Semantic Discourse with Peer Production
Research Proposal

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Abstract. There exist powerful semantic models for analyzing complex discourse, but previous attempts to integrate them into tools for widespread use have proven unsuccessful. This issue has become increasingly pronounced as more and more of our discourse moves into the digital realm, accelerating breakdowns in the way humans exchange ideas. At the same time, this digital shift has also initiated the phenomenon of peer production communities. These groups have a keen ability to produce goods and services that were previously considered infeasible, and in particular they have proven adept at collectively building repositories of knowledge. They continue, however, to struggle in their treatment of controversial topics. To fill this gap, I present a novel model for semantically representing discourse that is simple enough for widespread use, and then propose how a peer production community might use that model within the framework of a wiki to aggregate and refine discourse concerning controversial topics of interest.

Keywords: Semantic discourse · Peer production · Collective sensemaking

1 Introduction

The means by which humans exchange ideas has changed dramatically over the last fifty years. Whereas this process was once confined to intimate settings, today it almost exclusively happens digitally, either via more traditional outlets like journals and newspapers where content is now primarily produced and consumed online, or more modern, distributed platforms like blogs, forums, newsgroups, email lists, group chats, wikis, etc. that were explicitly designed for the web [1]. During this shift, unexpected challenges—e.g. bullying [2], trolling [3, 4], misinformation [5, 6], breakdowns in civility [7]—have emerged that call the utility of these tools into question.

Much effort has been spent trying to understand the extent to which these tools are failing us [3–6]. A stunning discovery is that in many cases it is not nefarious actors or design flaws but instead well-intentioned users that are unwittingly causing the most harm. Recent investigations into the 2016 Russian election influence campaign show that much of the Russian operation targeted the

anger, passion, and misinformation that Americans were already freely broadcasting across social media platforms [8]. Likewise, a recent analysis from MIT of how true and false news spreads on Twitter concludes that not only did falsehoods spread more widely and at a faster rate than the truth, but that it was humans, not robots, who were more likely to spread it [9]. This phenomenon is not limited to the confines of social media: there is growing evidence that a nontrivial percentage of peer-reviewed, academic research findings are false as well [10–13]. The closing example is a remarkable situation in which even a thoughtful, deliberative, and extensive discursive process among experts is unintentionally spreading misinformation. Whether due to design or human nature, it appears that useful, well-designed collaborative processes, from the benign to the sophisticated, are being challenged by good actors as well as bad.

One approach to this problem involves utilizing semantic models for discourse to break down complex discussions into manageable pieces [14–17]. None of these models, however, have proven capable for use by large-scale online communities. To fill this gap, I have designed a semantic discourse model which is powerful enough to capture contextual information, and simple enough, in theory, for use by a peer production group.

2 Related Work

2.1 Discourse

Modern technologies used for the collection and dissemination of discourse (i.e. Web 2.0 technologies [18]) are powerful, but the underlying principles they use are relatively simple. For microblogging, an individual shares packets of information in short bursts to their followers; for community forums, subcommunities organized by common interests share thoughts and ideas under self-moderation; for Q&A communities, newcomers ask questions and a dedicated group of experts attempt to answer them; and for wikis, groups of people cooperatively edit the same document. One of the challenges these communities face is that human discourse is incredibly complex [19], and does not always fit nicely into the rigid, simplified models for collaboration that these groups have assumed. There do exist powerful mechanisms for modeling the semantics of discourse–tools like Issue-Based Information Systems [14,15], Dialogue Mapping [16,17] and Rhetorical Structure Theory [20]–but they appear impractical for online communities in which ease of use is paramount for user growth and retention [21]. This is evidenced by numerous attempts in the late 2000s to create a semantic wiki [22–25]—a modified wiki that can support features like structured content, knowledge models, and reasoning [26]—that proved unsuccessful at scale. More modern approaches to this problem have focused more on building tools on top of existing infrastructure to improve the flow of information for the user [27–30], and less on designing fundamentally new ways for how the information is generated [31].

2.2 Computer-mediated discourse

Beginning in the 1980s, researchers sought to understand how instantaneous communication sans physical colocation was affecting human interaction [32–34]. The field that this initial work spawned can broadly be referred to as computer-mediated discourse (CMD), where CMD is the communication produced when human beings interact with one another by transmitting messages via networked or mobile computers [1]. Within this framework, researchers have looked at the structure of this new discourse [35–37], the types of positive and negative interactions it fosters [35, 38–40], associated social cues [41, 42], etc.; in doing so, they have uncovered numerous technical and social barriers unique to this new medium [43–45]. For communities that interact entirely or almost entirely within the digital realm, the effects of these barriers are pronounced. Today, online communities are known to harbor all different forms of abuse [46–48], and neutral interactions commonly devolve into disputes and hostilities [49]. An open question remains whether CMD is causing this behavior, or simply amplifying it. Either way, we find a clear instance in which discourse online is being stressed to a significant degree.

2.3 Peer production

The digital shift in our discourse has had at least one positive effect: it has uncovered the phenomenon of peer production communities, and in particular their knack for creating wildly useful products that upend traditional markets while brazenly defying standard models for work and remuneration [50]. A peer production community is a distributed group of peers who come together to produce a good or service [51]. In these groups, users who have never met collaborate and execute tasks without a classical hierarchical structure of authority. Peer production is the mechanism underlying five of the top one-hundred most visited websites in the world, and two of the top ten, as of December 2018 [52]; it is also responsible for the development of most of the technologies that underpin the internet [50]. Part of what makes these communities so intriguing is that they are able to produce widely impactful services and goods that would not normally be economically or logistically feasible under more traditional production mechanisms [50, 53]. Consequently, researchers seek to understand what factors affect a peer production group's ability to produce a good or service together: they try to find underlying motivations for why people are drawn to these communities [54], what challenges they face in successfully contributing [55, 56], what causes them to leave [57], and ultimately why a majority of these communities die off while a select few succeed [51].

