Linking Locations: Storytelling with Pervasive Technology

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ABSTRACT
With online location-aware smart phones in more and more pockets, storytelling is moving to the streets. Simultaneously, an increasing abundance of Linked Data is being made available, complete with geographical information. In this paper, we review the state of the art and suggest approaches to, and issues with, a storytelling system that combines these two technologies.

1. INTRODUCTION
Storytelling has always been part of the way in which people communicate, but recent technological developments are opening up new ways to engage in this activity. Location-aware technologies are now readily available and in regular use by many people, opening up increased possibilities for location-based storytelling. Recent developments, such as Wanderlust Stories[1] and Broadcastr[2], have begun to bring this to fruition, but we believe the quantity and structure of available data provides scope for a far richer experience.

Writing is subject to influence (conscious or otherwise) from all sorts of aspects: past events, locations visited, and people met. An incident in a book or film may be inspired by an event from the past, and a line of dialogue may be based on reality. Video games push this further: STALKER is set in Chernobyl[3]; Fallout 3[4] is based in a post-apocalyptic Washington DC; Grand Theft Auto[5] borrows locations generously from all over America. Locations in- and out-of-game match almost exactly: photo-realistically in places. Plot lines and interactions are drawn on top of the existing canvas of reality. These fictions are set in altered realities: in this paper we ask whether we can build fiction altered by reality.

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[1] http://wanderluststories.com
[2] http://beta.broadcastr.com
[3] http://www.stalker-videogame.com
[4] http://fallout.bethsoft.com
[5] http://www.rockstargames.com/grandtheftauto

To approach this challenge, it is first necessary to attain a collection of structured factual data - an area in which Linked Data shines. Cross-references between different data sources provide a vast amount of information, most structured in such a way that there is commonality between concepts. There are ontologies for geography, eating establishments, people, and even narrative itself. There is an exciting opportunity to combine the huge amount of location data available in Linked Data stores with the events that occur within a story, factual or fictional. All that is required is an approach to bridge the device and the content that is intuitive to authors and readers.

In this paper we will examine some existing location-aware systems; describe the Stories Ontology, its current applications, and other useful ontologies; and explore some of the possibilities that are available by coalescing mobile devices, location data, and narrative.

2. LOCATION SYSTEMS
With the introduction of GPS-enabled mobile devices, geographically inspired games and services have become increasingly prevalent. The former include games with the aim of discovering new locations, following paths to achieve goals, and competing against friends to 'own' geographical zones. The latter provide facilities to aid in tasks from finding nearby pubs to locating events in the user's vicinity. All manner of location-based systems are coming into common usage, from scavenger hunts to 'status-based' social networking systems.

Informative location-based services are generally oriented around answering "where's my nearest...?" questions. For example, Yelp[6] offers listings of local businesses based on one's current location; various applications, including The Weather Channel's Weather.com application, show local weather; and work has examined location-based services for recommending events[4]. Other information-based locational services focus on information about people who are in transit: for example, Neer[7] is concerned with dynamically sharing your location with an 'inner circle' of family and close friends.

By contrast, Foursquare[8] and SCVNGR[9] are both exam-

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[6] http://www.yelp.com/yelpmobile
[7] http://www.neerlife.com
[8] https://foursquare.com/
[9] http://www.scvngr.com/

ples of more 'playful' services oriented around 'checking in' to a location. Both services have initiated partnerships with public and private organisations, building promotions that encourage their userbase to check into places. Such systems, another example of which is Gowalla[10], let people check into locations with mobile web apps. Users can see where their contacts have been most recently, post or browse photographs of locations, and see who else is at (or has been at) their location. Some systems have gaming elements: for example, Gowalla users can find virtual tokens at some spots, and can collect or swap these. Other such systems include Brightkite, Hotspot, and Facebook Places.

Geocaching[11] is an example of locational gaming. It is a collaboratively organised scavenger hunt: people use GPS coordinates and clues given on a website to find "caches". While the game has clear antecedents in pre-digital treasure hunts, geocaching using GPS began in 2000 after private citizens were given access to far more accurate signals than previously, allowing more precise locations to be found. Today the game revolves around its website, which provides a database of caches and forums for discussion, and there are several dedicated apps for various mobile phones. Geocaching has been used in novel ways to tell stories, for example about the local history of an area, or to engage in a fictional tale which moves between different spots.

Broadcastr[12] is an example of a different kind of location-based system, one which is designed to support storytelling: users can share their memories – or perhaps their fiction – about specific locations with an online audience.

The majority of these systems operate from their own databases of locations and metadata, with little overlap between them. This lack of interoperability spawns competition over the accuracy and quantity of data available to the system: the Eiffel Tower in a location-aware game may have very different metadata to that in a system suggesting sight-seeing opportunities, even though they are both referring to the same location.

