A Semantic Tool for Historical Events

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Abstract

I present a set of functional requirements for a speculative tool informing users about events in historical discourse, in order to demonstrate what these requirements imply about how we should define and represent historical events. The functions include individuation, selection, and contextualization of events. I conclude that a tool providing these functions would need events to be defined and represented as features of discourses about the world rather than objectively existing things in the world.

1 Introduction

Most work in NLP on detecting and representing events tacitly adopts a theory of events that can be traced to Donald Davidson. The advantage of this theory is that it promises to provide a solid foundation for consensus on how to define and individuate events. But that consensus will be useful for specific domains of application only to the extent that it aligns with the way events are conceptualized in those domains. In domains where events serve conceptual functions that differ significantly from the ones assumed by that consensus, it may actually retard the development of practical tools.

History is one such domain. Automatic detection of events and their coreference relations would be a powerful tool for working with and learning from collections of historical texts. But events as conceptualized by historians differ in significant ways from events as theorized by analytic philosophers. Rather than attempting to formulate an alternative theory, I instead present a set of high-level requirements for a speculative tool that would benefit from automatic detection of historical events and their coreference relations. That is, rather than looking for a foundational theory to guide the definition and representation of events, I start by envisioning a useful tool and then try to determine how events would need to be defined and represented in order to create that tool.

The speculative vision I present is a semantic tool for informing users about events in historical discourse. A *semantic tool* is any instrument that can inform its users about concepts of interest in some domain, various names or terms associated with those concepts, and relationships among concepts (Hjørland, 2007). Examples include dictionaries, gazetteers, taxonomies, thesauri, and ontologies.

I have purposefully chosen to present a highly speculative, "blue sky" vision for two reasons. First, I want to ensure the relevance of my points to the NLP community by describing a tool that would only be feasible to build given successful automatic detection and representation of historical events and their coreference relations. Second, a less ambitious vision would not as clearly demonstrate the gap separating historians' conceptualizations of events from those of analytic philosophers.

2 Individuating Events

The first requirement is *individuation*. To be able to individuate entities is to be able to distinguish them from others. Any system that consists of individual records describing entities presumes some way of individuating those entities. But in practice individuation is far from simple. Bibliographic organization, for example, is plagued by the problem of when

38

to consider two documents to be "the same". The problem is worse for conceptual resources such as events. A semantic tool consisting of records identifying and describing events needs to employ some principles of individuation. The principles need to result in records with values sufficiently different that a user can distinguish between them and select the one he wants.

Philosophers have long debated how to individuate events. The problem is a deep one, as it is related to debates over the ontological status of events. To crudely simplify these debates, I characterize two basic positions, one which takes events to be concrete individual items in the world, and one which takes events to be products of language (specifically narrative language). My goal here is not to get into the specifics of the ontological debate but only to give a sense of the spectrum of different possible approaches to the individuation of events.

2.1 Events as Concrete Individual Things

The philosopher Donald Davidson believed that the structure of our natural language reflects the structure of reality. He argued that successful communication depends upon the communicators having "a largely correct, shared, view of the world" and that, since natural language is successfully used for communication, we can reach conclusions about the nature of the world by studying natural language (Davidson, 1977, p. 244). Using this approach to metaphysics, Davidson wrote a famous series of essays on the nature of events as indicated by our use of language (Davidson, 2001). The crux of his argument was that our use of language seems to indicate a difference between events and descriptions of events. Consider the following sentences:

1. Barack Obama signed the health care reform bill.

2. Barack Obama joyfully signed the health care reform bill with 22 pens in the East Room of the White House on March 23, 2010 (Stolberg and Pear, 2010).

Davidson argued that, intuitively, we want to say that these sentences all describe or refer to "the same event." If we trust our intuition we are led to believe that there is something in reality—the event—

to which all these sentences refer. Davidson sought to bolster that intuition by demonstrating that, without the notion of an event as a concrete entity with a location in space and time, we cannot make sense of certain logical relationships among statements, for example the fact that each sentence in the list above is understood to entail the previous sentences.

