Cascades in metaphor and grammar

A case study of metaphors in the gun debate

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Public discourse on highly charged, complex social and political issues is extensive, with millions of sentences available for analysis. It is also rife with metaphors that manifest vast numbers of novel metaphoric expressions. More and more, to understand such issues, to see who is saying what and why, we require big data and statistically-based analysis of such corpora. However, statistically-based data processing alone cannot do all the work. The MetaNet (MN) project has developed an analysis method that formalizes existing insights about the conceptual metaphors underlying linguistic expressions into a computationally tractable mechanism for automatically discovering new metaphoric expressions in texts. The ontology used for this computational method is organized in terms of *metaphor cascades*, i.e. pre-existing packages of hierarchically organized primary and general metaphors that occur together. The current paper describes the architecture of metaphor-to-metaphor relations built into this system. MN's methodology represents a proof of concept for a novel way of performing metaphor analysis. It does so by applying the method to one particular domain of social interest, namely the gun debate in American political discourse. Though well aware that such an approach cannot replace a thorough cognitive, sociological, and political analysis, this paper offers examples that show how a cascade theory of metaphor and grammar helps automated data analysis in many ways.

Keywords: metaphor, construction grammar, Embodied Construction Grammar, the gun debate, cascades, rights metaphors, metaphor identification, computational linguistics

1 Introduction

This paper presents recent developments in conceptual metaphor theory resulting from the application of a computational metaphor analysis and extraction system

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to the discovery of metaphoric language in corpora. The system boasts a data-oriented approach to metaphor analysis complemented by a deep semantic analysis formally defined in MN's metaphor cataloguing repository. The novelty of the proposed developments lies in the introduction and formal implementation of the concept of metaphoric *cascades* in metaphor analysis. A *cascade* is a hierarchically organized conceptual combination of image-schemas, frames, and metaphors that has been used often enough to become fixed as a single complex entity, though each of its parts continues to occur separately. Novel specific instances of linguistic metaphor commonly make use of existing high-level structures. The notion of a cascade builds on the observation made in frame semantics that frames are bundles of coherent roles dynamically related to one another (Fillmore 1976, 1982; Ruppenhofer et al. 2016); it also builds on the observation in conceptual metaphor theory that metaphors are essentially bundles of mappings across frames that occur within domains (Lakoff & Johnson 1980).

One example of a cascade occurs with the use of any expression that captures the LOVE IS A JOURNEY metaphor, as in *Their relationship is on the rocks.* The metaphoric expression evokes bundles of primary metaphors together, not piecemeal, in the mental processing of that sentence. These metaphors include: PURPOSEFUL ACTION IS MOTION TO A DESTINATION (the motion of the relationship/boat), DIFFICULTIES ARE IMPEDIMENTS TO MOTION (being on the rocks), PROGRESS IS FORWARD MOTION (the boat is understood to have been moving previously), LOVERS ARE TRAVELERS, RELATIONSHIPS ARE CONTAINERS, and many others. There are also cultural models involved, both in the source domain (i.e. what nautical travel is like) and in the target domain (i.e. what romantic love relationships are like). Finally, there are bindings across the semantic roles populating the source and target domains. For instance, we know that the lovers are simultaneously the travelers — as the people encountering difficulties to forward motion — and the people who were initially aiming for a shared destination. These metaphors and cultural models (frames) are related to each other in predictable ways, with many of the inferences about the state of this relationship coming from the highest levels of the primary metaphors involved.

A cascade approach to metaphor analysis pre-bundles these primary and general metaphors in a hierarchically related way, such that the next time a specific linguistic expression is analyzed, many of the same inferences and mappings can be reused. For instance, in an expression like *We've reached a dead end in the peace talks*, the target domain may have changed, but the same inferences — about progress, forward motion, intending to reach a destination, and encountering obstacles along the way to a destination — are preserved from the primary metaphors in the cascade. A cascade analysis is the opposite of an analysis that simply lists the metaphors and frames needed to understand an expression, which

would list them afresh for each new linguistic expression. The computational database and the metaphor identification process capture these formal interrelationships at the highest conceptual levels. Thus, the system quickly makes use of them again and again in the discovery of other metaphoric expressions. The benefits of a cascade model include the following: a) frequently-used primary metaphors and primary metaphor bundles only need to be analyzed once and then simply recognized when present for a specific linguistic expression; b) the formalization of these metaphor packages facilitates covering more empirical territory much faster (rather than analyzing sentences or expressions one by one, yielding unstructured lists of metaphors).

This paper details the most relevant findings from MN's metaphor database and corpus metaphor extraction endeavor, showing how a cascade theory of metaphor emerges naturally as a bridge between the study of conceptual metaphor and construction grammar. An important goal of this work is to make a case for a hybrid big-data/deep semantic analysis system by showing that statistical methods of metaphor analysis alone are not sufficient. Rather, MN's system necessarily requires fleshed-out analyses of metaphor hierarchical structure, including metaphoric entailments, frame-based knowledge, and image-schema structure (see Stickles et al., this issue, for a comparison of methodologies).

The proposed mechanisms constitute a way of conducting research in linguistics that is faithful to the Neural Theory of Language (Feldman 2006; Feldman et al. 2009) and follow naturally from existing work in cognitive grammar, frame semantics and construction grammar. Much like the philosophy underlying Embodied Construction Grammar (ECG), this analysis is fundamentally a simulation semantics-based one, which aims to capture the parallel processing of information, the best-fit nature of simulation, and the sequential dependency relations among conceptual structures (Bergen & Chang 2005). While the current paper focuses on the linguistic manifestations of metaphoric mappings, these expressions are just the tip of the conceptual iceberg. Indeed, cascades should be considered conceptual entities rather than just linguistic ones. As the paper illustrates, a single linguistic expression can receive multiple interpretations, distinguishable solely by what cascade path each interpretation activates.

To illustrate the workings of metaphoric cascades requires discussing the role of grammar. While metaphor is generally known to be a complex conceptual representation, metaphoric expressions tap into the conceptual background in ways that interact with the semantics of an expression's grammatical construction. For this reason, analyzing linguistic metaphor is by definition nearly impossible without constructional analysis. As an illustration of this inevitable symbiosis, this paper presents a study of the metaphors in the public discussion of the debate over

gun rights and gun control in the United States, one of the many socio-cultural domains within the purview of MetaNet's (MN) corpus work.

This case study is a useful testing ground for the effectiveness of the model for several reasons. First, specific grammatical constructs and metaphoric expressions, some of which are typical of each viewpoint involved in the debate, characterize the gun debate rhetoric. Unpacking the language of the debate to uncover the conceptual underpinnings of the worldview motivating the rhetoric is necessary. Without a thorough account of systematically combined mappings from metaphor to grammar, going beyond a list of isolated analyses of linguistic expressions is not possible (however interesting such a list may be). Second, as a problem of particular interest in the American media at the time of writing, the gun debate presents a plethora of real-world discourse data. The corpus from which the current study draws is a compilation of annotated texts drawn from the political discourse at large. Finally, the gun debate conveniently offers fodder for both the embodied cognition aspect of Conceptual Metaphor Theory (CMT) and the socio-cultural and political dimensions of human activity, both of which must be acknowledged in a thorough analysis.

The rest of the paper is organized as follows: Section 2 details the intellectual and theoretical background in this work, highlighting the most recent advances in the merger of metaphor theory and construction grammar. Section 3 presents the gun debate — the specific political issue that the paper highlights — and describes the cultural models necessary for contextualizing the empirical findings. It also briefly outlines MN's metaphor extraction system pipeline and the role of constructions in this system. Section 4 presents deep constructional analyses of metaphoric expressions typically found in gun debate discourse, and the role of metaphoric cascades in uncovering the major trends in viewpoint differences.

2. Theoretical background

The notion of hierarchies and schematic levels in semantics, construction grammar, and metaphor theory is not new. Most approaches in cognitive semantics adopt some kind of network model of knowledge that organizes both semantic meanings and diverse areas of cognition, including reasoning, emotions, and information about socio-cultural context. Foundational work in cognitive linguistics implicitly assumes such networks, as is evident in the radial structures that Goldberg (1995, 2006) posits for grammatical constructions. Likewise Grady (1997) and Lakoff (1987 and after) posit such networks for grammatical constructions, lexical analysis, and metaphor. Panther et al. (2009) do so for metonymy and metaphor, Hudson (1984, 2007) for word meanings, Talmy (1988 and after) and

Langacker (2002) for force-dynamics and image schemas. Many others propose network models of some sort across various linguistic and non-linguistic cognitive domains. In fact, the formal implementation of hierarchical binding lattices in ECG (Bergen & Chang 2005; Dodge 2010; Feldman et al. 2009) and in Fluid Construction Grammar (Steels 2011) represents some of the most advanced computational and formal implementations of such hierarchically-structured ontologies. Consequently, the current approach to metaphor is similar to and influenced by the advances in these approaches, especially ECG. ECG already incorporates networks much like those described above for a cascade analysis. ECG takes into account the deep semantics of frames, the decomposing of frames into primitive structural gestalts grounded in experientially-based image schemas, and the linking of these gestalts to linguistic form.

The current work represents a way of extending ECG to include metaphor and suggests some ways to represent this extension both conceptually and formally. The proposed notation is implementable both by linguists doing qualitative analytic work and computational linguists looking for ways to build a metaphoric construction grammar into their systems. To reflect the simulation process accurately, the analysis requires a detailed hierarchical network of constructions within a cascade-based model of metaphor. It also requires bindings across concepts and constructions that bring them together in the mental simulation.

2.1 What is a cascade?

The notion of cascades is grounded in the Neural Theory of Language, which holds that complex neural circuits are responsible for some of the most essential primary embodied concepts that subsequently act as the foundation for all other concepts (Feldman 2006; Feldman et al. 2009; Johnson & Lakoff 2002; Lakoff 2008a; Gallese & Lakoff 2005; Narayanan 1997). In neural terms, a *cascade circuit* is a learned network that brings together embodied circuitry for thought and language across diverse brain regions. It uses integrative circuits that, when active, (a) neurally bind localized embodied circuits across brain regions and (b) create integrated wholes from complex parts. Once learned, a cascade circuit can be used and re-used in the processing of thought and language. The circuitry characterizes image schemas, conventional imagery, conceptual integration clusters (i.e. blends, cf. Fauconnier & Turner 1998 and after), and metaphoric mappings. Crucial parts of the repertoire are primary embodied image schemas and metaphors, because information from the neural circuits directly connected to the body (motor action circuits, perception circuits, emotion and thought circuits) is necessarily activated in language use and language understanding.

