

Large scale agreements via Microdebates

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Debating online

- Web 2.0 platforms have rapidly become a mass phenomenon whereby billions of individuals consume and share resources.
- People became accustomed to arguing online in long-lasting debates, mainly in the form of comments in social network platform, such as FaceBook and Twitter, but also in the form of structured debates in debate-friendly tools.

Online debates...

- argumentative debate seems a promising tool for reaching agreement, with particularly interesting applications in e-participation and policy-making.
- idea is that Web 2.0 platforms may overcome the limitations of traditional opinion gathering methods such as questionnaires and polls,
- informed citizens can come up with new ideas and perspectives as opposed to expressing preferences upon some predetermined options
- bottom-up fashion

Arguments in online discussions

- The Argumentative Theory of Reasoning (Mercier, & Sperber, “Why do humans reason? Arguments for an argumentative theory”, *Behavioral and brain sciences* (2011) 34) tells us that people are good at reasoning when they communicate through an argumentative context.
- Arguments are used by communicants to convince other communicants, especially in absence of trust.
- When debating about policy issues, we thus expect that users will not only publish their opinion (like in a review setting), but also:
 - try to convince others by producing arguments;
 - rebut (attack) each others’ arguments.

...comes at a cost

- it becomes very expensive for by-standers and external observers to make sense of opinions emerging from online debates.
- An alternative approach could be to restrict one-self to getting a feeling of the general sentiment of an ongoing discussion, without necessarily having to really understand what is being said and why individuals make such and such claim and express such and such opinion.

Sentiment analysis

- Opinion mining/sentiment analysis techniques and tools look at sentiment orientation of opinions in terms of values in a positive/negative scale
- Classification **accuracy** is quite good in some domains, e.g., customer reviews
- But... it is not (yet) as good in political debates, and, above all, it does not explicitly tell **why** certain opinions are in place and how they relate to other opinions.

Our aim

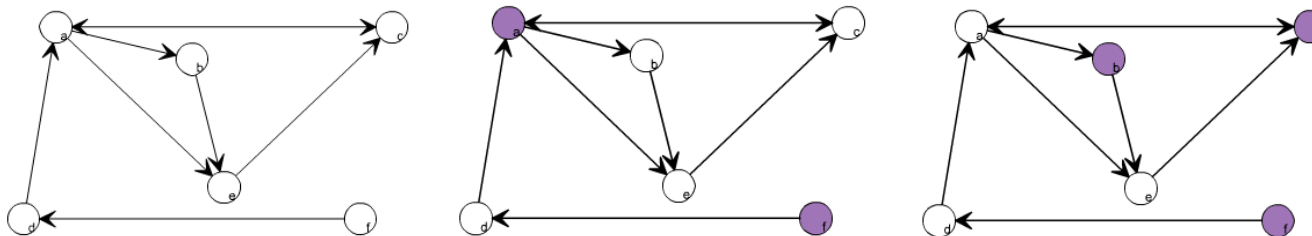
- Our work goes in the perspective of encouraging free, unconstrained online debate, as a tool in the hands of the citizens, who can use it to voice their opinions, and convey them to the policy-makers.
- we need to provide policy-makers with tools to automatically make sense of possibly very lengthy online debates

Our Aim:

- identify **specific opinions** used in a discussion
- identify the **argument structure** that is tied to such opinions (if any)
- identify the **relations amongst arguments**

Computational Argumentation

- We identify **computational argumentation**, and in particular **abstract argumentation**, as the conceptual and computational framework to model arguments and reason from them automatically.
- Dung's "On the Acceptability of Arguments and its Fundamental Role in Non-monotonic Reasoning, Logic Programming and n-Person Games", Artificial Intelligence 77(2): 321-358 (1995):
 - a set of atomic arguments, X
 - a binary attacks relation over arguments, $A \subseteq X \times X$, with $\langle x, y \rangle \in A$ interpreted as "the argument x attacks the argument y ".
 - collections of justified arguments described by extension-based semantics
 - Many semantics: ways to define extensions...



