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Threading Facts into a Collective Narrative World ⋆

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Abstract. The paper presents a framework that allows the collection of multiple story fragments from several sources and/or authors, in the context of social networks, where story fragments tell facts about items that are ontologically modeled in the system. The framework provides tools for threading facts together into stories; by doing so, it shapes a new narratological model, that mixes emergent narrative and authored approaches, and that can be defined as "collective".

1 Introduction

Recent years have witnessed the proliferation of Social Networking Services and more generally of the Social Web. People build, strengthen or nurture their relationships around *objects of interest*, by sharing multimedia content, tagging, rating, commenting. Due to the extensive usage of smartphones, this can happen virtually everywhere and at any time. While the first wave of Social Networks was generic, focusing on existing social relationships for the sake of themselves (e.g. FaceBook, Twitter), or revolved around digital or digitalized content (e.g. photographs in Flickr, web bookmarks in Delicious, music in Last.FM), a new generation of Social Services is emerging that focuses on real-life concrete objects, mainly as a result of geopositioning, item identification techniques (e.g. RFID) and again smartphone usage. Multimedia content, comments and tags can be attached to artwork in museums, monuments or street furniture in a city, products on a shop shelf. These physical objects then become hubs for sharing impressions, opinions, thoughts, and *stories*. Our work stems from a few observations on this phenomenon, some of which were excellently outlined in [13]:

- Story fragments are scattered around social networks. Are we able to recognize, aggregate and thread story fragments into *stories*?
- It is very difficult (even for a human) to tell apart story fragments from other content, as they are drowned in a huge amount of information.
- It is also very difficult to give a semantic interpretation to story fragments. Mostly, they are in the form of free text, images or video. Tags can help in identifying some relevant concepts contained in a fragment, but *threading* requires finding meaningful relationships and connections, not only concepts.

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It has been argued (see again [13]) that one possible way out is to provide users with tools that allow them to contribute *structured* story fragments, recognizable and suitable for interpretation.

In this paper we take a step in this direction, in the context of *semantically enhanced, thematic social networking services*. A *thematic social networking service* is a Web 2.0 application that allows users to get in touch and share diverse content regarding a specific *theme*, which is also referred to as the *domain* of the social network. A *semantic enhancement* consists of an ontological model that describes and relates the items in the domain, as well as other pertinent items.

In particular, we propose a language that allows users to (i) tell facts concerning his/her relationship and interactions with objects and/or people in the social network domain using a semi-structured approach, and (ii) provide links between facts. We discuss how a digital system can represent and interpret such facts by using *ontologies*. Finally, we describe a possible approach to help users find related facts, which they may want to connect into a story, by means of a *pertinence* measure. The result is an *interactive* and *collective* composition of stories, for which we propose a narratological model that expands the notion of interactive storytelling.

The work presented here is a part of the joint project PIEMONTE, which integrates a set of social networking and augmented reality tools, with the goal of developing a social application for iPhone™. The theme of the application is eno-gastronomy, with a focus on wine and food products as significant elements of the cultural heritage of a territory. Therefore the ontologies describe food and wine as well as restaurants, recipes, products, shops, fairs, and the actors of the domain such as cooks, producers, shopkeepers, etc. The semantic model includes also a geographic ontology for the physical locations. For this reason the examples throughout the paper will be taken from the eno-gastronomy domain.

2 Facts and their ontological representation

In our framework users can either provide story fragments by telling simple *facts*, or provide *links* between them. An *ontology of facts* acts as a repository for such fragments. Each fact is characterised by a *predicate*, that defines the type of action represented by the fact, and a set $\mathcal{R}$ of *roles*: fillers of the roles are domain entities that play a role within the action. Examples of predicates are: `Drink`, `Walk`, `Listen`, whereas examples of domain entities are: `Yesterday`, `I`, `Wine`, `March 23rd`, `Beauty`. This structure is modeled after basic one-verb sentences in natural language.