This paper argues that mental simulation occurs in the comprehension or production of any instance of linguistic expression. Simulation necessarily activates certain cascades with *only very small parts of these cascades evident in the linguistic expression.* Meanwhile, the activation of the cascades underlying the linguistic expression contributes most of what is needed to decode it. These invisible unconscious activations allow speakers to perform further reasoning and inferencing that cannot be deduced from the linguistic expression alone. This understanding taps into the well-established observation that metaphor is not just a linguistic trope, but a complex conceptual systematic mapping network with linguistic manifestations. For this reason, metaphoric expression seems to be infinitely creative, and not a set inventory of idiomatic expressions. Using the cascades that are in place, MN's system parses both conventionalized idiomatic expressions like *glass ceiling* and *ladder of success* as extensive creative elaborations of the particular metaphor, e.g. *she climbed the ladder of success, slid back down a few rungs, climbed back up again, hit her head on the glass ceiling, slightly cracked it but did not manage to shatter it*.

Such elaborations are perfectly well understood and frequently produced by speakers but do not seem to be memorized or stored verbatim. They are examples of existing dynamic conceptual structures that find expression through novel combinations of words. Therefore, an essential trait of cascades is their their ability to facilitate deep semantic processing while not requiring new formation from scratch for every instance of simulation. That is, a simulation is kept active in the background, so that when evoking the cascade via one particular instance of it, e.g. *[they] are killing the world economy*, language users have access to the same cascade in subsequent elaborations on the simulation, e.g. *…and could yet rescue it.*[1] Also, the metaphors fall out naturally from the conceptualization of a concrete scenario based on knowledge of life cycles, what killing entails, and what it takes to revive a dead being. This knowledge is bundled in complex frame structures, whose complexity is mapped onto target domains in metaphors.

Saying that cascade structure is *hierarchical* means that it is characterized by dependency and inheritance relations; when activating the most specific item, this by default also activates each and every dependent node in the hierarchy that is integral to the cascade as a whole. For instance, as Bergen & Chang (2000) describe, the meaning of *into* simultaneously activates trajector-landmark relations, containerhood, and motion along a path to a goal. In cascade theory, a controlling node is posited for the simultaneous understanding of those three image schemas present in the meaning of *into*.

1. http://www.telegraph.co.uk/finance/economics/11175757/Ageing-population-The-worlds-economies-depend-on-their-golden-oldies.html

Along with hierarchical inheritance relations, there exist sisterhood relations as well. When activating a cascade, higher-level structures are activated along with same-level or intermediate-level structures, which are necessary for processing the overall meaning. Cascades are present in frame networks as well as in the metaphoric mappings in which those frame networks structure the source and target domains. By virtue of the Invariance Principle (Lakoff 1990), metaphors retain much of the structural integrity of their source and target frames. Such a model aims to account for the seemingly vast differences at the surface level of linguistic expressions which, upon further investigation, reveal commonalities in terms of shared primary metaphors, shared frame structures, and shared image-schema structure. In a computational system, a cascade-based model will help with the natural language processing of metaphoric language by indicating points of convergence and divergence in particular cascades, which account for similarities and differences respectively, among metaphoric linguistic expressions.

As an illustration, two expressions may differ solely because somewhere down the inheritance network one of them profiles one part of the causal structure of some metaphor, while the other profiles a different slice of that same causal structure. For example, both *push into poverty* and *pull out of poverty* use much of the same metaphoric cascade structure revolving around the STATES ARE LOCATIONS event structure metaphor, but they diverge in specific causal inferences evoked by the lexical items *push* and *pull*, as well as in perspective. A cascade theory approach facilitates bringing out the shared information as much as possible, only minimally distinguishing divergences when necessary, as when, for instance, particular lexical meanings require doing so. This yields an economical system, one that is particularly amenable to comparative and cross-linguistic work, since languages can be similar at higher levels, because of shared experiential universals, and at the same time diverge in specific instantiations of general metaphors.

2.2 Bridging metaphor and grammar in ECG

The elaboration of ECG to include metaphoric and metonymic mappings is made feasible by the integral role that frame semantics plays in the ECG architecture. Constructions, from words to phrases to sentences, evoke the binding of increasingly complex frame networks. ECG refers to frames as schemas, which include all types of gestalt structures — those traditionally referred to as frames in the Fillmorean sense, those subsequently discussed as image schemas (Clausner & Croft 1999; Hampe & Grady 2005; Johnson 1987), and those referred to as cogs (Dodge & Lakoff 2005; Lakoff 2008a). Metaphor-specific versions of standard constructions consolidates metaphor with the detailed formal unification procedure

in ECG. Examples throughout the rest of the paper illustrate the role of frames in the ECG architecture.

The analysis in ECG proceeds as follows: at some point in the process of constructional unification, a unified construction evokes a frame that presents an opportunity for activating a metaphor. At this point, some constructional elements evoke the source domain and others the target domain of the metaphor. To mediate the mapping between the grammatical construction and the metaphoric domains, there exist one or more high-level metaphoric constructions; these constructions are in charge of directing some grammatical slots towards a source domain frame activation and others towards a target domain frame activation. Such a metaphorical construction can be seen as a high-level coordinating node: it activates several, internally complex bundles downstream from it.

This approach has emerged as a response to recent developments in the literature on the role of metaphor in grammar. Sullivan (2007, 2013) observed that "metaphorically used constructions have semantic requirements that constrain which words in the construction can be interpreted metaphorically, and which words instead indicate how the meaning of the metaphoric items should be mapped (2013: 5)". This is an important generalizable observation about how metaphors arise in constructions; that is, metaphors are predictable regardless of the particular metaphor or the class of constructions. These semantic requirements can be systematically encoded in the description of a construction, much like other semantic information. The present work is a first attempt to implement this observation formally.

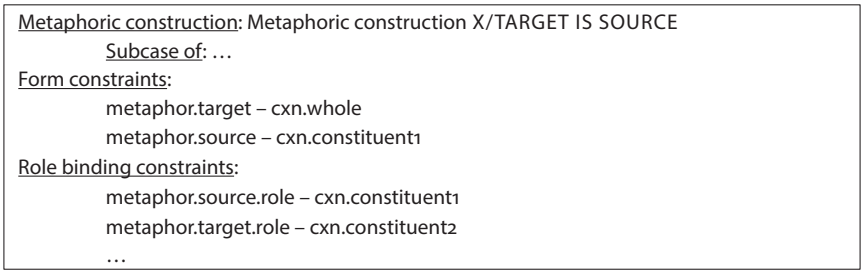

Figure 1. Schematic metaphoric construction

Figure 1 illustrates a schematized version of a metaphoric construction. The representation states that there is a construction by the name "Metaphoric construction X", here with a generic TARGET IS SOURCE metaphor placeholder. This construction may or may not be a subcase of another construction. It has form constraints listing which part of the construction evokes the source domain of the frame and which evokes the target. Notably (at least for all constructions analyzed here), the statement that the construction as a whole evokes the target domain as a whole is

true. That is a powerful statement and amounts to the assertion that a metaphoric collocation is primarily associated with its target domain meaning, with internal specifications as to how that target meaning is understood in terms of the source domain.

More precisely, this formal constraint associates the meaning of the whole construction with the meaning of the *conceptually autonomous* element; and the conceptually autonomous element, in most cases, is the target domain element. Sullivan first made this crucial observation illustrating this point by analyzing a variety of adjectival constructions. The semantically autonomous element is autonomous because it fulfills a semantic 'aboutness' requirement in the construction: it is the thing that the other constituent says something about or elaborates on and, consequently, it is conceptually independent of that elaboration (cf. Croft 1993; Langacker 1987).

The construction also specifies role-binding constraints giving linking definitions for the relevant mapped source and target domain roles, both linked to constructional constituents. Positing this type of bridge allows generalizing about the predictable behavior of common constructions when they have metaphoric meanings; it also allows implementing this generalization computationally, since role-to-role bindings are easily defined in a formal architecture.

This method of constructional representation, most notably a statement of subcase relations and of form and meaning constraints, was designed for ECG and is standard in that formalism. This work extends the notation to accommodate metaphoric expressions, and thus changes the notation accordingly.

3. The gun debate: A case study

3.1 Two models of morality

A thorough search through online blogs, news stories, transcripts, and other written media reveals that two main groups of supporters sustain the gun debate in the United States: those who favor gun rights and gun ownership and those who want to see stronger legislation on gun rights and gun ownership.[2] Each of these sides, of course, holds more nuanced opinions which strongly, moderately, or mildly promote the two main views. Existing corpus work in Critical Discourse Analysis has already found that asymmetries exist in the ways that the media represent

2. Additionally, there are those who favor the loosening of gun control legislation for purposes of preserving the US Constitution, without necessarily being in favor of gun ownership or gun use per se. Their discourse will not be analyzed in this work.

different voices in ongoing gun debate discourse (Downs 2002). The views are filtered through the perspectives and agendas of particular media outlets which over time tend to polarize in the nature and intensity of the view they represent. The current study focuses on the language that the more extreme ends of this spectrum use. Additionally, metaphoric language tends to become more salient the more extreme the discourse becomes.

The first of the two extremes of the gun debate is the individual oversight (hereafter IO) viewpoint, whose proponents prefer that the government not get involved in the rights of regular citizens with respect to their ability to purchase, bear, or use firearms. The other is characterized by a preference for government oversight of guns (GO), whose supporters generally hold that the United States needs more stringent government regulation of firearm ownership and firearm use. These stances are not unique to political discussions in the United States but reflect a more general cross-cultural tendency either to support or to oppose government involvement in what adherents view as essentially citizen affairs.

Lakoff (1996, 2008b) has noted that a connection exists between political views and the cultural models of family that their adopters employ. The GOVERNING INSTITUTION IS A FAMILY metaphor plays a vital role in all other viewpoint differences, as it results in a fundamental split between those who operate under the strict father model and those who operate under the nurturant parent model in the metaphoric subcases of that general metaphor. In a strict father model, an individual must display responsibility and discipline, both within the family sphere and in society at large. In this view, democracy provides citizens the liberty to pursue their own interests with no outside help or hindrance and with no responsibility for others. By the same logic, others should function with individual responsibility and discipline of their own, so they require no caretaking. Against this background, the federal government is a threat to liberty, as when trying to interfere with one's right to keep and bear arms, for example by imposing legislative gun regulations. In this model, guns and other weaponry allow moral (and, hence, deserving) citizens to arm themselves to protect their rights. Therefore, the Second Amendment is the constitutional right to bear arms, presumably to protect the citizens' liberty from the power of an intrusive government. Thus, proponents of this view metaphorically understand a right to a state or an activity as a clear, unhindered path to a location. To deny a right is thus to block such a path.

The nurturant parent model holds that in a democracy, citizens care about and empathize with each other; as such, they work through the government to provide public resources for all. Those public resources precisely serve freedom, specifically a freedom to enjoy commonly shared, collectively overseen resources. One of the responsibilities of the nation and its leaders (metaphoric parents) is to help keep the citizens ('children') *free* from harm. There is a notion of mutual

dependency and helpfulness between parent-nation and child-citizen. Thus, in the gun debate, legislative gun control measures are seen as protective measures against potentially real bodily harm from firearm use.