Davidson argued that natural language sentences such as these can be translated into a "logical form" that captures their meanings and the relationships between their meanings. The logical form of a sentence is expressed using first-order logic. First-order logic is distinguished by its use of *quantifiers* to enable the expression of generalizations like *Everything that thinks is alive* (universal quantification) and assertions like *There is something that thinks* (existential quantification). Davidson held that sentences like the ones above existentially quantify over events. For example, the logical form of the second sentence above would be something like (paraphrasing first-order logic) *There exists something X such that it is the event of Barack Obama signing the health care reform bill, and X was done joyfully, and X was done with 22 pens*. What the logical forms of the sentences above have in common, Davidson believed, was this *X*, the event that is their shared referent and the existence of which they commonly assert, despite the different modifications that follow this assertion (Davidson, 2001a).

2.2 Events as Abstractions from Narratives

Davidson's argument, which I have not done justice to here, is a strong one and has become the mainstream position on events among analytic philosophers. Ideas like Davidson's lie behind efforts to automatically "detect" and "extract" events by analyzing texts. Certainly given sentences like the ones above, and the kinds of sentences Davidson typically uses as examples, the intuition that the sentences all "refer" to the same concrete event is strong. But consider the following sentences:

3. On March 23, 2010, with the strokes of 22 pens, Barack Obama transformed the United States into a socialist country.

4. On March 23, 2010, with the strokes of 22 pens, Barack Obama ensured a more equitable future for the children of the United States.

Do these sentences "refer" to "the same event" as the previous sentences? Let's assume that the context of these last two sentences is such that it is clear that the writer intended to comment upon the health care reform bill, and not something else Barack Obama did with a pen that day. On the one hand, it seems correct to say that these sentences too refer to the same event as the earlier sentences. But on the other hand, it doesn't seem incorrect to say that these sentences refer to two different events. The first event is one in which a closet radical who has managed to fool a capitalist country into electing him president finally realizes the first step in his secret agenda. The second event is one in which a liberal hero finally overcomes the forces of wealth and power to strike a blow for the little guy.

Sentences 3 and 4 are notable for their strong point of view. In that sense, they are more typical of the kind of sentences found in historical narratives. As the philosopher of history Frank Ankersmit (1983, p. 173) noted, "the differences between descriptions given by historians of what is still felt to be the same event may be of a more dramatic nature than in the case of scientific descriptions." As a result, the question of whether events can be separated from sentences becomes a little less clear. It becomes even less clear when one considers not just individual sentences, but whole texts. The historian William Cronon (1992) compared two books on the long drought that struck the Midwestern plains of the U.S. in the 1930s, known as the Dust Bowl. Cronon found that despite covering the same span of time and region of space, the two books constructed two very different Dust Bowls: one a triumph of human spirit over natural disaster, the other a human-wrought ecological disaster.

It was these kinds of contrasts that led the philosopher Louis Mink (1978) to claim that

> we cannot without confusion regard different narratives as differently emplotting the "same" events. We need a different way of thinking about narrative. "Events" (or more precisely, descriptions of events) are not the raw material out of which narratives are constructed; rather an event is an abstraction from a narrative. (p. 147)

Mink argued, contrary to Davidson, that events are not concrete things existing apart from and referred to by sentences, but are ways of summarizing sets of sentence organized into narratives. Of course, with his qualifying "more precisely, descriptions of events" Mink left the door open to the claim that he too was making a distinction between concrete events existing in the world and the sentences or parts of sentences describing those events. Mink's point, however, was that in history events and descriptions of events are interchangeable; we cannot identify events except by narrating them and deciding whether or not to conclude that two narratives are, in the abstract, sufficiently similar to say that they emplot the "same" events.

2.3 Criteria for Individuating Events

My view on the nature of events is closer to Mink's than it is to Davidson's. Yet Davidson is clearly right that there are times when we wish to say that two sentences refer to the same event, or that two texts have the same event as their subject. Without conclusively settling questions about the ontological status of events, we can nevertheless conclude that the criteria for individuating events can vary. We can see this by looking at how the two positions on the nature of events lead to different criteria for individuating them.