Domain entities are elements of an ontology, with very general classes such as `Wine`, as well as very specific ones, e.g. `Bordeaux Grand Cru ACME 2001`. We do not describe in detail the domain ontology in this paper.

Domain entities can be role fillers for several roles; in particular, we consider the following roles:

– sbj (subject): who or what carries out the action (*John* drank wine.);
– obj (object): the thing(s) the action is carried out upon (John drank *wine*.);

– whr (where): any indication of the place where the action takes places (John drank wine *at home*.);
– whn (when): any indication of the time of the action (*Yesterday* John drank wine.);
– mdl (modality): any indication of the modality that further specifies how the action is performed (John drank wine *from a golden glass*.);
– why (cause or goal): the reason why the action took place (John drank wine *to forget his problems*)
– ctx (context): something related to the action that does not explicitly fit in any of the other roles.

The *predicate ontology* defines and organizes the predicates used to describe the actions performed in the facts. In the predicate ontology, predicate classes restrict the types of fillers for their roles. For example, the predicate `Drink` admits only `Liquids` as fillers for its obj role. For some predicates, or predicate classes, some roles may not be admissible, e.g. `Travel` has no object.

There are actually two sorts of predicate classes in the predicate ontology. **Abstract predicate classes** are non-lexicalized concepts, i.e. they are not associated with a specific verb (this is, actually, dependent on the specific natural language considered); they are used to define role constraints that are common to several predicates. However, there can hardly be any interest in providing (direct) instances of abstract classes, since they do not correspond to words in natural language. On the other hand, **concrete predicate classes** are lexicalized and can be instantiated. Concrete predicate classes can have subclasses as well, since there may be verbs that further specify certain actions. For example, the predicate `Devour` is a subclass of the predicate `Eat`.

The domain and predicate ontologies are represented in the Semantic Web recommendation OWL 2:

– There is a class of `Actions`, with properties corresponding to roles; i.e., properties `hasSubject`, `hasPlace`, etc.;
– Each subclass of actions has a name (e.g., `Ingest`, `Eat`, `Drink`, `Taste`) and imposes restrictions on the roles, e.g., `Ingest` must have as object some `Food` or `Drink` while `Eat` must have as object some `Food`. If a role is not admissible, we specify the empty range for the property. A role can have multiple fillers, and they can be fillers of subproperties, e.g. for an action `Move`, the property `hasPlace`, corresponding to the role whr can have two subproperties `hasPlaceOfOrigin` and `hasPlaceOfDestination`; the origin and the destination are two fillers of the whr role.
– The class of `ConcreteClasses` has, for example, `Eat`, `Drink` and `Taste` as members, relying on the punning feature of OWL 2, i.e. the metamodelling feature where the same name can be used for a class (`Eat`, the class of eating events) and an instance (`Eat`, the member of the class `ConcreteClasses`).

A **fact** is an individual in the OWL 2 ontology which is asserted to be an instance of some subclass of `Actions` (and inferred to be instance of other subclasses of `Actions`); the fact has role fillers in the domain ontology, respecting the type and number restrictions imposed in the action ontology.

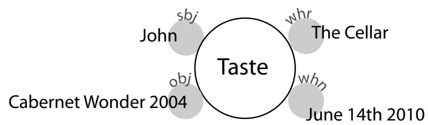

Fig. 1. A graphical representation of a fact

As an example, consider the individual `f123`, represented graphically in figure 1, such that:

- `f123` is an instance of `Taste`;
- `f123` has `John` (an instance of `Men`) as subject;
- `f123` has `Cabernet Wonder 2004 - 14234` (a bottle of the `Cabernet Wonder 2004` class) as object;
- `f123` has `The Cellar` (an instance of `Wine Bars`) as place (role `whr`);
- `f123` has `June 14th 2010` as time (role `whn`);

and the other roles have no filler. `f123` would be expressed in natural language as "John tasted Cabernet Wonder 2004 (bottle no. 14234) at The Cellar on June 14th, 2010 ".