Rights are invoked in both cases. GO supporters see such freedom from harm as promoting the right to life: death by firearm impedes the path to a normally long life. Gun control legislative measures seek to prevent harm from the use of firearms of certain kinds by blocking access to those firearms. IO supporters see such blocking of access to firearms as denying the constitutional right (the unhindered path) to the bearing of arms. This view of rights is based on the Location Event Structure Metaphor, in which ACHIEVING A PURPOSE IS REACHING A DESTINATION. There is also a major metaphor for rights that is based on the metaphoric dual: the Possession Event Structure Metaphor, in which ACHIEVING A PURPOSE IS GETTING A DESIRED OBJECT. In that version, rights become possessions that should not be taken away and whose ownership should be allowed.

In what follows, the cascade-plus-grammar analysis will characterize both of these major metaphors. This paper provides a metaphor analysis via particular grammatical constructs with high frequency of occurrence in web-based news and blogs. The process began by manually tagging the text as representing IO or GO views on the more extreme side of the viewpoint spectrum as detailed above, while ignoring neutral or bi-conceptual viewpoints. The next section details the methodology and tagging conventions employed in this work.

3.2 Methods and resources

The data gathered for this study come from MN's metaphor repository (Dodge et al. 2015), a collection of computationally implemented semantic frames and metaphoric mappings linked via inheritance relations in an intricate and growing database, which MN's extraction system uses to detect linguistic metaphors from corpus texts (see Hong, this issue). The corpus, compiled locally for this purpose, consists of many blog entries and news posts manually tagged as representing IO and GO viewpoints.[3]

In addition to the tagged corpus, the system also includes an encyclopedia of metaphors and frames, much like FrameNet (Ruppenhofer et al. 2016), which metaphor analysts compiled and maintained. The database contains over 700 metaphors and metaphoric entailments and more than 500 frames that act as the source and target domains of those metaphors[4]. The relations among the frames

3. See Appendix 2 for a description of the corpus, the number of words in the corpus, and the tagging methods employed.

4. See Appendix 1 for a list of frames used in the gun debate.

that supply the source and target domains provide a structure for those metaphors, which in turn are organized in hierarchical inheritance networks. The organization that structures the database is based on frame types and frame-to-frame relations that are similar to the ones used by other metaphor and frame semantic databases, most notably the ECG grammar (Dodge 2010) and FrameNet (Ruppenhofer et al. 2016). However, much of the frame structure in MN's database was designed specifically with an eye to metaphoric frame-to-frame relations, necessitating changes to the existing databases to accommodate features unique to metaphors. Thus, MN designed its frames to handle metaphoric mapping, not to characterize scenes or aspects of grammatical structure.

For the purposes of metaphor identification, the system uses only a limited set of grammatical forms, displayed in Table 1.[5] These forms are constructs with two slots, with each slot designated for a target or for a source domain element in the metaphor. The constituent slots of the constructional forms are pre-designated for source (S) and target (T) mapping in a metaphor. The automated metaphor extractor runs over large corpora of text and encounters lexical collocations that conform to its constructional, schema, and metaphor specifications. For instance, the extractor may find the sentence in (1).

(1) But what about our children, teachers and neighbors lost to the epidemic of gun violence? These innocent victims can no longer speak.[6]

The form-detection mechanism detects the Noun-of-Noun pattern in *epidemic of gun violence* and assigns *epidemic* to the source domain and *gun violence* to the target domain of a potential metaphor. Then, this information is passed on to the metaphor-matching system, which scans the metaphor repository for the closest available metaphor. The source domain frame of that metaphor must contain *epidemic* as the associated lexical item and the target domain frame must contain *gun violence* as the associated lexical items. Since the metaphor repository does not include every possible specific metaphor in existence (or every possible source frame to target frame mapping), the matching system leverages the complex hierarchical structure among existing metaphors in the repository, a structure that is made up of more general metaphors. For instance, while *epidemic of gun violence* would evoke at its most specific level GUN VIOLENCE IS A DISEASE, such a specific

5. The details of the metaphor identification system that was used to collect this data are not the focus of the present paper. For further explanations, see Hong (this issue). A brief overview is also provided in Dodge et al. (2015).

6. http://www.courant.com/topic/religion-belief/christianity/roman-catholicism/united-states-conference-of-catholic-bishops-ORCUL000006-topic.html

Table 1. Grammatical constructions used in metaphor extraction

Metaphoric cxn	Construction description	Examples
S-noun_of_T-noun	Noun of Noun	*foundation of the pro-gun movement* *toxicity of gun control* *brush fire of gun control legislation*
T-noun_poss_S-noun	Noun's Noun	*the gun lobby's stealth assault on small-town America*
T-noun_mod_S-noun	Noun-Noun	*America's gun control shield* *gun control chokehold*
S-verb_T-dobj	Verb-Object	*combat gun violence* *erode the Second Amendment* *push gun rights*
T-subj_S-verb	Subj Verb	*gun crime skyrockets* *the gun lobby blocks legislation*
T-noun_cop_S-noun	Copular	*NRA is a blight* *the gun is a talisman* *gun control is a disease*
S-adj_mod_T-noun	Modifying Adjective	*weak gun laws* *unfettered gun rights*
T-noun_cop_S-adj	Predicative Copular	*gun control is dead* *NRA is rabid* *the US is oversaturated with guns*
S-noun_prep_T-noun	Prepositional Modifier Construction	*war over gun rights* *attack from the gun lobby*
S-verb_prep_T-noun	PP Construction	*impacted by gun violence* *slide into gun control tyranny* *obscured by anti-gun propaganda*

metaphor does not exist in the metaphor repository.[7] However, the conceptual metaphor SOCIAL PROBLEMS ARE DISEASES has a higher likelihood of existing in the repository, since it is a more general metaphor that can apply to multiple types of social problems, of which gun violence is only one. In the frame network of

7. For purposes of staying faithful to what we believe is cognitively accurate, we want to encode a few mid-level and even fewer high-level metaphors, rather than encoding many specific-level metaphors. Then MN relates specific lexical items to those few higher-level sets. Granted, in ideal terms having a database of hundreds of thousands of metaphors is best, because such a database would result in a smaller chance of error for metaphor detection in corpus texts. But MN's goal is to start with as few distinctions as possible and motivate more distinctions as needed. For instance, more distinctions are needed during the quality control phase, when the metaphor identifier fails to pick up perfectly good linguistic metaphors (false negatives) or, alternatively, produces false positives.

social problems, other frames exist, such as poverty, drug trafficking, and racism. Along the hierarchy, Violence is a subcase of Social Problem, and Gun Violence is a subcase of Violence. The metaphor-matching algorithm looks upstream in the target frame network. While the algorithm cannot return GUN VIOLENCE IS A DISEASE, it can accurately return SOCIAL PROBLEMS ARE DISEASES from the string *epidemic of gun violence*. By a process of inferential deduction on the basis of knowledge about Social Problems and Violence in general, it is possible to deduce similar inferences about Gun Violence, such as its undesirability, the need to deal with it in some organized way, the existence of victims and perpetrators, etc. All the specifications about the entailed mappings from the domain of diseases to the target domains in question are established at the highest levels of the metaphoric cascade structure. Subsequently, every specific instance inherits these specifications, a process that adds more detail about the general inferences as applicable to that specific case.

4. Metaphoric and frame cascades in the gun debate

4.1 Shared frames and metaphors

All participants in the gun debate tend to use many of the same source domains and metaphors given shared structure at the highest levels of conceptualization. That is, whether talking about GUN CONTROL AS A DISEASE or about GUNS AS A DISEASE, one is using the same cascading inferences in the source domain of those metaphors. Figure 2 represents one narrow slice of the Harm frame family as codified in MN, focusing only on some of the frames most often encountered in gun debate rhetoric and some of the associated lexical items that trigger those frames.

In the case of the Harm source domain, much of what is known about the causal structure of harm of all kinds, and the effects of harm on the affected, is established at the highest levels of the Harm frame. When talking about specific instances of harm — more precisely, instances of Physical Harm (such as stabbing or crushing) — general role relations and inferences are passed downward. For example, the harmer/stabber injures the harmed/stabbed resulting in damage/injury, with frame-specific knowledge about how that injury looks and feels. Thus, more specific instances of harm inherit the general inferences.

The source domain of Harm, especially the specific frame of Physical Affliction, is a very common source domain in metaphors about the gun debate regardless of the political stance of the speaker and regardless of whether the topic is gun rights or gun control. Examples (2)–(5) provide instances of IO and GO positions, both of which use the Physical Affliction frame.

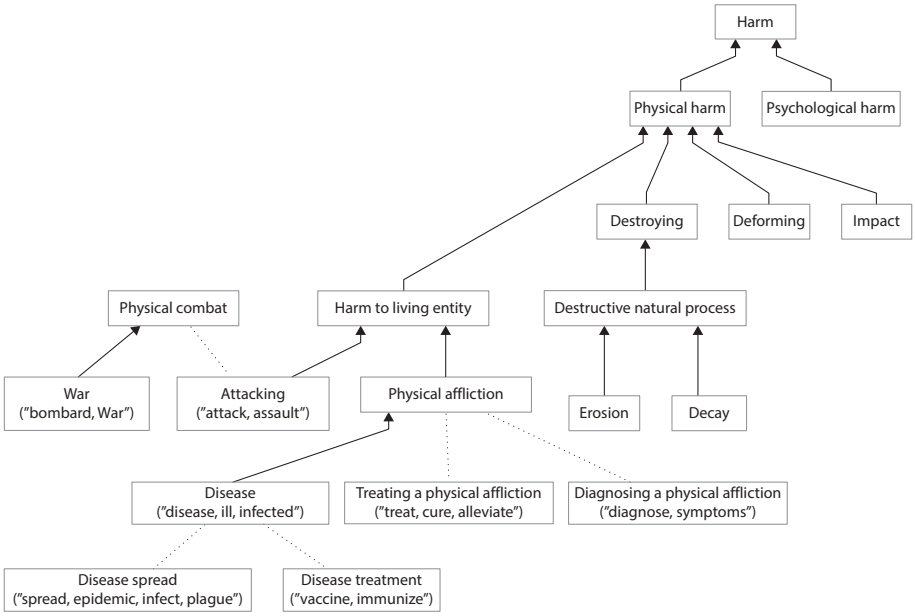

Figure 2. Harm frame network*

* Solid arrow-tipped lines indicate structural relations among frames, usually signaling that one is a subcase of the other. The dotted lines indicate non-structural relations. These denote sub-processes (e.g. Treating a Physical Affliction is a subprocess within the Physical Affliction scenario) or perspectivizing relations (e.g. Attacking is a perspective of Physical Combat). These relations are formally distinguished in the metaphoric extraction system and receive different computational weights in the metaphor extraction process.