Davidson claimed that events are concrete individual things that we can count. He recognized that this claim, to be credible, required some principle for counting—some principle for deciding whether there is one event or two. In practice, Davidson (2001c) noted, we do seem to successfully count events, since "rings of the bell, major wars, eclipses of the moon and performances of *Lulu* can be counted as easily as pencils, pots and people" (p. 180). So, he asked, what are the criteria of individuation? He argued that

> Events are identical if and only if they have exactly the same causes and effects. Events have a unique position in the framework of causal relations between events in somewhat the way objects have a unique position in the spatial framework of objects. (Davidson, 2001c, p. 179)

Davidson's proposal is interesting because it

seems to suggest that Mink was correct when he argued that two narratives cannot differently emplot the "same" event. If to emplot an event is to place it in a nexus of causal and contingent relations, then two differently emplotted events are, under Davidson's criteria, two different events. But Davidson did not consider narratives to establish true causal relations. When Davidson wrote of the "causal nexus," he seemed to have in mind something like what Laplace's demon might see: the one true set of causal relations as determined by scientific laws. Historical narratives, on the other hand, he considered to be just "causal stories" or "rudimentary causal explanations" and not true causal relations, and thus presumably not suitable for individuating events (Davidson, 2001b, p. 161–162).

Later Davidson (1985), in response to a critique by Quine (1985), abandoned his proposal that causal relations individuate events. He accepted (with some reservations) the alternative criteria suggested by Quine that events are the same if they occupy the same space at the same time. This raises the problem of deciding deciding how, or whether, events occupy space and time. But both Quine and Davidson remained wedded to the idea that events are concrete individual things, and thus that there *are* some true set of individuation criteria for events, even though those criteria may be complex, and even though in many cases we may not be able to actually satisfy those criteria well enough to ascertain identity. In contrast, consider the historian Paul Veyne's (1984) declaration that

> events are not things, consistent objects, substances; they are a découpage we freely make in reality, an aggregate of the processes in which substances, men, and things interact. Events have no natural unity; one cannot ... cut them according to their true joints, because they have none. (p. 36–37)

Veyne argued that individuation criteria are not given by nature or language but are what we make of them. That is the position I take here. A semantic tool would need to propose some criteria for individuation, but there is no "true" set of criteria it must adhere to. Of course, the kinds of criteria suggested by Davidson and Quine are useful ones and

the authors of a semantic tool might choose to use them, particularly if they wished to advocate a more "scientific" viewpoint. But these are not the only criteria, and authors might choose others or even more than one set of criteria. The main requirement is that authors document the choices they make.

An example of best practice for documenting individuation criteria was provided by Doerr et al. (2010) in the design of their time period thesaurus. Rather than assume that spatiotemporal location alone suffices to individuate periods, they made a distinction between the characteristics used to individuate time periods and the spatiotemporal regions associated with those periods. This made the thesaurus robust to new archaeological discoveries. For example, if a period were defined as being associated with the prevalence of a certain kind of pottery, then the later discovery that said pottery was in use earlier than was previously known would only result in a change to the temporal bounds associated with the period, not its individuation criteria.

3 Selecting Events and Documents

There are two main reasons why one might use a semantic tool to select event records. First, one may be interested in using the tool as a kind of reference resource, to acquire some basic knowledge of the event and its relations. Or one may wish to explicitly link a document to a particular event. For instance, a blogger who wishes to label a blog post as being about the Soweto Uprising might use a semantic tool to find a standard identifier for that event, which he can then use to link his post to the event record. In either case, the user would use some attribute or relation to select the event of interest.

3.1 Selecting Events

Most obviously, one can look for events by *name*. But most events do not have names, and in these cases, the event would need to be looked up via some entities or concepts to which it is related. There are a number of possibilities here. One might be interested in events involving some character, for example events in the life of Emma Goldman or events involving the Confederate States of America. Or one may be looking for events associated with or portrayed as occurring in a particular place or setting,

such as Ireland or the American Midwest. Finally, one may look for events that are directly related to another event in some way that doesn't necessarily involve shared characters or settings. For example, one might seek events that have been portrayed as causes or consequences of the Battle of the Boyne, or all events that have been emplotted as leading up to, part of, or following from the French Revolution.