Debates on Twitter

- Toni & Torroni, “Bottom-up argumentation”, *Proc. TAFA-11 LNAI 7132*, (2012) 249-262:
 - proposal for enhancing online debate platform, allowing users to specify elements of argumentation framework within ongoing debate (sample platform: facebook)
- Our proposal is to develop an application based on a Twitter dialect that allows users to discuss about topics, aided (in the back-end) by computational argumentation.
- People use Twitter to talk about their daily activities and to seek or share information by broadcasting brief textual messages (tweets) to people who “follow” their activity, in a micro-blogging fashion.
- We therefore introduce the concept of **micro-debates**

Twitter Micro-Debates

- a **micro-debate** is a stream of tweets where users annotate their messages by using some special tags:
 - # tag identifies a specific micro-debate (name)
 - \$ tag identifies one or more assertions they support
 - !\$ tag identifies one or more assertions they oppose
- thus a micro-debate tweet will look like:
 - tweet := comment #debateName <\$opinionA, ..., \$opinionM> <!\$opinionB, ..., !\$opinionN>
- We have developed an ABM prototype in NetLogo and a NetLogo extension to automate parsing and visualization

A conversation on windmills and sugarmills

- Actor A: “sugarmills produce as much as windmills produce, and at half the cost!”
- Actor B: “I don't think so, windmills are much more productive than sugarmills, as recent studies proved [link]”
- Actor A: “well, in India only, sugarmills produce 2,000 megawatt of biomass-based energy every year, as much as windmill”
- Actor B: “ok, but how much do sugarmills consume? windmills just 20% of their energy”
- Actor A: “sugarmills consume 30%, but help to recycle the waste of sugar production... windmills don't”
- Actor C: “yes, and recycling the waste is a good feature windmill miss, because it makes energy production integrated with consumption good production”
- Actor D: “I do believe you are leaving out the cost of both the plants ... there are no real “green alternatives”
- Actor B: “Ok, but sugarmills productivity is tied to sugar prices, while windmills productivity is not!”
- Actor A: “sugarmills productivity is also tied to policy for selling energy, and in Brazil and India is convenient... what about windmills?”

Twitter Micro-Debate

...an hypothetical Twitter
micro-debates...

The image shows a vertical scroll of nine tweets from a Twitter thread. Each tweet is from a user whose name is redacted with a black bar. The tweets discuss the productivity and environmental impact of sugar mills versus windmills. The first tweet compares the policy for selling energy in Brazil and India. The second and third tweets discuss productivity and the cost of plants. The fourth tweet mentions recycling waste. The fifth and sixth tweets discuss energy consumption percentages. The seventh tweet mentions biomass energy production in India. The eighth and ninth tweets compare the productivity and cost of windmills and sugar mills. The words '\$windmills' and '\$sugarmills' are highlighted with green circles in the eighth and ninth tweets, respectively. Each tweet has a '1m' (1 million) view count and an 'Expand' link below it.

1m
\$sugarmills prod is also tied to policy for selling energy, and in Brazil and India is convenient! what about !\$windmills #energyalt
Expand

1m
Ok, but !\$sugarmills productivity is tied to sugar prices, while \$windmills productivity is not! #energyalt
Expand

1m
I do believe you are leaving out the cost of both the plants ... there are \$norealgreenalternatives !\$windmills !\$sugarmills #energyalt
Expand

1m
\$recyclethewaste is a good feature !windmills miss, because it makes energy prod integrated with consumption good prod #energyalt
Expand

1m
\$sugarmills consume 30%, but help to \$recyclethewaste of sugar production... !\$windmills don't #energyalt
Expand

1m
ok, but how much do !\$sugarmills consume? \$windmills just 20% of their energy #energyalt
Expand