(2) Gun trafficking… is a result of pent up demand for self-defense weapons in areas afflicted with restrictive gun controls. [8] (IO on gun control)

(3) The time has come for all gun owners to band together to defeat these overt and unprecedented attacks on the right to keep and bear arms.[9] (IO on gun rights)

(4) …some in our culture firmly believe that the Heller and McDonald decisions cured all gun control ailments because it said so in some internet gun forum.[10] (GO on gun control)

8. A pro-gun rights blog: http://extranosalley.com/?p=111

9. Recreational gun use website: http://www.ammoland.com/2012/12/gun-banners-now-want-all-guns/#axzz3T50tWFKi

10. A pro-gun control blog: http://gunfreezone.net/index.php/2013/09/19/tactical-practical-podcast-this-is-why-we-cant-have-nice-things-starbucks/

(5) …people are really looking toward those Second Amendment remedies and saying my goodness what can we do to turn this country around?[11] (GO on gun rights)

However, statistical frequency reveals some noteworthy tendencies. A sampling of some of the physical affliction-related lexical items shows that writers who generally tend to exemplify the GO stance tend also to use more of the language of physical affliction than writers adopting an IO stance.

Table 2. Physical affliction-evoking lexical items in metaphoric usage

	Government oversight	Individual oversight	total
afflict	0	3	3
ailment	0	1	1
ameliorate	1	0	1
bandaid	2	0	2
cancerous	2	0	2
cure	1	1	2
disability	1	0	1
disable	0	3	3
disease	0	1	1
disorder	0	1	1
dose	0	2	2
epidemic	29	4	33
fever	0	3	3
ill	7	2	9
illness	3	0	3
immunity	2	0	2
immunity to	1	0	1
immunize	3	0	3
injuries	1	0	1
panacea	2	0	2
plague	16	3	19
rescription	2	2	4
rashp	0	1	1

11. Spoken by Nevada Republican Senate nominee Sharron Angle: http://talkingpointsmemo.com/dc/angle-i-was-speaking-broadly-about-second-amendment-remedies

Table 2. (*continued*)

	Government oversight	Individual oversight	total
recover	3	13	16
recovery	0	2	2
relieve	0	1	1
remedy	5	0	5
scourge	2	0	2
scar	9	0	9
sickness	0	1	1
symptom	0	1	1
syndrome	0	1	1
treat	15	6	21
unhealthy	0	1	1
wound	1	1	2
Total	108	54	162

Note that the GO viewpoint mostly concerns the threat of the uncontrolled spread of gun violence, exemplified by the frequent use of *epidemic* and *plague*, and also about 'treating' gun violence, as exemplified by the frequent use of *treat*. Similarly, all writers on the gun issue show a preference for metaphors pertaining to physical

Table 3. Competition-related lexical items in metaphoric usage

	Gun control		Gun rights		Total
	GO	IO	GO	IO	
aggressive	0	1	0	0	1
assault	2	0	1	1	4
attack	1	2	0	4	7
battle	14	3	10	8	35
beat	0	1	0	0	1
beating	0	1	0	0	1
blitzkrieg	0	2	0	0	2
challenge	1	0	0	0	1
challenging	0	0	0	0	0
champion	1	0	0	1	2
conflict	0	0	0	0	0
conquer	0	0	0	0	0

Table 3. (*continued*)

	Gun control		Gun rights		Total
	GO	IO	GO	IO	
defeat	2	3	0	0	5
defender	0	0	1	4	5
defiance	0	0	0	0	0
defy	0	0	0	0	0
enemy	0	0	0	1	1
fight	9	9	5	8	31
fighting	0	1	0	0	1
foe	0	0	0	0	0
gamesmanship	0	0	0	0	0
hostility	0	0	1	0	1
kick	0	1	0	0	1
lose	2	3	1	5	11
loser	0	1	0	0	1
onslaught	0	0	0	1	1
opponent	20	13	0	2	35
opposers	1	0	0	0	1
opposition	11	6	0	0	17
play	0	1	0	0	1
plot	1	0	0	0	1
raid	0	1	0	0	1
resistance	0	0	0	0	0
revolution	0	0	0	0	0
strategy	2	3	0	0	5
strike	1	0	0	0	1
struggle	0	0	0	0	0
supporter	14	17	7	9	47
tackle	2	0	0	0	2
trump	0	0	0	1	1
victory	0	0	0	1	1
war	4	6	0	2	12
warrior	0	0	0	0	0
weapon	1	1	0	0	2

Table 3. (*continued*)

	Gun control		Gun rights		Total
	GO	IO	GO	IO	
win	0	2	0	0	2
winner	0	0	0	0	0
Total	89	78	26	48	241

competition, specifically aggressive competition such as attacking, combat, and war, but also competitions such as games and sports.

(6) The gun lobby again will likely trump common sense and peoples' safety.

(7) Attacks on guns are attacks on personal sovereignty to undermine the power of the People to remain in control over the country.

(8) "Gun Wars: The Struggle Over Rights and Regulation in America"[12]

Table 4. Similar Legislation and Advocacy metaphors across viewpoints

		GO viewpoint examples	IO viewpoint examples
legislative action is (caused) motion	gun control legislative action is (caused) motion	*liberal groups worked to block the gun rights bill in Ohio legislature* *the courts will uphold gun control legislation*	*anti-gunners want to push gun control onto us* *gun control laws restrict citizens' rights to protect themselves* *gun control laws enable more crime* *anti-gunner Dianne Feinstein & Barbara Boxer push gun confiscation through the Pause for Safety Act* *squash gun control bills*
	gun rights legislative action is (caused) motion	*lax gun laws allow terrorism in the US* *lax gun laws lead to more gun violence*	*push to expand gun owner's rights* *the president could try to squash pro-gun legislation* *awesome pro-gun legislation is on the fast track*
advocacy is physical combat/war/attacking	gun control advocacy is physical combat/war/attacking	*gun control advocates were met with strong resistance* *war over gun contro'* *combat gun violence*	*gun control advocates attack our right to own guns* *fight against gun control*
	gun rights advocacy is physical combat/war/attacking	*the gun lobby has squashed federal funding* *power of the gun lobby*	*Republicans will fight to defend gun rights* *battle over gun rights*

12. http://gunwars.news21.com/

The use of competition frames is also subject to frequency fluctuations, with the topic of gun control tending to exemplify this family of frames (gun control: n=167; gun rights: n=74); the divide among speakers does not seem to be quite as sharp as in the previous comparison (GO: n=115; IO: n=126).

Whether the discourse favors gun control or gun rights, discussions on legislation and advocacy more generally show the use of many of the same metaphors. These include, but are not limited to, the general metaphors shown in Table 4, each listed with examples from their respective perspectivized special cases for the two main viewpoints. In general, the discussion of advocacy (including lobbying) tends to evoke the ARGUMENT IS WAR metaphor uniformly, while legislation tends to evoke a metaphor of Motion or Caused Motion uniformly, depending on the profiled causal process.

Thus, by examining the frequency of source-frame lemma collocations with various target-frame lemmas, a picture of how metaphors tend to cluster in a particular cultural or political domain begins to emerge. Additionally, thanks to corpus metadata, tagging for the distribution of these metaphors among speakers of differing political viewpoints is possible, as is finding patterns in their general concerns with respect to an issue, e.g. a tendency to talk more about issues of legislation, lobbying, and rights.

Nevertheless, important fundamental differences in political stances, with roots in the more complex metaphoric structures underlying the surface statistical data, do exist. Stopping at the numbers outlined in Tables 2 and 3 above precludes addressing some of the most interesting questions, such as the following: Why should these metaphors, rather than others, occur at all in the domain of the gun debate? Why do the observed similarities and differences in the linguistic manifestation of two very different concepts — gun control and gun rights — exist? And what, if any, is the connection between the writer's personally held viewpoint and the metaphors s/he is likely to select when addressing either gun control or gun rights?

The next sections detail how MN's system helps analysts delve deeper into the internal metaphoric structure of particular choices of linguistic items. Specifically, these sections present the findings, facilitated by this approach, about the core differences between IO and GO viewpoints, findings that are generalizable across multiple linguistic metaphors and collocations.

4.2 A focus on rights

When considering the use of gun-rights and gun-control metaphors, one of the most striking differences lies in the persistent focus on the very notion of rights. In particular, gun-rights proponents emphasize the right to own and use guns, while gun control proponents emphasize the right to live without the threat of gun

Table 5. Metaphoric mentions of 'gun rights' by both IO and GO writers*

Frame family	GO	IO	Total
Body schemas	14	12	26
Crime schemas	4	11	15
Disease schema family	15	6	21
Endangerment schemas	22	10	32
Fluid schema family	9	5	14
Food schema family	3	3	6
Force schemas	8	7	15
Forced movement schema family	14	12	26
Guided motion schema family	9	6	15
Harmful encounters schemas	32	22	54
Internal motion schemas	13	9	22
Machine schemas	4	2	6
Magic schemas	0	0	0
Motion impediments schemas	26	62	88
Natural process schemas	21	13	34
Object schemas	39	47	86
Physical combat schema family	79	129	208
Physical properties schema family	4	5	9
Position schemas	5	6	11
Protecting schemas	70	95	165
Translational motion schemas	27	51	78
Total	418	513	931

* This count includes both instances of 'gun rights' and 'Second Amendment rights', whereas Table 3 includes only the former.

violence. Statements such as the following from an online news source capture the GO viewpoint: "I will always argue for the right of 'the people' to own firearms, but I also know that other 'people' — who may or may not think differently — have the right to 'life, liberty, and the pursuit of happiness.'"[13] Such an explicit statement is relatively rare, leaving the impression that GO supporters do not concern themselves at all with issues of rights. Results from a data-gathering endeavor that looked exclusively for particular collocations involving rights would lead the

13. "'Assault rifles' a place to start much-needed discussion", by Larry Simoneaux: http://www.heraldnet.com/article/20120730/OPINION04/707309975

analyst to conclude erroneously that only IO proponents address issues of rights, since frequently gun rights-related metaphors are linguistically explicit and hence include an overt conceptual metaphor. However, as the quote above demonstrates, this conclusion could not be further from the truth. Instead, while both IO and GO proponents are evidently concerned with protection and promotion of rights, only gun-rights proponents use conventionalized metaphoric language that communicates those views. Expressions such as *protect our gun rights*, *they can't take away our gun rights*, *they're destroying our Second Amendment rights* occur repeatedly in print sources. In fact, mention of gun rights, regardless of the metaphor source domain, occurs more often in tagged texts contributed by IO writers than in those by GO ones, in addition to their overall high frequency.

At the same time, conventional and repeated metaphoric language expressing the desire for protection of the right against gun violence seldom occurs, even though those metaphors exist in the minds of gun-control proponents as much as they do for gun-rights proponents.

