Senghor on the Rocks: A Georeferenced Electronic Novel

Florian Ledermann (Vienna University of Technology)[1]

Christoph Benda (Austrian Academy of Sciences)[2]

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[1] ledermann@ims.tuwien.ac.at

[2] christoph.benda@oeaw.ac.at

Introduction

SENGHOR ON THE ROCKS is the first novel that has been extensively illustrated with the help of online satellite imagery and was written in the classical form of a novel long before we developed an online format for publishing. Because of its linear narrative structure, the consistent first-person perspective and the movement that happens throughout the text, it was well suited for adaption as an online "geo-novel" based upon Google Maps, but it is not what usually is referred to as Electronic Literature as the term is presently understood.

The aim of this paper is twofold; firstly, we will attempt to place the project on the map of electronic literature, and secondly we will present - primarily technical - aspects of the project that may be beneficial for other projects in the field.

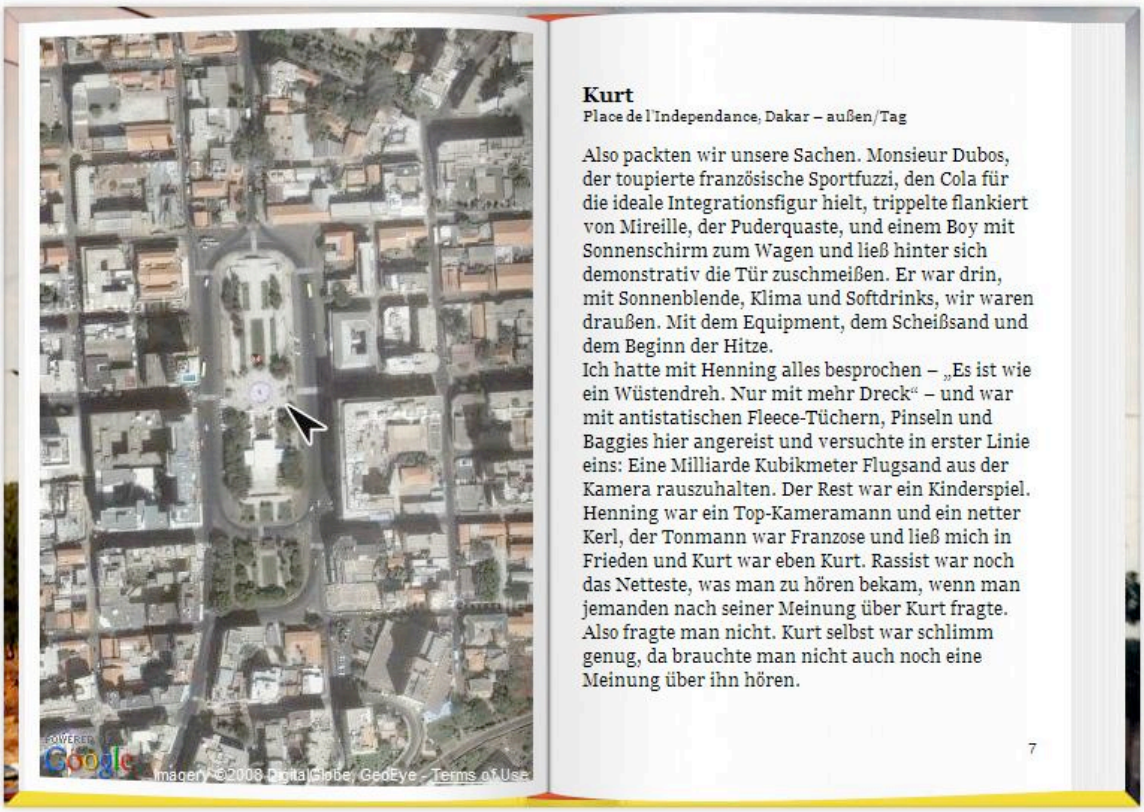

Fig. 1: The first page of text from SENGHOR ON THE ROCKS presented as a Virtual Book in a web browser.