Notice that facts can also be seen as an advanced form of *tags*: tags are used to label an item, e.g., a blog post or a photo, with words the item is related to, but the relation type is generally unspecified, even though the tag is typically used to express what the photo or post is about. Facts, on the other hand, explicitly relate different elements of a social network - e.g. users, (food) items, places, etc. - and communicate the type of relation that holds between them.

3 Linking facts together

Facts express quite well simple meaning, generally conveyed in natural language with simple one-verb sentences, or paratactic sentences, containing verbs coordinated on the same hierarchical level. Notice however that the language we are introducing is less structured than natural language, leaving room for interpretation on the part of the reader. In a sense, our language can suggest what happened rather than describing it in detail. Think for example of a fact f_1 with predicate `Drink` having `sbj=Charles`, `obj=Cabernet Wonder 2004`, `whn=June 15th, 2010` and `ctx=Susan`. We know that Charles drank cabernet on June 15th, and that this has something to do with Susan, but nothing more is said.

In order for users to express narrative fragments, we need to provide them with means for linking facts together. In natural language this can be obtained by simple juxtaposition (when the connection between two sentences is obvious), or by subordination, or by using conjunctions. In our case, we provide three ways of linking facts that are inspired by natural language, but at the same time are less structured. Again, the idea is to suggest a connection between two things that happened, rather than precisely describing them. The user is not required to have grammatical knowledge to decide what type of link is suitable for his/her case; he/she is expected to choose what best conveys the meaning he/she intends without trying to translate a pre-formed sentence into a natural language.

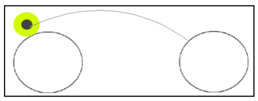

Fig. 2. Link 1

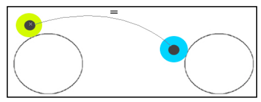

Fig. 3. Link 2

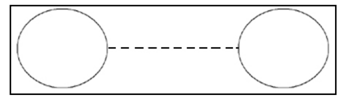

Fig. 4. Link 3

1. **Fact/Role-filler Link.** The user selects a fact as a role-filler for another role. The concept expressed by the first fact acts as a role, for example the subject or the object, in the second one. In natural language this is obtained by subordination and in particular by relative sentences. For example, consider again the above example of Charles drinking Cabernet, and suppose that he wants to say that he did it for Susan's birthday. He may decide to write the second fact f_2 with predicate `Has`, `sbj`=`Susan`, `obj`=`birthday`, `whn`=June 15, 2010. Then he may use this second fact as a role filler for the `why` role in f_1.
2. **Role-filler/Role-filler Link.** The user links two role fillers in two different facts: the idea is that the two facts have a referent in common. What this link says is that the individual object referred to by the first filler is the same as the one referred to by the second filler. If the two fillers denote exactly the same entity within the system, this link exists implicitly. However, there are cases where it is necessary to make it explicit. For example, consider the fact f_1 above and the fact f_3 with the predicate `Buy`, `sbj`=`Charles`, `obj`=`Cabernet Wonder 2004`. If Charles wants to specify that the bottle he drank in the fact f_1 is the same he bought in the fact f_3, then he may link the two `obj` fillers.
3. **Fact/Fact Link.** This third type of link establishes a more generic relationship between two facts. In this sense it is similar to conjunction or juxtaposition of sentences in natural language - although a distinction between the two is not made here: in principle, a link between two facts may even represent a disjunction or an adversative. The link can be directed, thereby suggesting a sequence, or undirected, simply suggesting some kind of association. If we consider again the facts f_1 and f_2 above, a user may decide to suggest causality by simply adding a directed link from f_2 (Susan's birthday) to f_1 (Charles drinking Cabernet).

4 Reasoning on facts

In our framework users can insert new facts into the system, as well as use already existing facts in conceiving their stories. Our aim is to design a system that is able to help the users by suggesting previously added facts that appear to be related to the facts they have inserted. For this reason we introduce a measure of *pertinence* between two facts: given a fact inserted by a user, it can be used to perform a query for pertinent facts already present in the system, which can be useful in threading a piece of a story. Before formally defining the pertinence measure, we will introduce *conceptual specificity* and *closeness*, two properties of facts which pertinence relies on.