At its core, the issue of guns taps into a deeper concern about the protection of rights for all involved, employing the general metaphor family of Rights for the target domain. Rights frames are in turn metaphorically understood in terms of a number of source domain frames pertaining to the protection and ownership of physical possessions and physical territories, all grounded in the Object Event Structure Metaphor system. As a frame, Rights is a general category grouping. In the organization of the target frames subsuming all kinds of rights of general interest in American society, specific kinds of frames can be grouped under the more general category of Rights.

There are multiple links, especially between more general and more specific frames, because target domain frames — being frames that are highly shaped by socio-cultural, political and personal factors — are less clear in their hierarchical organization than frames that usually end up in the normally concrete source domain of a metaphor. The fact that target domain frames are relationally malleable is a direct reflection of the differing worldviews and attitudes of speakers. For instance, the right to own guns can be framed in the mind of any speaker either as a

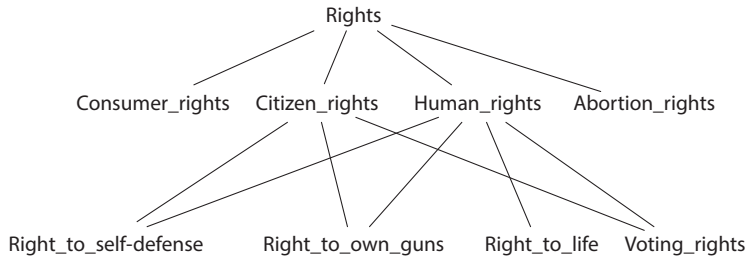

Figure 3. Rights frames network

citizen right or a human right depending on whether the speaker believes the state has authority in endowing him/her with that right[14]. For this reason, target frames of metaphors are usually contested concepts and can be variably interpreted depending on the particular inclination of the metaphor's user or audience.

At the same time, frames that surface in the source domains of metaphors are less subject to contestation than those surfacing as target domains. The frame organization of physical possession, for instance, has several dimensions that most speakers agree upon regardless of the speakers' worldview. Thus, speakers agree that they can have, take, give, exchange, protect, threaten, value, long for, etc., a possession. That speakers interact with possessions in these ways is not contested.[15] Thus, object possession can be structured in a somewhat uncontested manner, organizing the frames of loss, gain, exchange, transfer, etc., of possessions in a network.

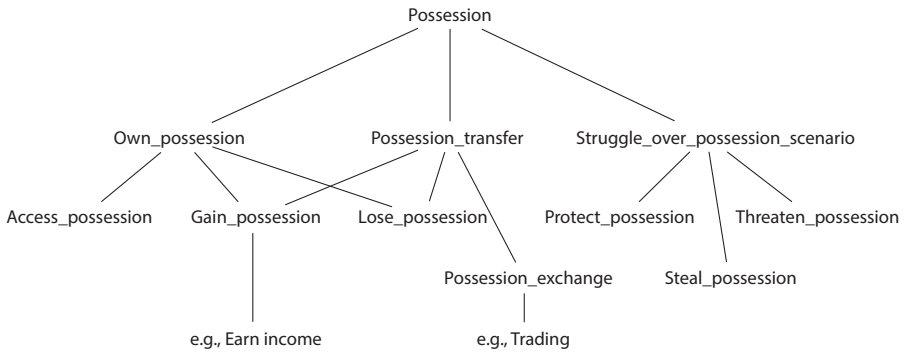

Figure 4. Possession frames network

Therefore, saying that the metaphor RIGHTS ARE POSSESSIONS is manifest in the gun debate means that the source domain provides a complex of frames and inferences that all sides of the debate are likely to agree on, one whose logic all sides

14. Incidentally, this distinction — between a particular right being fundamentally a human right vs. being a citizen right — is at the heart of many modern socio-political issues, including abortion rights, gay marriage rights, and voting rights. Proponents of, say, abortion rights argue that these are fundamental human rights that cannot be trampled. This contrasts with how challengers might see them, which is as more flexible citizen rights that can be changed with a mere change in legislation. Target domain frame relations — the links one uses to connect a particular instance of some issue to a more general conceptualization of that domain — are important indeed.

15. Note that this statement does not suggest the impossibility of contesting the circumstances surrounding particular instances of possession, i.e. whether or not something actually belongs to someone; nor does the statement preclude debate over the cultural dictates of entitlement. Rather, the statement is about the invariance from person to person of the frames and force-dynamics relating to direct interaction with any type of item that is thought of as a possession.

understand. Sides differ in how they map those inferences from the established and agreed-upon structure of the source frame to the somewhat differing relational composition of the target frame.

However, regardless of how an individual interprets the notion of rights, a generalization exists in the form of an overarching metaphor that lends its complex inferential structure and role-mappings to all subsequent incarnations of that general metaphor. In the gun debate, the overarching high-level metaphor shared between IO and GO is RIGHTS ARE POSSESSIONS. However, in specific instantiations that distinguish the two sides of the debate, IO is represented by the GUN RIGHTS ARE POSSESSIONS subcase, while GO is represented by the RIGHT TO LIFE IS A POSSESSION subcase. Sentence (9) exemplifies the GO position as focused on the right to life.

(9) …his face flushed, eyes wet with grief, he lambasted "craven, irresponsible politicians, and the NRA" for enabling his son's death. "They talk about gun rights; what about Chris's right to live?"[16]

Speakers may agree on the source domain, depicted in its entirety in Figure 4, while disagreeing on the specific target domain frames in question, i.e. which link under Rights (Figure 3) they employ. The result is that both types of speaker use the same general metaphor employing all of its inferences with respect to possessions, yet follow different binding paths in the specific metaphors that each applies. They differ in terms of which specific target-frame relation they follow to the general Rights frame, and in which source domain sub-frame they consequently use. In other words, they differ on whether they think of their rights in terms of enjoying a current possession, seeking a possession they don't yet own, or protecting a possession they own which is threatened by outside forces.

Overall, both gun rights and gun control supporters agree that rights in general are valuable possessions that they must guard against external threats. They differ in terms of their beliefs about who poses the threat, who can protect their rights against that threat, and what constitutes the entity under threat, (namely, their right to life or their right to own guns). Since metaphors are bundles of mappings, and the mappings reveal the internal metaphoric structure, the general metaphor is stated in Figure 5 with the role-to-role mappings, in addition to the two subcases of the general metaphor.

Figure 5 also lists the metaphoric entailments associated with the general metaphor. These entailments derive from the inferential structure of the source domain frame of Possession, which the mapping process subsequently preserves in the target domain. That is, reasoning about the source domain in terms of having,

16. http://www.economist.com/blogs/democracyinamerica/2014/06/gun-control-america

	RIGHTS	ARE	POSSESSIONS
Mappings:	rights_self		possessed_object
	rights_worth		possession_worth
	rights_enjoyer		possession_owner
	rights_bestower		possession_giver
Metaphoric Entailments:	enjoying rights		owning a possession
	valuing rights		valuing a possession
	getting/taking rights		getting/taking a possession
	protecting rights		protecting a possession
	threatening rights		threatening a possession
	…		…
Subcase 1 (IO):			
	GUN RIGHTS	ARE	POSSESSIONS
Mappings:	gun_rights_self		possessed_object
	gun_right_worth		possession_worth
	gun_rights_holder		possession_owner
	gun_rights_bestower		possession_giver
Subcase 2 (GO):			
	RIGHT TO LIFE	ISA	POSSESSIONS
Mappings:	right_to_life_self		possessed_object
	right_to_life_worth		possession_worth
	right_to_life_holder		possession_owner
	right_to_life_bestower		possession_giver

Figure 5. General metaphor cascade for Rights

giving, and taking possessions amounts to transfering that reasoning process to thinking about rights. The metaphoric entailments introduced at the general level of the metaphoric cascade trickle down to the subcases, such that reasoning about gun rights and the right to life occurs in much the same way as reasoning about rights in general.

Establishing entailments at a higher level allows for a more efficient inferential transfer system, since there is no need to restate entailments and mappings that already exist at the root nodes of the cascade also at lower levels. Note, however, that the more specific levels may introduce constraints on the manifestation or, at the very least, frequency of occurrence of particular entailments. For instance, typical mentions include gun rights being 'taken', but less so right-to-life being taken (again, a contested issue). Part of the reason for this involves obstacles to entailment transfer that the target domain itself poses: if the target domain frame of right-to-life is conceptualized as an intrinsic and inalienable, fundamentally human, right, then anyone's taking it away is unlikely.

An important side note must address the role of metonymy in the meanings of these expressions. Expressions like *they tried to take away our guns* and *we must protect our guns* lie in a deeply embedded metonymy within the specific metaphor that IO supporters adopt. Namely, while gun rights are metaphoric possessions,

it is also true that guns are actual physical possessions. Nevertheless, statements such as *they tried to take away our guns* are metaphoric, not literal. This situation results from a metonymic link between the physically possessed guns and gun rights as metaphoric possessions. Since guns are a role in the gun rights frame, the metonymy holds frame-internally in the target domain of the metaphor GUN RIGHTS ARE POSSESSIONS. Thus when uttering *don't take away our guns*, a speaker is more likely to be referring to the denial of gun ownership rights via judicious or legislative action, rather than showing worry that someone may actually knock on their door and physically take the gun from their house (although that can also certainly happen in some cases).

Frame-specific and metaphor-specific cascades play an important role in speakers' use of and listeners' parse of these metaphors. In the current case, knowledge about possessions in general is contextualized in a much larger network of inferential relations, spanning multiple levels of metaphoric specificity. The metaphor GUN RIGHTS ARE POSSESSIONS actually figures into one particular, highly specific slot in a much more complex network depicted in Figure 6. The diagram details the immediate structure surrounding the metaphor GUN RIGHTS ARE POSSESSIONS in the more general Object Event Structure metaphor cascade (for the differences between this and the Location Event Structure metaphor, see Lakoff & Johnson 1999). Once characterized as Possessions, gun rights or rights in general can be reasoned about in terms of the many types of frame-interactions one can have with Possessions. The metaphor group at the top of Figure 6 characterizes target-domain inheritance relations: the lowermost metaphors in that group are