Part 1: Placing SENGHOR ON THE ROCKS on the map of Electronic Literature

Even though the ELO's definition of the term Electronic Literature refers to

> *"works with an important literary aspect that takes advantage of the capabilities and contexts provided by the stand-alone or networked computer"* [3]

– and by that the Senghor-project – it is not easy to answer the question where (or if) SENGHOR ON THE ROCKS can be placed on the map of Electronic Literature. (Besides that it would not be appropriate for me as the author to judge or even comment upon the importance of the project's literary aspect.)

As already stated, at first SENGHOR ON THE ROCKS was not intended to be a contribution to the field of Electronic Literature. The possibility to easily annotate text with geodata via Google Maps and Google Earth happened at the time the novel was about to be finished. SENGHOR ON THE ROCKS is not "digital born" as Katherine N. Hayes claims for that Electronic Literature must be[4] and accordingly rather belongs to the field of "literature that has been digitized"[5] and should been seen separated from the field of Electronic Literature.

In specifying digitized literature Ernst Rohmer refers to what he defines as "Literatur im Netz",[6] a field he clearly separates from "Netzliteratur" (a term that can be seen as an equivalent of the use of "Electronic Literature"). But the focus of projects addressed by Rohmer is to make and keep literary works in the public domain accessible and available[7]. A further category in this context – one not mentioned by Rohmer – are electronic editions.[8] As most of the activities involved in annotating a fictitious text with geodata in order to present it online is editing work we at first looked to the concepts of digital editions. Nevertheless, we had to abandon the idea of entitling SENGHOR ON THE ROCKS a digital edition. Firstly, because it then would include the novel as a similar example to those in note 6 and secondly because especially in a scientific context speaking of a digital edition would be misleading as the term normally refers to *scholarly* digital editions whereas

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3 http://eliterature.org/about/

4 Hayles, Katherine N. (2007): Electronic Literature: What is it? (http://eliterature.org/pad/elp.html, last viewed 31.07.2008)

5 see above

6 Rohmer, Ernst (2005): Links zum Kanon. Die literarische Tradition und ihre Präsenz im Netz. In: Segeberg, Harro und Simone Winko (Hrsg.): Digitalität und Literalität. Zur Zukunft der Literatur im Netzzeitalter. München: Fink, 2005 (auch: http://www1.uni-hamburg.de/DigiLit/rohmer/links_kanon.html, last viewed 31.07.2008)

7 As examples Rohmer among others mentions the Project Gutenberg (http://www.gutenberg.org/wiki/Main_Page, last viewed 31.08.2008) and the German "Projekt Gutenberg" (http://gutenberg.spiegel.de/, last viewed 31.08.2008)

8 Current Austria based examples are e.g. the Austrian Academy of Sciences' "AAC-Fackel" (http://www.aac.ac.at/fackel, last viewed 31.08.2008) or the planned CDROM-edition of Robert Musil's works as described in Fanta, Walter (2006):Die Klagenfurter Ausgabe Robert Musil. Historisch-kritisches Edieren am Computer. In: Jahrbuch für Computerphilologie – online, Jg. 6 (http://computerphilologie.tu-darmstadt.de/jg06/fanta.html, last viewed 31.07.2008)

SENGHOR ON THE ROCKS is trying to address an audience interested in an entertaining read, a new form of presenting literature online or a new Google Maps mashup.

A further category of literature in the digital context SENGHOR ON THE ROCKS could be measured against are eBooks. (Even though eBooks seemingly are the last thing theorists active in the field of Electronic Literature wish to deal with.[9]) However, we don't think that SENGHOR ON THE ROCKS can by categorised as an eBook because as we hope to show in our presentation the goals of the project are not limited to distributing a text in digital form. Besides the controversies about presenting print (or printable) literature online in general[10] the discussions about e-publishing of text normally focus on questions of distribution, formats, DRM, marketing aspects and reading devices[11] of course.