One particularly fascinating aspect of peer production groups is their skill in creating repositories of knowledge [21]. After the web itself, the invention of the wiki was perhaps the premier catalyst for this phenomenon [58]. From a technological perspective, its novelty was that it not only allowed but incentivized users to instantly publish their ideas in a shared, collaborative space. This innovation led directly to the world's largest social experiment in peer production

and collective sensemaking to date: the ongoing Wikipedia project, the social dynamics of which are a highly active area of research [59–62]. While it was certainly not the first attempt to create a digital repository of knowledge [63], it has arguably been the most successful [64, 65]. Other popular models for collective sensemaking that currently fill this space include Q&A communities (e.g. StackExchange, Quora) and discussion-based forums (e.g. Reddit). While these websites are widely successful and are among the most visited on the web today [52], the communities that effectively run these sites continue to face significant challenges in the way they handle controversy [66–71]. Recent efforts to mitigate these effects focus on controversy detection using machine learning techniques, both for the web [66–68], and for Wikipedia in particular [65, 69]. While effective at identifying when a controversy is occurring, these approaches do not alter the fundamental collaborative dynamics that cause these disputes.

3 Proposal

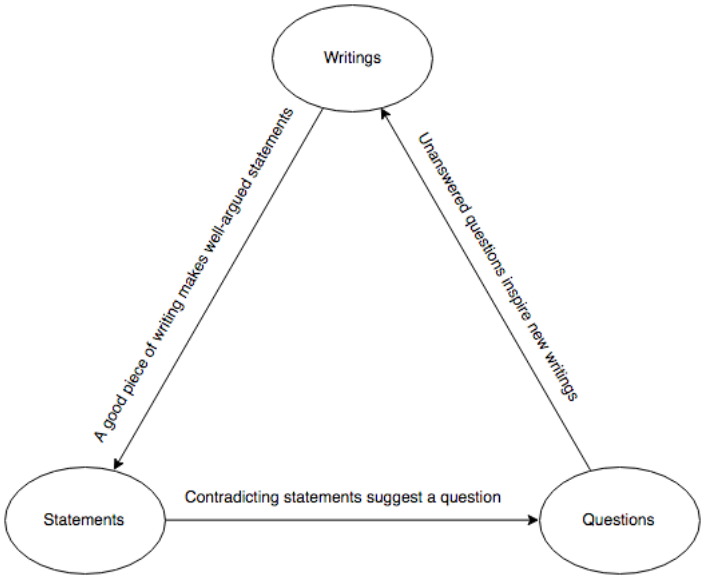

Fig. 1: Semantic Discourse Model

I have identified a gap in the literature when it comes to building tools to support peer production systems that can handle controversial, complex discourse. Current attempts to build semantic wikis are focused on applications for smaller-scale, organizational best-practices [31]. Further, more modern efforts to improve how peer production groups handle controversy build upon existing infrastructure and do not affect the underlying processes by which information is

accumulated and processed within these communities [28, 30, 31, 65–70]. Consequently, I propose a tool that takes a semantic approach to representing discourse and is simple enough to be usable by a massive online community.

The model I have devised is simple: I hypothesize that one can broadly categorize all forms of discourse into three categories: writings, statements, and questions. In particular, writings are the creative works we produce to try to make sense of the world, statements are the subsequent claims we derive from these writings, and questions are the unknowns arising when two or more of these statements directly contradict. These three categories reinforce each other: writings argue towards particular statements, contradicting statements suggest a particular question, and unanswered questions inspire new writings. Using this model, I will construct a wiki that is capable of cataloging the most important writings, statements, and questions concerning controversial topics of interest. I plan to adapt the basic wiki structure using tabbed documents to adequately capture the dynamic connections between these categories. I will also modify it such that individuals can publish their own creative writing in a way that is not directly editable by the community as is the case for a standard wiki article. I will integrate popular features from Wikipedia such as user permissions, rollbacks, templates, and requests for comments that will allow the site to function at scale. A proof of concept for this project is available at [72].

Once constructed, I will approach individual communities of inquiry with a well-defined area of expertise and study them as they attempt to collaborate and pool their knowledge on the site. I will study how well they interact with other users and in what ways they are able to successfully contribute to the project, if any. I will also use various psychological metrics to quantify a user's understanding of a complex topic when they visit a page on this site versus a corresponding page on Wikipedia. A key innovation of this model is that it may be able to account for the repetitive, unproductive cycle of discourse that frequently transforms civil discussions on controversial, complex topics into chaos and misinformation; hence, I will also study how effectively this tool can deflect and/or manage those types of harmful contributions.

I plan to spend the first two years of my program fulfilling course requirements, refining the prototype in [72], immersing myself within the current literature of discourse representation and peer production, and performing empirical studies to understand the state of the practice and the needs of these communities. This will culminate in a dissertation proposal detailing how my proposed system works and what metrics I will use to study its effectiveness. In year three, I will build the system to full specification and perform an initial study on its ability to cope with particularly controversial topics. In years four and five, I will study this tool in a wide variety of contexts, and execute a research program with discrete projects suitable for undergraduate student involvement.

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