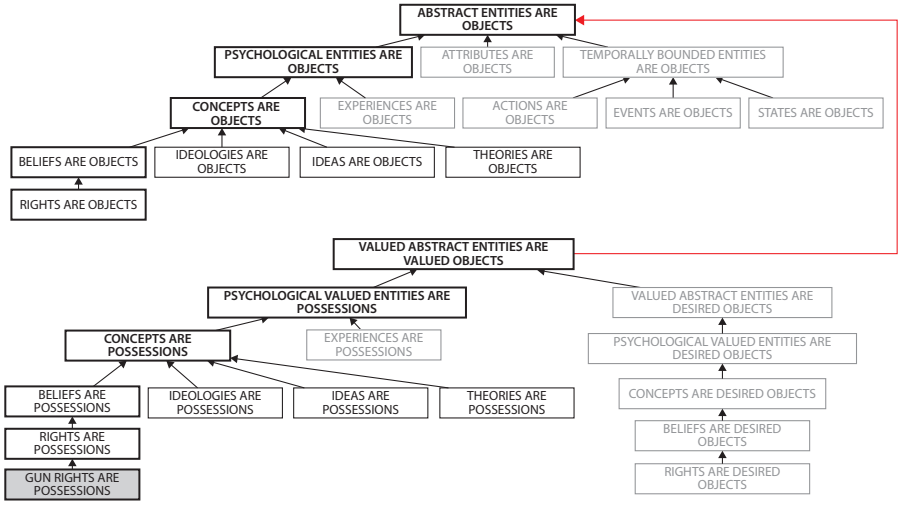

Figure 6. The Object Event Structure metaphor cascade

successive subcases of the metaphors above them. The top of the network shows the most schematic representation possible: ABSTRACT ENTITIES (of whatever kind) ARE OBJECTS. The lower diagram section is itself a subcase of the higher one and adds to the inferences about objects being valued, encompassing both possessions (objects one already possesses) and desired objects (objects one does not possess but wants)[17]. The entailments in these latter two sub-paths are very different from each other: if it is a possession that someone has, s/he seeks to keep it; if someone does not have something that s/he wants, then s/he seeks to obtain it. A series of successive subcase relations in the source domain characterizes the bottom section as a whole (a subcase of the top section). That is, the higher levels include instances of valuable objects, but the subcases are increasingly specific instances of possessions going lower in the diagram. The difference between Possessions and Objects lies in the idea of Ownership that possessions entail as opposed to valued objects that are either not owned or not ownable. At each point, both in the target and in the source subcase relational structures, two principles make cascades effective in the consistent interpretation of diverse linguistic metaphors: a) additional inferential information is added as the subcases get more specific, and b) the inferences introduced at the higher levels are simultaneously active when their successive child metaphors are active.

In brief, what we know about the event structure of a metaphor in a cascade, we also know about all metaphors below it; and what we know about the event structure of the source domain, we also know of the target. This layering accounts for the following metaphoric entailments of the general metaphor RIGHTS ARE POSSESSIONS: ACQUIRING RIGHTS IS ACQUIRING A POSSESSION, HAVING A RIGHT IS HAVING A POSSESSION, BEING DEPRIVED OF A RIGHT IS BEING DEPRIVED OF A POSSESSION, among many others.

The main point of this exposition about metaphoric cascades is that specific instances of metaphors, such as the metaphors encountered in texts about the gun debate, need not restate the same complex entailments pertaining to states, events, causal dynamics, and frame-based complexity (such as how they interact with Possessions). Rather, all of these entailments are established only once at a very high level in the cascade network and apply to every subsequent subcase introduced into the structure. Thus, fitting every new linguistic collocation, however novel, into an existing system is easy.

17. Throughout this work, the frame of Possession inherently includes the inference that the possessed object is valued; 'valued possession', thus, would be a redundancy.

4.3 A focus on social problems

A second difference lies in the use of a particular set of metaphors by one side of the debate compared with that of the other side. In particular, the metaphoric language evident in gun-control discourse mostly focuses on the issue of gun violence and how the effects of gun use result in a myriad of social problems, such as rampant crime, accidental deaths, gang violence, and violence involving children, among many other problems.

(10) In the summers in Richmond, where I completed my residency, the trauma bay was also plagued by weekly gun violence.[18]

(11) The NRA, says Pittsburgh police detective Joseph Bielevicz, takes every chance it gets to stymie even reasonable efforts to combat gun violence.[19]

(12) Could you have done more to stop the spread of assault weapons and gun violence over the last four years?[20]

As these examples show, usually gun-control discourse uses the GUN VIOLENCE IS A DISEASE / GUN USE IS A DISEASE metaphor extensively, by virtue of conceptualizing gun violence and gun use as a social problem, thus employing a more general SOCIAL PROBLEMS ARE DISEASES metaphor[21]. In this way, gun control proponents focus on the effects of gun use, then seek remedial action to lessen that undesirable effect in the form of stricter regulations governing gun ownership. This derives from a metaphoric cascade, with the general metaphor NEGATIVELY EVALUATED CONDITIONS ARE HARM at the top.

Figure 7 minimally represents the cascade needed to understand expressions like *gun violence epidemic*. This expression instantiates a specific metaphor, and the inferences compiled for its understanding are added at different levels of the cascade. Figure 7 displays a metaphoric expression (on the right of Figure 7) that instantiates each cascade level. Every lower level is linguistically manifested using the source domain lexemes of the higher levels, but the reverse is not true (the highest levels have no linguistic instantiation, because they are too schematic).

18. http://www.readthehook.com/109026/surgeons-plea-gun-control-public-health-issue

19. http://www.salon.com/2012/07/23/nra_a_lobby_for_criminals/

20. http://www.foxnews.com/opinion/2012/09/28/terrifyingly-large-questions-for-obama-and-romney/

21. There is a metonymic link here between GUNS ARE A DISEASE and GUN VIOLENCE IS A DISEASE. See Stickles et al. (2014) for an elaboration on the additional mechanisms needed to resolve the metonymy in ECG.

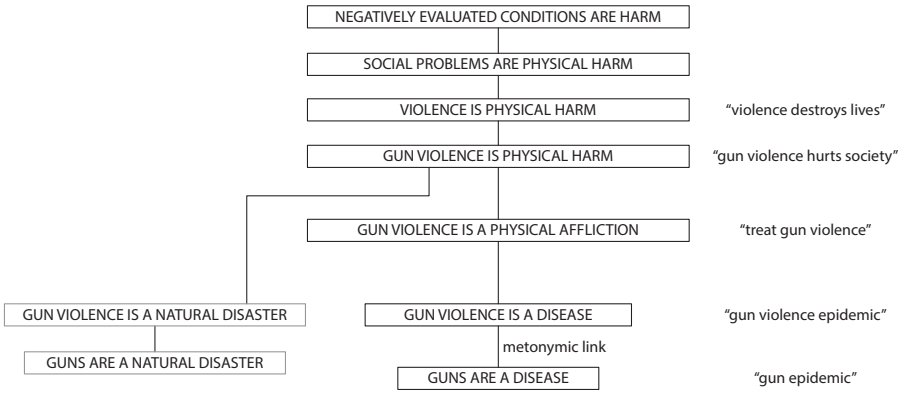

Figure 7. Gun violence metaphors cascade

Thus, there are at least two big differences in metaphor use between the two sides of the gun debate. First, in terms of the implication of rights as part of the gun debate, the two sides share a common perspective: both are concerned with protection of rights. Yet, one side seems to be more linguistically active in realizing the same underlying set of metaphors to express their views. Second, gun-control discourse focuses on the effects of gun use drawing on a metaphor system that conceptualizes its target domain as a social problem.

A more important generalization about this difference is worth stating: namely, this fundamental difference between IO and GO viewpoints results in different views of what is harmful. Because of IO's valuing of gun rights, anything that threatens the right is harmful, including governmental entities that regulate gun ownership policies in a way that infringes upon gun rights. In contrast, GO's concern is more about the harmful effects of gun possession than about gun rights; GO proponents focus on both the immediate negative consequences of gun use (which are non-metaphorically harmful) and on societal and less context-immediate consequences. The position-takers share high-level models of Rights, as well as of Harm, but the metaphoric cascades that distinguish them at the lower levels follow different paths. Figure 8 summarizes the two perspectives with different binding paths: bold binding lines represent IO's binding path; and regular lines represent GO's binding path. Dotted lines represent shared bindings to the higher level of Rights.

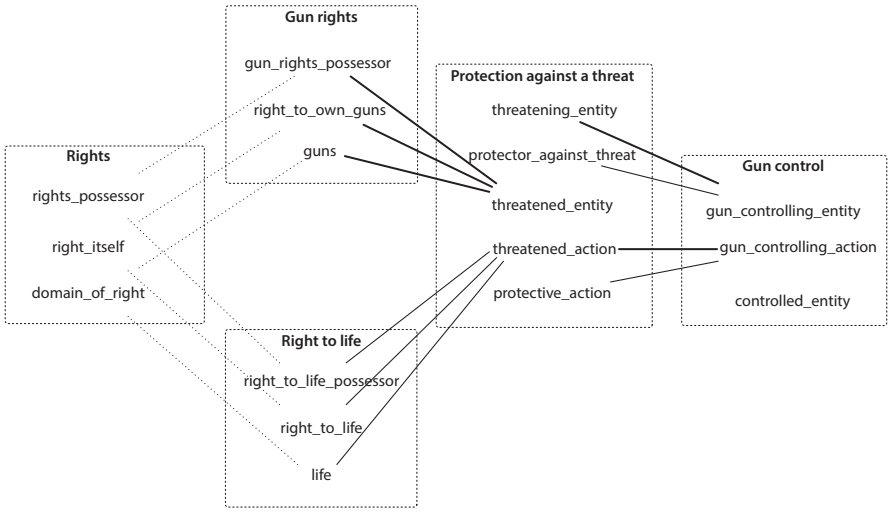

Figure 8. Cascade of bindings across frames resulting in different views of harm

5. Metaphors meet constructions

5.1 *Gun-grabbers* and *gun-rights grabbers*

Given the metaphors and frames discussed in Section 4, invoking construction analysis will shed more light on the differences in worldviews. One particularly frequent metaphor is realized in the expressions *gun-grabbers* and *gun rights grabbers*, a set of collocations with an inherent point of view. The metaphor expresses IO supporters' fear of excessively stringent governmental policy that will diminish gun ownership rights in the future.

(13) Have the gun rights grabbers ever stopped to think about it?

(14) Have gun grabbers awakened a sleeping giant?[22]

In (13) and (14), the *grabbers* are metaphorically seizing gun rights. *Grabber* evokes the Gain possession frame, but *gun rights* is an abstract concept and does not match the object-type role of acquired possession. How can a human grab a non-physical object? The general metaphor CONCEPTS ARE PHYSICAL OBJECTS supports the metaphoric reading of *gun rights* as acquirable objects; the metaphor maps the source domain of physical objects onto the target domain of intangible concepts, of which rights is a subcase.

While (13) evokes a straightforward metaphoric mapping, in (14) the 'grabbed' noun, *gun*, is of type object. In this case, *gun-grabbers* might have a literal reading

22. http://www.liveleak.com/view?i=06b_1360130561

in which actual guns are seized. Nevertheless, here the noun *gun-grabbers* is again metaphoric capturing the speaker's fear of loss of rights rather than loss of a physical object. In this context, *gun* is metonymic for the gun-rights role in the Gun Rights frame in the entailed metaphor RESTRICTION OF GUN RIGHTS IS REMOVAL OF PHYSICAL OBJECT, thus providing the same metaphoric interpretation as (13). *Gun* evoking *gun rights* is a frame-metonymy, whereby an artifact that is instrumental in and the focus of a belief system evokes that belief system. Figure 9 illustrates the metaphor CONCEPTS ARE PHYSICAL OBJECTS, its special case GUN RIGHTS ARE PHYSICAL OBJECTS, and an entailment in the latter RESTRICTION OF GUN RIGHTS IS REMOVAL OF PHYSICAL OBJECTS. An arrow from the 'guns' role to the 'gun-rights' role in the Gun Rights frame represents the metonymic link necessary to simulate (14) correctly.