4.1 Conceptual Specificity

An ontology is a rooted, directed acyclic graph of IS-A (subclass-of or instance-of) relations, and the distance between two nodes n_1, n_2 is defined as:

$$\textsc{dist}(n_1, n_2) = \min\{|p_1| + |p_2| \mid \exists g \text{ such that } g \xrightarrow{p_1} n_1,\ g \xrightarrow{p_2} n_2\},$$

where $g \xrightarrow{p} n_1$ means that p is the path connecting the node g to the node n_1 and $|p|$ is the length of the path p.

Conceptual specificity is monotonically dependent on the depth of the corresponding node in the ontology, where $\textsc{depth}(n) = \textsc{dist}(\mathit{root}, n)$. Although one may be tempted to use depth as a measure of conceptual specificity, this would not work in our case for the following reasons:

- Due to the lack of homogeneity among different parts of the domain ontology (which in fact is a grouping of several sub-ontologies), concepts with the same depth have different levels of specificity. Moreover, relative specificity may vary depending on the context in which the users are telling their stories. For example, if the context is a beer festival, then the generic entity `Beer` has a lower significance with respect to the case where the context is a Farmer's Market where beer is present among many other things.
- The highest part of the ontology is made of some fairly abstract concepts that have no practical significance with respect to the domain itself - the best example of this is the `Thing` node that is usually the ontology root. Any path crossing this node should have an *infinite* length, since if such an abstract concept needs to be considered to find something in common between the nodes n_1 and n_2, then it means that n_1 and n_2 are in different subdomains (for example, a `Bavarian Weissbeer` and a `Countryside Village`).[3]

In order to address these two issues, we propose a tri-partition of the ontology, (if possible) provided by an expert. Initially, the expert should provide a boundary, given once and for all, between *abstract concepts* (denoted by $\mathcal{A}$) and *concrete concepts* (denoted by $\mathcal{C}$). For every $n \in \mathcal{A}$, we let $\textsc{spec}(n) = -\infty$.

Further, the expert should identify in $\mathcal{C}$ a subset of nodes $\mathcal{Z}$ that represent the 0 level regarding specificity. The point here is to locate the nodes in the different sub-ontologies that have similar relevance in a certain context. For example, in a Farmer's Market scenario one may choose the ontology nodes that represent

[3] Notice that this does not mean that there is no connection between these two notions (maybe there is a Bavarian countryside village that hosts a wonderful brewery!) but that they are not *ontologically* connected.

different food products, such as `Vegetables`, `Cheese`, `Fish`, etc. On the other hand, in a beer festival scenario one may choose the direct descendants of `Beer` together with the whole `Food` entity.

Starting from $\mathcal{Z}$, we compute a set $\mathcal{S}$ of *significant nodes* (nodes either in $\mathcal{Z}$ or descendants of nodes in $\mathcal{Z}$) and a set $\mathcal{I}$ of *insignificant nodes* (all other nodes in $\mathcal{C}$). $\mathcal{A}, \mathcal{I}, \mathcal{S}$ form a tri-partition of the ontology. Then[4]

$$\forall n \in \mathcal{S}, \textsc{spec}(n) = \textsc{dist}(\mathcal{Z}, n) \text{ and } \forall n \in \mathcal{I}, \textsc{spec}(n) = \textsc{dist}(n, \mathcal{Z}).$$

where $\textsc{dist}(\mathcal{Z}, n) = \min\{\textsc{dist}(n', n) \mid n' \in \mathcal{Z}\}$ and $\textsc{dist}(n, \mathcal{Z}) = \min\{\textsc{dist}(n, n') \mid n' \in \mathcal{Z}\}$.