3. LINKED DATA RESOURCES
Fundamental to any locational narrative technology are, naturally, geographical resources. GeoNames[13] provides an extensive dataset for this purpose, with over 8 million place-names. Their ontology defines the latitude and longitude of these places; their spatial relationships to other locations, such as neighbours, contained regions, and regions containing the locations; and data associated with the places, such as the type of location (e.g. lighthouse, pier, beacon), postal codes, and related resources in other datasets. GeoNames also provides services to look up these places given a longitude and latitude.

From the GeoNames dataset, one of the most fruitful links is to DBpedia[14]. This offers a wealth of data, primarily ex-

tracted from structured data on Wikipedia[15]. In the case of Paris, for example, DBpedia offers information on population, famous Parisians, campuses, battles, and even precipitation! Aside from countries, it also contains information regarding establishments (e.g. restaurants, churches, libraries, etc). With a little extension, it would be possible to find all restaurants in Paris that sold coffee.

Ontologies, and datasets, are also available for information about people. FOAF[1] is the most prevalent, with the FOAF Project commencing in 2000. An instance of the FOAF Person class can include details about names, birthdate, projects, and links to other people - though the latter is only at a high level. Bio[16] extends this with events (e.g. Birth, Death) and relationships (e.g. mother, father), and the Relationship Ontology[17] provides more varied relationships (e.g. mentor of, would like to know).

Finally, to ease the creation of Linked Data-backed stories, there are ontologies for the description of narratives. The Stories Ontology[2][6] is a purposefully light ontology, derived from the OntoMedia ontologies for multimedia annotation[3]. A Story is defined, at its simplest, as being a set of Events with a subject. These Events, modelled with the Event Ontology[5], contain information about the people, places, and things involved in the event, and the time at which it began/ended. Individuals may then build Interpretations of these events, and indicate facts that they believe are asserted as a result of their occurrence.

By using the Stories ontology in tandem with existing datasets, it is possible to build a narrative wherein the Events refer to people, places, and events that have been previously annotated. These may be fictional or factual, allowing for an exciting blend of information.

4. LOCATION-AWARE NARRATIVE
Given the data described above, it is possible to investigate how this can influence generated narrative. Figure 1 shows a potential input structure for such a system. A narrative using this structure could portray an event set in a coffee shop, with the protagonist drinking, and the next scene taking place in a nearby church. Using the structure implicit in our Linked Data, we can amend the story based on the reader's location.
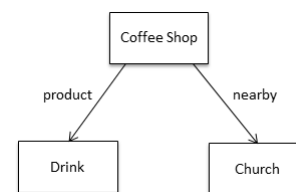

Figure 1: A possible input structure for a piece of narrative.

4.1 Class Specialisation

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[10] http://www.gowalla.com
[11] http://www.geocaching.com
[12] http://beta.broadcastr.com
[13] http://www.geonames.org/ontology
[14] http://dbpedia.org
[15] http://www.wikipedia.org
[16] http://vocab.org/bio/0.1
[17] http://vocab.org/relationship/

Class Specialisation suggests the navigation of the class hierarchy downwards, thus reaching concepts which are more specific than those given as input to the narrative. For example, if we know that the reader is in a specific coffee shop, we can alter the story to give detail based on this information. Furthermore, we could then apply specialisation to properties connected to this location, where possible. Figure 2 illustrates the hierarchy within the data (Costa being a Coffee Shop that sells Mochas), and how this could alter the details in the narrative. The right-hand portion of the figure shows the information attained from data sources (maybe a coffee shop-specific source).
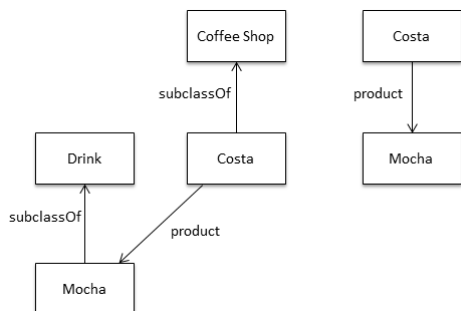
Coffee Shop

Costa

subclassOf

product

Drink

Costa

Mocha

subclassOf

product

Mocha

Figure 2: Figure 1 adapted, given more details about the coffee shop.

4.2 Class Generalisation

The inverse of the previous approach, generalisation navigates up the class hierarchy. For example, the reader may be in a location which sells drinks, but is not a Coffee Shop (see Figure 3). With a defined maximum distance, the system could alter the narrative, providing that the required properties still existed at the higher level. As such, a story may discuss a Restaurant: the location is similar to that required, but tailored to be closer to one pertaining to the reader's location.

