialogues should be modeled is an unsolved problem, one of special importance for those applying argumentation techniques in the field of education.
Inquiry in the Analytics

• Earlier commentators on Aristotle such as Ross (1949, 59) had accepted the new the earlier method of dialectical argumentation described in the *Topics* was later superseded by a better method, namely the way of laying out demonstrations described in the *Analytics*.

• On this view the method of scientific inquiry described in the *Analytics* supersedes and replaces the method of dialectic (Bolton, 1999, 58). On this view, scientific inquiry, in Aristotle’s view, is not a form of dialectical argumentation of the kind defined in the *Topics*.

• But more recently, the generally accepted opinion among Aristotelian scholars has turned the other way (Bolton, 1999, 59). Some Aristotelian scholars now accept the view that the method of dialectic described in the *Topics* is applicable not only to philosophical discussions but also to scientific inquiry of the kind described in the *Analytics*.
The Role of the Topics in Dialectic

• Once we get a better grasp of the characteristics of Aristotelian dialectic, the idea of fitting the topics (or argumentation schemes) into the framework of Aristotelian dialectic really helps to show how dialectic is based on them.

• Particularly important here is Slomkowksi’s theory that the underlying logical structure of the Aristotelian topics is the argument form called hypothetical syllogism.

• It appears evident from reading Slomkowksi’s chapter on the topics that the form of argument he calls hypothetical syllogism is the same as the one now called defeasible *modus ponens* (DMP) in argumentation studies (Walton, Reed and Macagno, 2008, 366).

• For these reasons, I would suggest that an important topic for future research is to consider whether the Aristotelian topics fit DMP.
The Role of the *Endoxa*

- One case of special interest is the relationship between endoxical premises of the kind used in arguments in Aristotelian dialectic and the argumentation scheme for argument from general acceptance (Walton, Reed and Macagno, 2008, 311).

  - **General Acceptance Premise**: A is generally accepted as true.
  - **Presumption Premise**: If A is generally accepted as true, that gives a reason in favor of A.
  - **Conclusion**: There is a reason in favor of A.

- This form of argument was traditionally called the argument from popular opinion in the logic textbooks, where it was typically regarded as an informal fallacy. More recently it is regarded as a defeasible form of argument, a heuristic or short-cut argument that can support a conclusion weakly as a presumption, but that can be made stronger by testing it against critical questions and counterarguments.
Relating Aristotelian Dialectic to AI

• More work needs to be done to get a better picture of how the model of Aristotelian dialectic provided by the core structure along with ten additional features fits with the various dialectical models of argumentation in the recent literature in argumentation and AI.

• To help get an overview of the terrain, the next slide shows a graph that represents in rough outline how these dialectical structures are related to each other as sub or supercategories of each other.

• Negotiation dialogue is not even included in the figure, in so far as there appears to be no evidence that Aristotle would have included negotiation as a framework of argumentation coming under the heading of dialectic.
Relating Dialectic to Types of Dialogue

- Information-seeking Dialogue
  - Examination Dialogue
    - Peirastic
    - Exetastic
  - CD1 Critical Discussion
- Inquiry
- Persuasion Dialogue
- Core Structure of Aristotelian Dialectic
  - CB
  - Full Aristotelian Dialectic
- Deliberation
  - Aristotle's Ethics
- Eristic Dialogue
  - Quarrel
- Core Structure + 10 Features
A Research Program

• The research program suggested by these findings is to extend the core formal structure to build other formal models that include more and more of these ten features.

• This program should start by sequentially building stronger and stronger formal systems of dialectic that gradually model more and more of these features.

• The ultimate goal should be to build a full formal system of Aristotelian dialectic that models all ten features.