Once the metaphor is fully simulated at the level of the local construction, it further combines with additional metaphors that additional lexical material introduce as the expression becomes embedded in larger structures. Consider another example involving *gun-grabbers*:

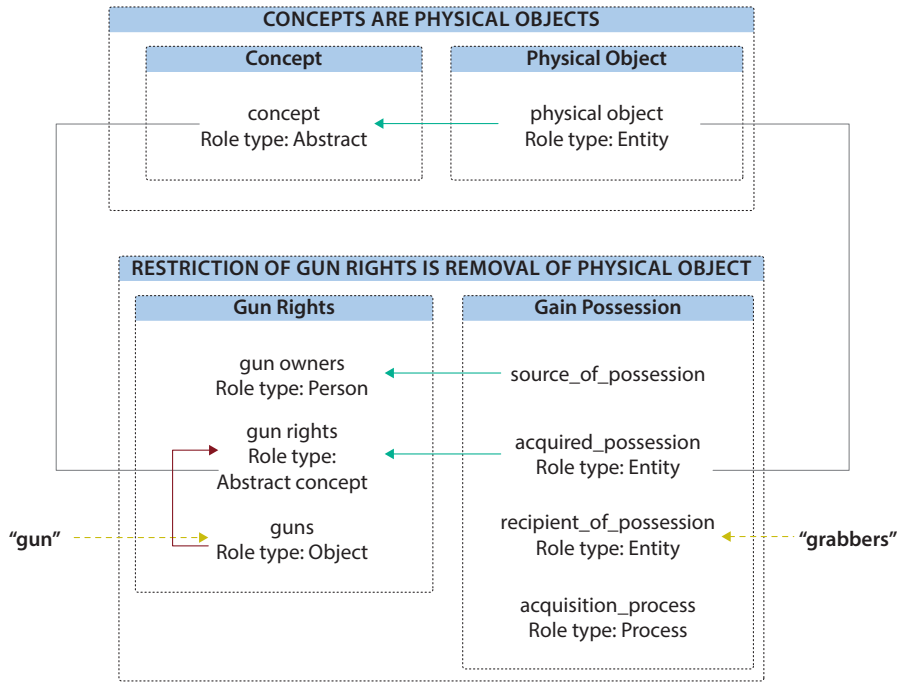

Figure 9. Mappings and bindings for *gun rights* and *gun-grabbers*

(15) gun-grabbers are a blight on society[23]

Even though the noun *gun-grabbers* is internally metaphoric and internally complex in having both source and target elements, as a whole it is interpretable in terms of the target domain at the metaphoric general level. The target domain frame of Gun Rights Regulation now acts as input to the next metaphor that *blight* introduces, specifically GUN REGULATION IS A DISEASE, here conceptualized as a subcase of SOCIAL PROBLEMS ARE DISEASES.

Constructionally, at the broadest clausal level a copular [NP1 is NP2] construction coordinates bindings across two metaphors: NP1's RESTRICTION OF GUN RIGHTS IS REMOVAL OF PHYSICAL OBJECT and NP2's GUN REGULATION IS A DISEASE. NP2's internal structure evokes the second metaphor by virtue of its complex NP status, Noun-on-Noun, with N1 signaling the source domain and the N2 signaling the target.

As Figure 10 shows, the metaphoric complex NP construction is responsible for binding the constructional constituents of NP2 to the metaphor GUN REGULATION IS A DISEASE. A second metaphoric construction, the metaphoric copular construction at the clausal level, binds the first and second metaphors together. It binds the shared target domain frame, i.e. Gun Rights Regulations, to the correct

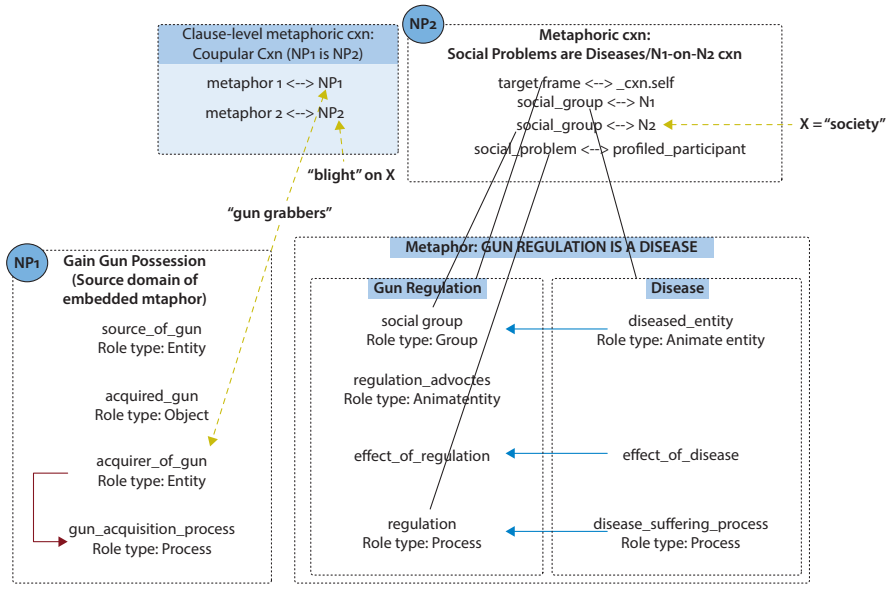

Figure 10. Metaphoric constructions in a complex unification

23. http://www.usmessageboard.com/current-events/331773-ok-gun-grabbers-you-have-your-mandatory-gun-registration-24.html

NPs in the copular construction and provides the viewpoint of Gun Regulation as a Social Problem. *Gun grabbers* must be metaphorically realized already, as in (14), to evoke the gun_regulation_process metonymically, which then maps onto the disease_process in the second metaphor. The copular construction takes an existing metaphoric target domain as input to NP1 (*gun-grabbers*) via the regulation role (type: Process) and links it to NP2 (*blight on society*) by coordinating the target domain with the right source domain in the appropriate constructional slots, precisely by using a metaphoric construction that performs these bindings.

5.2 Two cascade paths for the same construct: *gun control*

A second example illustrates a similarly detailed constructional analysis resulting in a dual understanding of the same collocation: *gun control*. Again, as with the issue of Rights, the duality is a result of the frame-relation path adopted in the target domain of the metaphor. *Gun-control* is metaphoric but it could be interpreted in two ways, depending on which frame *gun* evokes and how it links metonymically in that frame.

One understanding is that gun control is the legislative control of gun rights and gun ownership policies, an interpretation typical of the IO viewpoint. For this reason, the term *gun control* is ominous for those holding the IO perspective and causes fear of loss of rights in those inclined to interpret the expression via that metonymic link. Another understanding is that gun control is the legislative and punitive control of gun violence by means of surveillance and stringent supervision of the purchase and use of guns. In this view, gun control is good because it will result in less gun violence eventually. GO supporters, and in general, those apt to associate guns with violence, are likely to hear *gun-control* with a positive and hopeful connotation. They are likely to show support for any official policies and rhetoric touting the benefits of gun control. Figure 11 illustrates the bindings and metonymies involved in the GO understanding, and Figure 12 does the same for the IO understanding.

The IO and GO viewpoints share much of the same structure with one important difference: the top-level shared metaphor CONTROL IS PHYSICAL CONTROL is activated via one of its subcases, namely, CONTROL IS OBJECT CONTROL. That metaphor binds with RIGHTS ARE OBJECTS to yield the complex metaphor CONTROL OF RIGHTS IS PHYSICAL OBJECT CONTROL. This binding results in a different specific metaphor for the IO viewpoint when encountering the expression *gun control*. This difference in pathway activation patterns is unconscious and only surfaces very rarely in discourse. When it surfaces, it does so in the form of explicit cancellation or negation of those inferences in subsequent statements. For example,

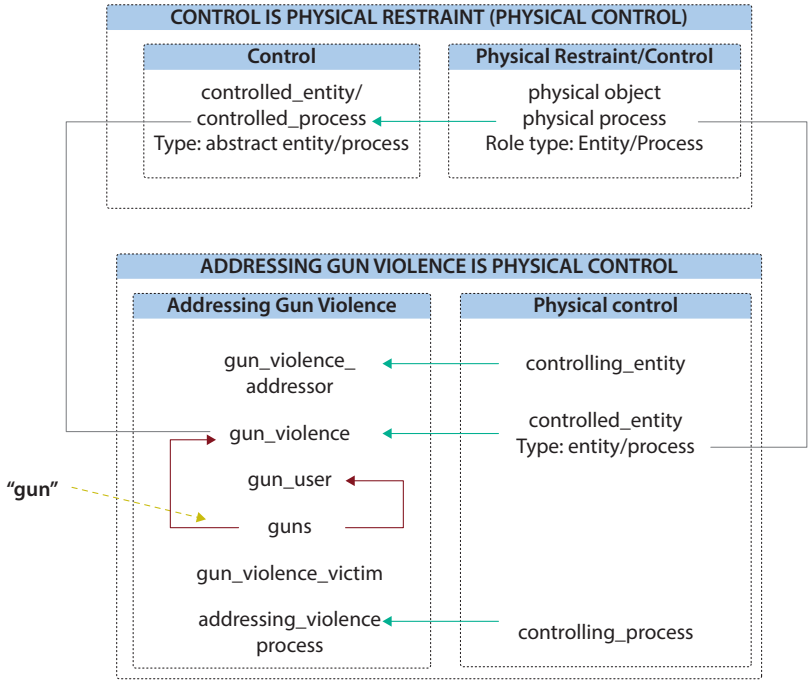

Figure 11. Cascade for ADDRESSING GUN VIOLENCE IS PHYSICAL CONTROL (GO viewpoint)

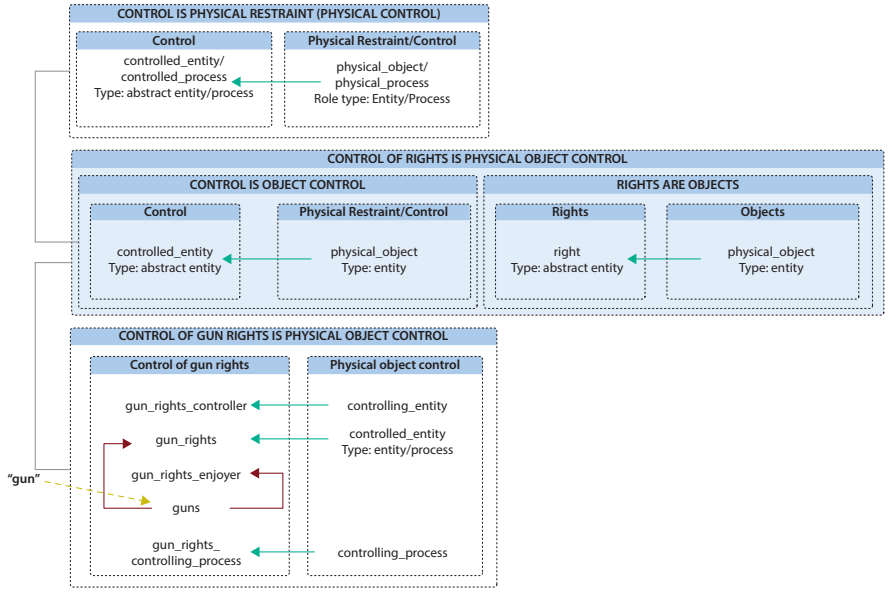

Figure 12. Cascade for CONTROL OF RIGHTS IS PHYSICAL OBJECT CONTROL (IO viewpoint)

consider an IO speaker's explicit refutation of the GO's operative underlying metaphor ADDRESSING GUN VIOLENCE IS PHYSICAL CONTROL, as in (16).