Restaurant

product

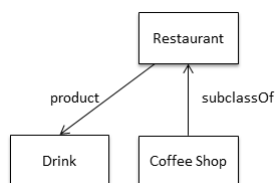subclassOf

Drink

Coffee Shop

Figure 3: An example of class generalisation: Restaurant has the same properties as Coffee Shop but is more general, so is a viable candidate when the reader is in that location.

4.3 Spatial Adaptation

Moving away from a single location reference, there is naturally a spatial relation between locations in a narrative. A character may travel to a new area, or one may be mentioned either by a character or a narrative. It might be described relative to a prior location (e.g. nearby, far away, within, containing). All of these relations are described by the GeoNames ontology, and thus we can use the ideas of specialisation and generalisation described above to further personalise the narrative.

For example, a simple case could be 'He sat in a restaurant in London.'. If the reader was actually in Newcastle, the content could change to 'He sat in a restaurant in Newcastle.'. After applying class specialisation, it may further alter to 'He sat in a pizzeria in Newcastle.'

A more complex case could be 'He flew to Newcastle Airport, and made his way to the hotel that overlooked the Tyne.' Here two geographical conditions have to hold: the location of the airport must be near the location of the hotel, which must be near the location of the river. By first generalising the classes to 'airport', 'hotel', and 'river', a query could be built to retrieve potential options for the personalised narrative.

4.4 Narrative / Spatial Flow

There are some readily apparent issues to building location-influenced narrative:

1. What should be shown if the reader isn't in a suitable location?

2. What do we do if the reader changes location mid-story?

3. Should we expect the reader to move to a new location to continue a story?

The first case can be handled readily with suitable authoring: if class generalisation and specialisation cannot amend the narrative appropriately, the original text can be used. As such, it would simply read as a regular, non-personalised, story. It may be that the reader has previously visited a suitable location, in which case this data could be used to ensure a coherent thread.

This thread may be further disrupted should the reader change location while reading - especially if stories are generated in sections, rather than in their entirety. One possibility is to use their initial location throughout, but to provide an option to 'rewrite' the story based on their new position. This could also allow for interesting interactivity options for readers: they may wish to rewrite their story in a different location to see how things change.

Finally, there is an issue regarding the amount of work required to read a story. Some existing locational games, such as Wanderlust mentioned earlier, only reveal the next part of the story once the reader is in the correct location. While this adds significant context to the narrative, it also acts as a block to readers who can't get to these locations. Our approach wouldn't require that the reader move, but it could allow for more detailed information to be added to the story if they were in the correct place. As such it is an optional feature, which would provide exciting personalisation if the reader would like it, but would not detract from the story if the locational data was not available.

5.   CONCLUSIONS AND DISCUSSION

In this paper we have outlined a potential approach to narrative personalisation based on locational linked data. Due to its support for varying levels of detail, it provides a mechanism which does not place restrictions on the reader, but instead offers added richness if they wish it to be available. Our use of linked data would remove the need to build data resources at the time of writing, and instead suggests an incentive for domain experts to supply their data in machine-readable representations. If their location is available in this form, it may be placed into a story!

Locational storytelling offers the ability to use social information. How might one's reading of a locational tale change if friends are involved? One approach could be to make the reader the protagonist, reading the story from a particular character's point of view, while a friend reads the other half of the story from the perspective of a different character. An alternative might be to personalise stories by including relevant references to friends. If Alice reads a story set in New York and we can see that her Gowalla contact Bill frequents a cafe featured in the story, we could have the protagonist pass Bill on her way into the cafe. Would changes like these facilitate greater reader engagement?

The answers to these questions are also coloured by the extent of autonomy given to readers to control characters. For example, authors may wish to let readers influence the course of the story with their location: if the protagonist visits the church before the coffee house, she may not meet the newspaper salesman who becomes important later on. It is hard to predict whether such changes would increase reader engagement or be perceived as a burden and ignored. Multiplayer interactive fiction and group-built roleplaying games could be a source of inspiration for work in this area, but meanwhile we would like to consider what level of functionality everyday technologies support.

There are also issues from the authorship perspective. Creating locational narratives requires an additional layer of support: some authors will be happy to explore these technologies without that support, but it is safe to assume that many authors would appreciate access to suitable tools. We need tools to let authors define locational variables as well as to sketch out the overall structure of their tales and put flesh on the bones of their narrative. At the time of writing, we are uncertain of what priorities authors would have in this area, and this is a particularly important question that we would like to pursue.

The area of locational narratives holds an enormous amount of potential, especially now that relevant technologies are in commonplace use. We believe that this paper has outlined some key areas of interest, and hope that it stimulates further dialogue on suitable next steps.

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