In case there is no expert to provide the tri-partition, it is possible to set $\mathcal{A} = \emptyset$ and $\mathcal{Z} = \{\mathit{root}\}$. By doing so, we get $\textsc{spec}(n) = \textsc{depth}(n)$.

4.2 Conceptual Closeness

In the literature there are two main approaches to measure the closeness (similarity) of two concepts in an ontology. The first uses the definition of *entropy*, as in [15]. However, adopting this kind of approach requires a reasonably complete ontology, which is something we cannot assume. In fact, in the context we are dealing with (namely, the Social Web) the ontology of the domain is bound to grow depending on the social network usage, and it is fairly difficult to make any assumption about the completeness or even the homogeneity of the semantic information. Another approach is to use the ontology graph structure, as discusses in [14]; this method is also referred to as *edge counting*.

However, we need to account for the fact that, if an edge is a measure of conceptual distance, edges that are closer to the terminal nodes should be shorter than those closer to the initial (root) node. This corresponds to the intuitive perception of conceptual distance: two child nodes of the `Drinkable` entity (e.g., `Beer` and `Milk`) are conceptually more distant than two child nodes of the `Bavarian Weissbier` entity (e.g., `Hefeweizen` and `Kristallweizen`).

Therefore, we assign a non-constant length to the edges: the length of an edge is monotonically decreasing with the *conceptual specificity* of its source node. Then, for each edge $e = (n, n')$ from n to n' we define

$$\textsc{len}(e) = 2^{-\textsc{spec}(n)}.$$

This definition naturally extends to a path p as the sum of the lengths of its constituent edges, and we can thereby give a modified definition of node distance:

$$\overline{\textsc{dist}}(n_1, n_2) = \min\{\textsc{len}(p_1) + \textsc{len}(p_2) \mid \exists g \text{ such that } g \xrightarrow{p_1} n_1,\ g \xrightarrow{p_2} n_2\}.$$

Using this modified notion of node distance we introduce a variation of the similarity measure defined in [10] given by:

$$\textsc{clos}(a, b) = -\log\left(\frac{\overline{\textsc{dist}}(a, b) + 1}{2 \times \text{MAX} + 1}\right) \tag{1}$$

[4] This definition has an undefined case if there is a leaf node that is not reachable from $\mathcal{Z}$. A solution is to include all such leaves in $\mathcal{Z}$ by default. We omitted it in the definition for the sake of simplicity.

where MAX is the maximum length of a path from a concrete concept node to a terminal node in the ontology.

4.3 Pertinence

In order to perform a query by pertinence we have to take into account that different facts can use different predicates to express their content and that for each predicate its set of roles has different weights associated with each role, i.e. each role filler contributes differently depending on the predicate used for the given fact. For example, `obj` has higher importance for the `Buy` predicate, whereas `whr` has higher importance for the `Travel` predicate. As mentioned in Section 2, the predicates are part of predicate ontology and each of these predicates has properties corresponding to the roles in $\mathcal{R}$. Without sacrificing generality we can assume that each fact has only one predicate, since every fact can be decomposed into more facts with only one predicate. Also, there might be more role fillers for each role. Then, given two facts f and g, the *pertinence* of the fact g for the fact f takes into account how close the corresponding predicates and role fillers are in the ontology, by using the closeness measure introduced above and applying weights appropriately. Pertinence takes into account an additional factor, *co-location*, described below.

$$\textsc{pert}(f, g) = \alpha_0 \mathrm{CP} + \Sigma_{i=1}^{m} \alpha_i \mathrm{CRF}_i + \beta \mathrm{COLOC} \qquad (2)$$

where $\textsc{cp}$ is *predicate closeness*, $\textsc{crf}_i, i = 1, \ldots, m$ are *role filler closeness values* (m is the number of role fillers for f), $\textsc{coloc}$ is the *colocation* and $\alpha_0, \ldots \alpha_m, \beta \in \mathbb{R}$ are weights. In the pertinence formula:

– Predicate closeness $\textsc{cp}$ is calculated using domain entity closeness (given by equation 1), taking into account the weight π_{f_0} of the predicate f_0 of the fact f (given in predicate ontology for each predicate), i.e., $\textsc{cp} = \pi_{f_0} \textsc{clos}(f_0, g_0)$.
– When calculating role filler closeness, for each pair of role fillers from facts f and g we apply equation 1. The resulting value is then weighted. The weight takes into account several factors, such as the relevance of the considered roles for the given predicates, a multiplier for the case in which the two fillers are fillers of the same role, a normalizing factor depending on the number of fillers, and a threshold below which the value is set to 0. A detailed description is out of scope of this paper.
– In the special case where closeness is being calculated for two users, we use their social network relationship instead of conceptual closeness. In a social network, a given user may have a set of friends, a set of *trusted* users, and possibly other relationships. The type of relationship is defined in the user model, and it can be used to give a closeness factor between two people.
– The co-location of two facts measures the chances that their actors met while performing the described action[5]. We use Google Geocoding Web Service to

[5] Like in the *selva* of Ludovico Ariosto's romance "Orlando Furioso", or the international conferences in Davide Lodge's *academic* romance[11].

get the needed latitude and longitude position of a fact occurrence, as well as the information about the bounds of the specific area. We introduce a three-dimensional space where two dimensions are latitude and longitude and the third dimension is time. In this space, the spatial-temporal location of a fact is represented by a parallelepiped whose base is the region it is happening in and whose height is the corresponding temporal interval. Two facts are co-located if they happen in the parallelepiped obtained as the intersection of two parallelepipeds that correspond to the two facts.

5 Towards a social/collective narratological model

Considering the interactive, social and collective nature of our system, we propose a narratological model that describes both the interaction with the author and the generation of the narrative world contained in the system. Since the user has the possibility to insert into the system both narrations and single pieces of information, it is fundamental to define a way to combine these elements into a wider unity. As we will see in this section, the result is not exactly a narration, but a *narrative world* which has some characteristics in common with narrative forms such as interactive storytelling and emergent narrative.

The massive spread of digital media has brought in potential and peculiarities that can strongly influence narrative possibilities and make them substantially different from previous narrative forms [16]. In fact, they are not just authored by a single person, but derive from a potentially enormous number of authors, that can create, modify, assemble and link them, collaborating even without being in the same place or knowing each other. In digital media text is not a sequential monolithic block anymore but it changes to hypertext through massive use of links that give the user the possibility to choose many routes to surf the content, thus becoming an author who establishes the order, the presence, the rhythm and consequently the meaning of the text. These innovative characteristics of digital narration permit an interbreeding among genres producing new narrative forms, such as the branching narrative and the hyper-textual one, that can be classified as interactive storytelling [5].There is another new narrative genre in digital media, called emergent narrative [12] which is a style of participated narration in which the structure of the narrative emerges from the interaction between the characters instead of being defined by a predefined plot.

Existing narratological models need to be revised because of the innovations introduced by digital media [9]. In fact, the traditional narratology model was thought to describe analogical narrative as a linear sequence of the author's work, the product and the reader (see figure 5). It is now obvious that this does not fit the narratives in digital media. A possible interactive storytelling model is sketched in figure 6. The author provides alternatives, that can be developed by the user interacting with the system. Hence, the product, being a composed story, is determined by the author's input to the system and by the users' interaction.

Fig. 5. Traditional narratology

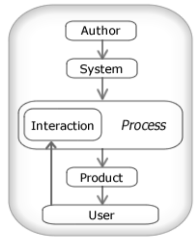

Fig. 6. Interactive digital storytelling narratology

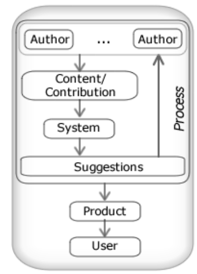

Fig. 7. Social/collective narratology

Referring to our project (see figure 7), there is no one controlling the evolution of the narration, but each user acts as an author writing his/her story fragments, in the form of facts. The system collects and organizes them and can suggest authors connections between the facts they added and other pertinent ones. This allows authors to improve their narratives by relating them to experiences of other users, resulting in a collective emergent narrative world that always evolves in terms of contents, i.e. facts, and links among them. The system has the same characteristics of digital media and some features in common with the above mentioned forms of digital narrative. In fact, it is a mix of collective authored approaches, as several users of the community contribute with their facts, and an emergent narrative, as a story crops out connecting facts.