In addition to selecting events through their relationships to other concepts and entities, a semantic tool would support selecting events using the abstract grid of space and time. For example, one might be interested in events that took place within a given geographical area or that encompassed a given point on the globe. Similarly, one might look for events that took place during the 19th century or that were ongoing on June 4th, 2009. Finding events in space and time requires that events be resolvable to locations in a spatiotemporal reference system.

Finally, users might wish to select events of a certain type, such as battles or social movements. Given that one man's riot is another man's revolt, this can be more complicated than it first appears. To select events that have been typed a certain way, one would need to specify both a taxonomy of event types and possibly a party responsible for assigning types to events. Given the lack of standard event type taxonomies, it may be easier to rely on event name queries to approximate queries by type. Since named events often have types integrated into their names (e.g. the Watts *Riot* or the *Battle* of the Boyne), searches on event names may help select events of a certain type, especially if alternate names have been specified for events. For unnamed events, however, keyword searches on textual descriptions are unlikely to provide precise or complete results, and querying using an explicit type from a taxonomy would be preferable.

3.2 Selecting Documents Related to Events

But selecting an event may not be a user's goal but a means of finding an event-related document of some sort. A document can stand in two kinds of relation to an event. First, it may have been transformed into *evidence* for an event through the process of historical inquiry. In other words, some historian has studied the document, made a judgment about the status of the document as a survival from the past, and on the basis of that study and that judgment has inferred an event.

The historian Henri-Irénée Marrou (1966, pp. 133–137) enumerated a number of forms this inference from document-as-evidence to event can take. In some cases the inference may be very direct, as when the event in question involves the document itself, e.g. when it was produced, or when a certain word or phrase was first used. A slightly less direct form of inference moves from the document to some mental event, e.g. an intention, of the document's creator. Yet further afield are inferences made about the general milieu of the document's creator, inferences made on the basis of ideas expressed or the way they are expressed, regardless of the creator's specific intention. Finally there are those inferences made to events localized in time and space: things that characters in the past did or had happened to them. This last category of inferences is the least certain, despite the seemingly "concrete" or "factual" nature of the events inferred.

The second kind of relation that a document can bear to an event arises when the historian articulates his inferred event by producing a historical narrative. A historical monograph, historical documentary film, or a historical museum exhibit is a document that *portrays* an inferred event.

It is possible for a document to be both a portrayal of an event and evidence for some event. An eyewitness account is a portrait of an event, and if a historian has judged it to be authentic and accurate, it is also evidence for that event. Yet a document that is both portrait and evidence need not bear both relations to the same event. Marrou (1966, p. 135) gave the example of the work of fourth-century Roman historian Ammianus Marcellinus, which *portrays* events during the reigns of Constantius II and Julian the Apostate, yet which may be used as *evidence* for very different events, such as the appearance of particular ways of thinking or acting among a certain class of Roman men of that time, inferred from the language of the document.

When looking for documents related to an event, one may not be concerned with the kind of relation at all. In this case, if the event of interest is named, it may be sufficient to look for (variations of) the event name using full-text search of textual documents or of written descriptions of non-textual documents.

But this approach is unlikely to be either precise or comprehensive. Besides the well-known vocabulary problems that plague full-text search, there is the problem that documents which portray or evince an event may not use any names of that event. Expanding queries to include the names of people, places or other concepts related to the event may help, but to be reliably findable such documents would need to be explicitly linked to an identifier for the event.

Explicit linking to an event record would be indispensable if the *kind* of relation between the document and the event were important. One would need to be able to narrow down the set of all related documents to those that were related as evidence or those that are related as portraits, or to those that were related as both evidence and portrait. It might be desirable to further narrow the set by specifying *who* treated the documents as evidence or who created the portraits. The latter is a basic function of any bibliographic instrument. The former is rarely found in current tools, but will be increasingly important as the publishing of historical data becomes more widespread.