(16) Remember that gun control is attacking not guns, and it's not attacking violence; it is attacking individual sovereign authority which is backed by lawful force.[24]

Example (16) skillfully reframes gun control from an issue of the individual's concern for safety and suppression of violence (via the metaphor ADDRESSING GUN VIOLENCE IS PHYSICAL OBJECT CONTROL) to the speaker's intended metaphor, CONTROL OF RIGHTS IS PHYSICAL OBJECT CONTROL. In the speaker's viewpoint, generic control takes the form of an attack on a fundamental right that a sovereign authority imbued to the right holder, backed by law and codified in the US Constitution.

Example (16) about *gun control* illustrates a case in which the exact same linguistic expression evokes multiple metaphors depending on the political and moral viewpoint of the speaker or listener. A search for surface source frame — target frame collocations as a method of metaphor analysis would not uncover such rich variation in conceptual framing. In contrast, the metaphor extraction system described in this paper, coupled with a metaphoric cascade network organized in a metaphor repository, will detect multiple cascade paths upon encountering the extracted linguistic metaphor *gun control*. While the automated system cannot detect which of the two paths the writer of the text intended (or which the reader is likely to understand), it can posit the dual possibility to the analyst by making available the two cascades, as a means of narrowing down the metaphors needed to understand the expression. Further, if the system also contains a corpus that is tagged for viewpoint (as was the case for the gun debate text that MN analyzed), the system can match the candidate metaphors against the corpus metadata and narrow down the choice when presenting the results to the analyst. For instance, upon detecting that sentence (16) comes from a website tagged as primarily IO-oriented, the system will calculate that CONTROL OF RIGHTS IS PHYSICAL OBJECT CONTROL is more likely the intended metaphor.

6. Conclusions

This paper presented a sample of the data and of the analytic methods designed for MN's metaphor repository and metaphor extraction system. The innovation of conceptual metaphor theory, as grounded in the notion of cascades, underpins the

24. http://thefiringline.com/forums/archive/index.php?t-230832.html

approach adopted in MN. Specifically, cascades are packages of bindings among frames and metaphoric mappings across frames that recur in mental simulations. Several traits of cascades are noteworthy. First, typical frame-to-frame and metaphor-to-metaphor relations modeled in terms of inheritance structures from more general to more specific metaphors define these packages. Second, cascades are not only theoretically but also computationally defined and modeled and MetaNet implements them in an automated system of metaphor identification based on naturally-occurring metaphoric collocations from the wild. We have established the definition and architecture of metaphoric and frame cascades and illustrated their operation in one particular cultural domain: that of the gun debate. By virtue of this automated process and the complementary deep semantic analysis of the metaphoric networks evoked by particular expressions, we uncovered remarkably insightful conceptual patterns in the worldview-shaping cultural models, which are typical of the GO and IO camps relating to the debate on gun ownership in US political discourse. Extensions to other political and social domains are possible and easily adapted to this framework. In the future, an application of this method to data from other languages would provide a fruitful testing ground for cross-linguistic comparability of metaphors.

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Appendix 1. List of frames from the MetaNet database appearing in the Gun Debate corpus analysis and extraction (397 frames out of a total 565 in the database).

Ability to act
Absorption
Access
Access to an object
Accompany
Across
Action
Addiction
Adoption
Advocacy
Affection
Aids to downward motion
Aids to motion
Air motion
Amassing
Analysis
Anger
Animal
Animal life cycle
Antagonistic force
Argument
Artifact
Attach
Attacking
Authority
Avoiding obstacles
Awake
Awakening
Barrier
Barrier to accessing a location
Being at a High Location
Being at a location
Being at a Low Location
Being in a Bounded Region
Being in the middle of a scale
Being stable
Belief
Biological entity
Bird
Blood flow
Boat
Boat motion x-schema
Body
Body of water
Bounded region
Building
Bully
Burden
Bureaucracy
Business
Card game
Career
Causation
Cause contact
Cause to see
Caused change of state
Caused Downward Motion
Caused Upward Motion
Center periphery
Chewing
Citizen participation
Citizens
Civil social-political community
Cleanliness
Clear paths to accessing a location
Closing a portal
Communication
Community
Competition
Competitive sport
Complex physical object
Component of building
Concentration
Condition of physical object
Confinement
Consciousness
Constitution
Constructed Confinement
Constructed Restraints
Consume
Contact
Containing
Containment
Control
Corporation
Country
Crafting
Create object
Crime
Cultivation
Cut
Danger
Darkness
Death
Debt
Decay
Decision making
Decrease size
Deforming
Deity
Democracy
Desiring
Destroying
Destructive force
Detach
Difficulties in action
Directed emotion
Directed vision
Discard
Discussing
Disease
Disease spread
Disease treatment
Disgusting
Disorderly group
Dispersal
Dissect
Distant
Downward motion
Driving a vehicle
Drugs
Duration
Dwelling place
Eating
Economic resource

Economy
Edge
Education
Educational institution
Election
Emotion
Employment
Enablement
Energy
Entity
Environmental restraints
Equality
Erosion
Evaluation
Evil
Evil creature
Excess body weight
Existence
Experience pain
Extinguish
Factory
Family
Fierce animal
Finance
Fire
Firm
Fit
Fixing
Fluid motion
Food
Force
Force-application
Forced movement
Freedom
Freedom of action
Functionality
Gain possession
Gambling
Game
Gap in path
Geographic feature
Governing action
Government
Grasp
Greed
Group
Guided motion
Gun debate
Gun-rights advocacy interest group
Happiness
Harm
Harm to living entity
Health
Health treatment
Heat
Heating fluid
Hiding
Human life cycle
Hunger
Idea
Ideology
Impact
Impeding downward motion
Importance
Impurity
Income
Increase ease of accessing a location
Increase size
Ingestion
Insanity
Institution
Instrument
Investment
Journey
Judgment
Judicial action
Judicial decision-making
Killing
Land vehicle
Large geographic features
Law
Lax
Leadership
Learning
Leftover Food
Legality
Legislation enactment
Legislative action
Legislative branch
Liberal market
Life
Life cycle
Light source
Lightness
Limited resource
Liquid
Living
Loose fit
Lose possession
Machine
Magic
Market
Mass motion
Maze
Measuring
Media
Membership
Military leadership
Misfortune
Money
Moral evaluation
Morality
Motion
Motion along a path
Motion back and forth
Motion impediments
Moving backward
Moving forward
Moving into a bounded region
Nation
Natural disaster
Negotiation
Nutritious food
Object
Object insertion
Object manipulation
Object propulsion
Obscenity
Open
Operating a machine
Opportunities
Organization
Organizational leadership
Overeating
Ownership
Parasite
Parent
Part_whole

Paths out of a location
Payment
Performance
Person
Personal weapon
Pest
Physical affliction
Physical attributes
Physical combat
Physical connection
Physical path
Physical strength
Physical structure
Physical weakness
Placing in a protected location
Plant life cycle
Plants
Police
Political region
Politics
Portals
Position
Possession
Poverty
Process
Process completed state
Process end
Process start
Process stop
Protect against contact
Protecting
Proximal
Punishment
Purity
Purposeful action
Pursue
Quantity
Race
Reaching a destination
Reasoning
Regulation
Relation
Release liquid
Remove burden
Representation and decision-making
Resource
Resource container
Responsibility
Restaurant
Restore to life
Restraints
Rights
Robot
Romantic relationship
Rotation
Sadness
Safety
School
Seafaring_vehicle
Seeing
Seeing scenario
Selection
Self propelled motion
Self-defense
Separation
Servant
Servitude
Servitude authority
Shepherding
Silencing
Size
Smell
Social class
Social obligation
Society
Speaking
Speech act
Speech in society
Stability
Stable
Starvation
State leadership
Stop airflow
Stop flow of substance
Straightness
Substance
Sunken confinement
Support
Surgery
Taste
Taxation
Taxes
Temperature
Tending to plants
Textile
Theft
Theory
Thinking about
Ticket
Tight fit
Touching
Transfer scenario
Treating a physical affliction
Trespassing
Trust relationship
Tyranny
Understanding
Unstable
Upright posture
Upward motion
Using
Value
Vehicle
Vehicular accident
Vertical position
Violence
Visual obstruction
Voting
Voting rights
War
Water Confinement
Wealth
Wealth redistribution
Wealthy people
Weapons handling
Wearable disguises
Weather
Weight
Wilderness
Word
Work scenario
Worship
Zealotry

Appendix 2. Methods and statistics for manual tagging of GO and IO viewpoints

	# of words	# of Linguistic Metaphors	# of Conceptual Metaphors
Government Oversight	1,180,917	4522	53
Individual Oversight	1,407,278	4003	47

MetaNet used two data collection methods for the Gun Debate case study.

Method 1: A linguist searched for blogs expressing opinions on IO vs. GO viewpoints with a substantial number of posts, e.g. "Of Arms & the Law" (http://armsandthelaw.com) and "Progressive Eruptions" (http://progressiveerupts.blogspot.com). The linguist found 11 government-control blogs and 11 individual-control blogs. The process included filtering that aimed at keeping only posts or pages containing mentions of items like guns and second amendment. The filtering yielded two sets of documents from quite distinct points of view, all of which were on the topic.

Method 2: MetaNet queried the Yahoo! search engine with various combinations of terms related to guns and expressions of opinions, e.g. "gun control" editorial and "another Columbine". Searching for terms such as "\editorial", "\commentary", "\op ed", or "\column" generated more documents stating opinions, with 5,550 URLs collected in this way. Linguists classified 333 of them manually into GO and IO groups. These data constituted the other part of the Gun Debate case study corpus. MN has collected more than 20,000 URLs whose search results contain the word *gun*, which are now available data to expand the case study.

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