1m
well, in India only, \$sugarmills produce 2,000 megawatt of biomass-based energy every year, as much as !\$windmill #energyalt
Expand

1m
I don't think so \$windmills are much more productive than !\$sugarmills as recent studies proved... #energyalt
Expand

1m
\$sugarmills produce as much as windmills produce, and at half the cost! #energyalt
Expand

Naive Argument Framework

- As a first step, we extract and parse the stream of tweets in a selected micro-debate so that:
 - for each \$opinionName tag, an argument is created;
 - for each !\$opinionName tag, an attack link is created toward the named opinion
 - each argument stores all the comments that refer to that argument in the micro-debate
- **Naive AF:** we consider every assertion to be an argument and include it in the argumentation framework

Naive AF

The screenshot shows a NetLogo window titled "NetLogo — twitter-like [/Users/ogabbrie/Dropbox/Simone-Paolo/projects/Twitter-like]". The interface includes a toolbar with "Interface", "Info", and "Code" tabs. Below the toolbar are buttons for "Edit", "Delete", "Add", and a "Button" dropdown. A speed slider is set to "normal speed", and there are checkboxes for "view updates" and "continuous". A "Settings..." button is also present.

The main workspace displays a network diagram with four nodes: `$sugarmills`, `$swindmills`, `$recyclethewaste`, and `$norealgreenalternatives`. The nodes are connected by lines, forming a diamond shape with `$swindmills` at the top, `$norealgreenalternatives` at the bottom, `$sugarmills` on the left, and `$recyclethewaste` on the right.

On the left side of the interface, there are two sections. The top section is labeled "debate" and contains a text input field with "#energyalt", a "Get Debate" button, and a "Remove not-Arguments" button. The bottom section is labeled "semantic" and contains a dropdown menu with "ideal" selected and a "Semantic Extension" button.

The Command Center at the bottom shows the following commands and outputs:

```
observer> ask turtles [print (word "argument is: " label " and comments are: " comments)]
argument is: $swindmills and comments are: [[Yes, but $sugarmills productivity is tied to sugar prices, while $swindmills productiv
argument is: $recyclethewaste and comments are: [[ $sugarmills consume 30%, but help to $recyclethewaste of sugar production... ! $
argument is: $sugarmills and comments are: [[ $sugarmills productivity is also tied to policy for selling energy, and in Brazil an
argument is: $norealgreenalternatives and comments are: [[I do believe you are leaving out the cost of both the plants ... $norealg
```

From naive to **smart** AF

- We then propose **argument classification** as a way to verify if each node is a well-formed argument or not:
 - If, based on its comments, a node proves to be a well-formed argument, we keep it in the AF;
 - if, based in its comments, a node prove **not** to be a well-formed argument, we exclude it from the AF.
- Our idea is to define what a “well-formed argument” is by way of COGITO rules, and delegate to a COGITO module a fully automated argument filtering process.

Smart AF

The screenshot shows the NetLogo 'twitter-like' interface. The window title is 'NetLogo — twitter-like (/Users/ogabbrie/Dropbox/Simone-Paolo/projects/Twitter-like)'. The interface has three tabs: 'Interface' (selected), 'Info', and 'Code'. The top toolbar includes 'Edit', 'Delete', 'Add', a 'Button' dropdown, a 'normal speed' slider, 'view updates' (checked), 'continuous' (dropdown), and 'Settings...'. On the left, there are two sections: 'debate' with a text input containing '#energyalt' and a 'Get Debate' button, and 'semantic' with a dropdown set to 'ideal' and a 'Semantic Extension' button. The main area is a 3D view titled 'ticks:' showing a network diagram with three nodes: '\$sugarmills', '\$swindmills', and '\$recyclethewaste'. '\$swindmills' is at the top, with arrows pointing down to '\$sugarmills' and '\$recyclethewaste'. The bottom 'Command Center' shows the following text:

```
observer> ask turtles [print (word "argument is: " label " and comments are: " comments)]
argument is: $swindmills and comments are: [[Yes, but $sugarmills productivity is tied to sugar prices, while $swindmills productiv
argument is: $recyclethewaste and comments are: [[$sugarmills consume 30%, but help to $recyclethewaste of sugar production... !$
argument is: $sugarmills and comments are: [[$sugarmills productivity is also tied to policy for selling energy, and in Brazil an
argument is: $norealgreenalternatives and comments are: [[I do believe you are leaving out the cost of both the plants ... $norealg
observer> ask turtles with [label = "$norealgreenalternatives"] [die]
```