4   Contextualizing Events

While individuation and selection are necessary and useful functions, the effort of constructing a semantic tool for historical events would not be justified by these functions alone. Another key function of such a tool would be to provide *context* in an unfamiliar historical domain. As the historian Ann Rigney (1990) observed,

> There is a certain difficulty involved for a twentieth-century reader—particularly a reader who is not French—in following these nineteenth-century histories of the French Revolution (or indeed more recent ones) since they depend so largely on the reader's foreknowledge of a particular cultural code to which the principal elements of the Revolution already belong. (p. 40 n. 22)

A semantic tool could potentially help such a reader understand this code by linking events to time, place and related concepts, as well as putting them in the context of the narratives for which they act as mnemonics. To navigate this labyrinth of nested contexts, one needs a map:

> What information searchers need are maps that inform them about the world (and the literature about that world) in which they live and act. They need such maps in order to formulate questions in the first instance ... This is probably especially so in the humanities, where concepts are more clearly associated with worldviews. (Hjørland, 2007, p. 393)

A semantic tool for historical events would be a map informing users about the past and discourses about the past. Like a map of space, it could be used for both exploration and orientation.

4.1   Exploring the Past

A semantic tool for historical events would make it possible to learn about the past by following connections among events, characters and other concepts. The idea that the past is best understood through a network of contextual relations was dubbed "contextualism" by Hayden White (1973):

> The informing presupposition of Contextualism is that events can be explained by being set within the "context" of their occurrence. Why they occurred as they did is to be explained by the revelation of the specific relationships they bore to other events occurring in their circumambient historical space ... (p. 17)

A semantic tool for contextualizing historical events would thus be comparable to an outline of subjects for a history course, or a higher-level framework for organizing a series of syllabuses for history education. A syllabus or framework provides a map to help teachers and students find their way through a web of events and explanations. As students get older and become more capable, more detail can be added to the map. Any history is such a map in a certain sense. Ankersmit (1983) suggested that what makes historical narratives useful is that, like maps, they strip away the overwhelming detail of actual experience, leaving an intelligible form:

43

A map should not be a copy of reality; if it were we could just as well look at reality itself. Being an abstraction of reality is just what makes maps so useful. The same goes for historiographies: we expect the historian to tell us only what was important in the past and not the "total past". (p. 51)

The intelligible form of a geographical map consists of the spatial relations made evident in its layout. One can look at a map to see where places are relative to other places. The map provides spatial context. A history provides historical context. One can read or watch history to learn how events happened relative to other events. The relations thus articulated in a history compose its intelligible form. Just as a simple hand-drawn route map can be easier to follow than a photorealistic one, a semantic tool would make these relations clearer through further abstraction.

The analogy with geographic maps raises the question of aggregation. Geographic maps of different regions can be transformed and projected onto a common system of coordinates. Can we expect to be able to merge semantic tools covering different domains of history to obtain a master tool covering a superset of these domains? According to Paul Ricœur (1984), we expect that

the facts dealt with in historical works, when they are taken one at a time, interlock with one another in the manner of geographical maps, if the same rules of projection and scale are respected … A secret dream of emulating the cartographer … animates the historical enterprise. (p. 176)

Indeed, isn't the promise of being able to link together fragments of history into a collaborative whole one of the great motivations to develop standardized schematic representations of historical relationships? But we should not expect a single coherent past to emerge from such interlinking. We must remember that the relations in a semantic tool for historical events would be abstractions from historical narratives, which portray the past but are not the past itself. Different narratives express different points of view that do not necessarily combine into intelligible wholes.

Aggregating events into a larger framework would not yield a more complete view of the past, because there is no "whole view" of the past to be completed. However, a more complete view of *discourse about* the past could be achieved by juxtaposing different portraits made from different perspectives. To do this a semantic tool would need to accommodate conflicting views without trying to resolve them.

4.2 Orienting Oneself in Historical Discourse

A semantic tool that informed users about varying and possibly conflicting interpretations of past could be used for orientation. One may use a map to orient oneself by determining one's own position relative to something else. The philosopher Jörn Rüsen (2005, 1) has proposed that history is a "cultural framework of orientation" in time. According to Rüsen, we make the passage of time intelligible through reflecting on our experiences, interpreting and telling stories about them. Through such interpretation, the otherwise unintelligible passage of time acquires meaning and becomes history. History orients us in time: it tells us who we are and how we relate to what has come before.