6 Related work

For an overview of narrative theories, from Aristotle [1] through Propp, Greimas and Barthes, to Bremond, with the emphasis on their application in interactive storytelling, we point the reader to [4].

INSCAPE [6, 17] is an authoring environment where even inexperienced users can conceive, create and experience interactive stories. It is possible to design interactive storyboards, edit and visualize the story structure, create 2D and 3D characters and scenes, include sounds, pictures and videos, and publish the story on the Internet. The stories are visually represented as topological graphs where nodes are objects of the story and edges are interactive transitions or conditional relationships. This is very similar to our approach of connecting facts into the story. Our aim is to provide a system where different kinds of digital content can be used in constructing facts.

In [3] an approach is described to evaluate narrative presentation for lifelog archives containing large amount of data in different formats: SenseCam diaries, photos, videos, text documents. The authors describe how the content is reduced and organized to produce a coherent narrative presentation. They conclude that visual content is the one used the most to communicate the experience; that the nature of the story and the author's personal view of the story have a considerable impact on the fragments used for representing the story and the final outcome. As in our framework, story fragments are collected from heterogeneous sources, letting the users freely chose and combine the available elements.

PoliCultura [2] is a project designed for Italian schools to enable children to participate in interactive construction of stories over a longer period of time. Using a web-based authoring-delivery environment, children are able to put together text, images and mp3 files and produce interactive stories. Although the work is presented as a platform encouraging *collective narratives*, it is more similar to a *collaborative narratives* system, where many authors participate in constructing a story in a collaborative effort. On the other hand, our approach is an effort towards constructing collective narrative where authors do not need to collaborate in order to produce a story.

7 Conclusions and future work

In this paper we introduced a framework for collective storytelling in social networking services. Our assumptions are *(i)* that the social network is *thematic*, with tales revolving around the chosen theme, and *(ii)* that there exists an ontological description of the domain we can rely on for the interpretation of users' contributions.

We focussed on devising a language that allows users to express simple facts in a semi-structured way: they can select an action and then associate elements of the ontology with it, specifying for each of them the role that it has in the fact. In principle, users can also fill roles with elements that are not in the ontology, but in that case the interpretation of the fact is going to be partial. Users can also link together facts, and we showed how the types of links they can use (namely, Fact/Role, Role/Role and Fact/Fact) can be related to connective elements in natural language. Our goal was to provide an expressive language, with a good trade-off between structure and simplicity. The result has in our opinion two interesting features:

- It is **non-linear**, since links organize facts in a graph and not in a sequence. In this sense, it integrates the experience of hyper-textual narration.
- It allows people to **suggest** connections between entities or between facts, without needing to be explicit or very precise about the nature of these connections.

We believe these features make our representation language suitable for automated link generation and emergent approaches. Indeed, we see automated link generation (or at least automated link proposal) as the next step in our work.

Our framework builds on top of the semantic social networking environment implemented in the PIEMONTE project. In the user interface, each concept (object, place, person) is surrounded by a wheel of related concepts and users navigate the social network by spinning the wheel and moving its central focus by dragging concepts inside it. The user interface for telling facts is designed in a similar way, putting a predicate in the center of the spinning wheel, allowing the user to choose the related concepts around it.

An evaluation for the storytelling system is planned in two steps: an evaluation of the closeness measure on concepts in the ontology is currently being performed, where test users compare their own subjective measure of closeness with the one provided by the system. Then, facts will be collected from test users and the pertinence measure will be evaluated with the same method.

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