Enhanced Visualization

- finally, we compute semantic extensions (i.e., we find coherent group of arguments based on some criterion) on the **smart AF**, in order to visualise possible results of the discussion, thus helping policy-makers and citizens better understand what is going on in the discussion

Visualization

The screenshot shows the NetLogo 'twitter-like' interface. The window title is 'NetLogo — twitter-like (/Users/ogabbrie/Dropbox/Simone-Paolo/projects/Twitter-like)'. The interface includes a toolbar with 'Interface', 'Info', and 'Code' tabs. Below the toolbar are buttons for 'Edit', 'Delete', 'Add', a 'Button' dropdown, a 'normal speed' slider, a 'view updates' checkbox, a 'continuous' dropdown, and a 'Settings...' button.

The main workspace displays a network diagram with three nodes: a blue node labeled 'Swindmills' at the top, and two pink nodes labeled '\$sugarmills' and '\$recyclethewaste' at the bottom. Arrows point from the pink nodes to the blue node, indicating a directed relationship.

On the left side, there are two sections. The top section is titled 'debate' and contains a text input field with '#energyalt', a 'Get Debate' button, and a 'Remove not-Arguments' button. The bottom section is titled 'semantic' and contains a dropdown menu with 'complete' selected and a 'Semantic Extension' button.

At the bottom, the 'Command Center' shows the following output:

```
admissible extension set(s) is: [[ $recyclethewaste ] [ $recyclethewaste $sugarmills ] [ $sugarmills ] [] ]
complete extension set(s) is: [[ $recyclethewaste $sugarmills ]]
```

Future work

- All the tools needed are partially implemented.
- Still missing:
 - argument classification to filter arguments and keep well-formed arguments only
 - experimental evaluation to test the effectiveness of this approach in a real-world setting.

Conclusions

- CON: work in progress
 - the tool is only partially developed (argument classifier still under develop.)
 - using our syntax, Twitter users may develop habits that could be different from what we expect, leading to unforeseen system behaviour
- CON: needs active engagement from users
- CON: high-risk action: many innovations required together
- PRO: allows deep analysis of arguers' position in a debate
- PRO: technology may be useful in many other domains:
 - it uses a multidisciplinary approach
 - valuable outcome of e-Policy project

Conclusions

- PRO: no need to manually analyse documents:
 - posts are annotated by users (a form of “crowdsourcing”: less qualified labor needed)
 - argument classification is automated (eliminates important bottle-neck)
- PRO: exploits wisdom of crowds (bottom-up argumentation), and as opposed to polls:
 - arguments arise bottom-up from the debate, it is not necessary that a single user expresses the argument entirely; many users can contribute
 - open approach (analysis dynamically visible to all users)

Readings

- Dung, “On the Acceptability of Arguments and its Fundamental Role in Non-monotonic Reasoning, Logic Programming and n-Person Games”, *Artificial Intelligence* (1995) 77(2): 321-358
- Mercier & Sperber, “Why do humans reason? Arguments for an argumentative theory”, *Behavioral and brain sciences* (2011) 34
- Toni & Torroni, “Bottom-up argumentation”, *Proc. TAFA-11 LNAI 7132*, (2012) 249-262

Thank you for
your attention!!!

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