According to Rüsen's theory, one way that people orient themselves using history is by tracing the kinds of threads White described in his account of contextualism. Genealogy, or seeking one's origins by tracing back through a web of births and marriages, is a good example of this. Other examples are stories told of the founding of an institution of which one is a member: the story of how Yahoo!'s founders started the company in a trailer at Stanford University is regularly recounted to new employees. These stories directly relate their audiences to historical characters and events, in effect making the audience members characters too.

But, as Rüsen showed, history does not perform its function of orientation only at this level of direct genealogical relations with the past. More often, history orients its audience at the level of interpretation, where histories are treated as stories rather than as transparently presenting inferred relations. For example, historians often allude to historical events as instructive examples for understanding current events. Consider the historian of early

twenty-first century economic inequality in the U.S., who references the Gilded Age of the late nineteenth century. He does so not necessarily because he intends to trace causal relations between the earlier period and the later one. Rather he does so because he wishes to imply that the narrative that presents the best perspective for understanding the current situation is one that has a *form* similar to a particular, conventionally accepted narrative of the Gilded Age. He is making an analogy.

While analogies like the one above draw upon conventionally accepted narratives, other histories seek to re-orient their audiences by criticizing conventionally accepted narratives. To a certain extent, nearly every history attempts to do this—if the conventional story were perfectly adequate, why produce a new one? But certain histories specifically aim to dislodge a dominant narrative and replace it with a new one. Where analogies with the past appeal to a kind of continuity of form, critical histories try to break that continuity.

Finally, there are histories that try to orient their audiences not by directly linking them into historical narratives, nor by analogizing with or criticizing accepted historical narratives, but by giving accounts of changes in the narratives themselves. These histories re-establish continuity by portraying a higher-level process of change. An exemplary case is Thomas Kuhn's *The Structure of Scientific Revolutions* (1962), in which he posited that discontinuous change in scientific thought is itself a steady factor, something his late twentieth-century readers could use as a reference point for understanding their present situation.

What is important about Rüsen's typology of history is that it shows how history functions to orient us at the level of discourse and not simply at the level of direct chains of causal relation to the past. A semantic tool that was intended only to help people understand the past through exploration of the threads among events and characters and their settings would not need to refer to the stories that spun those threads. But if the tool were intended to help people orient themselves by understanding *discourse about* the past, it would need to represent not only events and characters and places but also the narratives that emplot them, and relations among these narratives.

Drawing upon Rüsen's ideas, Peter Lee (2004) developed a set of requirements for a framework for history education that would not only help students contextualize historical events but also develop their "metahistorical" understanding. Lee argued that students should understand not only what happened, but how we explain what happened. Lee argued that history education should simultaneously develop both students' conceptions of the past and their understanding of history as a discipline and discourse. These are the two functions that I have labeled "exploration" (of conceptions of the past) and "orientation" within historical discourse.

A semantic tool intended primarily to provide access to a homogeneous collection of documents, or to enable exploration of a narrowly defined slice of history, might simply summarize a single consensus story of the past. But a semantic tool for orienting users to a wider historical discourse would need to aid their understanding of the variety of stories told about the past, and to do so it would need to represent not only the contents of those stories—events, characters, settings—but the stories themselves.

5 Conclusion

The issues that I have raised here may seem far afield from the practical concerns of present day NLP research in medical informatics, topic detection and tracking, or natural language understanding. Certainly the development of a semantic tool for historical events is likely to be a much lower research priority than many other more immediate applications of automatic event detection and representation. But I have focused here on historical discourse simply because it puts the issues discussed into sharp focus, not because these issues are unique to the historical domain. No matter what the domain, NLP researchers working on systems for detecting and representing events will be forced to resolve the question of whether they are detecting and representing objectively existing things in the world or features of discourses about the world. And I believe that even the most "objective" areas of application that appear to need the former will eventually, like history, turn out to need the latter.

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