All of which are of minor interest to the Senghor-project. The most important feature separating SENGHOR ON THE ROCKS from an eBook are that eBooks normally present plain text and that features like "multimedia enhancements such as animation" are ranked as unimportant (or even very unimportant) by the vast majority of frequent eBook users.[12]

Turning back to the core interest in the field of Electronic Literature, various typologies, concepts, theories and definitions of hypertext fiction, code poetry, browser art, interactive fiction, locative narratives, generative art, ergodic literature and many more can be worked through resulting in a picture of a field with a strong drive toward technical and textual innovation. But the question where or if SENGHOR ON THE ROCKS belongs to that picture in the first place remains unanswered.

Point of view

The centre of what could be called the common ground of the Electronic Literature theory from my perspective seems to be the conviction that works of all generations and all genres in the field at least explore non-linear structures.

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9 see e.g. Rettberg, Scott (2008): Communitizing Electronic Literature: „While use of the Internet has become an important part of everyday life in many parts of the world, most people have no idea that electronic literature exists, or at best, have heard of "eBooks" and think that by electronic literature we mean print books distributed as PDFs or some other electronic format. (http://grandtextauto.org/2008/05/29/communitizing-electronic-literature/, last viewed 15.07.2008)

10 Jonathan Franzens statements in Cameron Martins (online) Interview: An Email Conversation with Jonathan Franzen (see http://www.barnesandnoble.com/bn-review/note.asp?note=18038255&cds2Pid=22560&linkid=1202646, last viewed 14.08.2008) can serve as a good example for the widespread presumption of the inferior or at least provisional character of "stuff getting published online".

11 This topic soon will draw attention again, as Amazon plans to launch its eBook reader Kindle in Germany in fall 2008 (see e.g. http://www.heise.de/mobil/suche/ergebnis/?rm=result;q=e-book;url=/mobil/newsticker/meldung/114051/;words= , last viewed 14.08.2008)

12 IDPF eBook User Survey 2006: http://www.idpf.org./doc_library/surveys/IDPF_eBook_User_Survey_2006.pdf, last viewed 14.08.2008)

Ironically, the entire Senghor-project was driven by the idea to equal the strict spatial and temporal linearity of the text by displaying it on a map. Measured against the theories of Electronic Literature this means we were not trying to overcome linearity but we focused on it.

Due to the fact that the way the novel is presented online is very closely related to its form and content, it is necessary to give a brief overview of these aspects. As pointed out in the *work's description* SENGHOR ON THE ROCKS presents a story about the journey of a young Austrian through Dakar and Senegal. Even though the choice of the perspective in a novel does not have constitutively political implications, nevertheless writing in the context of what is called the "cross cultural dialogue" is a minefield of clichés, projections, cultural attributions and prejudices. An omniscient narrator in this case is almost impossible as she would have to have – or pretend to have – equal knowledge of both cultures: the one the visitor is rooted in as well as that of the country or area visited. Trying to describe the cultural "Other" from an assumedly objective point of view always comes with the peril of producing exoticisms or hegemonial projections. The relationship between "West" and "East" as fundamentally described by Edward Said in Orientalism[13] on a very general level serves as an example of this phenomenon. Furthermore, "culture" as such is a questionable category. Referring to anthropological field work, Gert Baumann states that "by stereotyping informants as 'belonging to' or even 'speaking for' a pre-defined 'community', one runs the risk of tribalizing people, instead of listening to them, and might end up studying communities of the researcher's own making"[14]. Despite methodological differences, an author runs the same risks and as Johannes Benda puts it in his diploma thesis on "Intercultural Relationships in the Integration Process" it generally is of great social importance not to reduce people's activities and behaviour to cultural patterns.[15] Aware of all these findings and pitfalls the whole novel is strictly told in a first-person perspective stressing the bias of a subjective view instead of trying to avoid it. At the same time, the main character pretends to tell his story not only from his very own point of view but also at the very moment it is taking place. Especially in the first and fast moving part of the novel this minimal distance between the action being narrated and the act of narration leaves little room for reflective thought and forces the reader into the lopsided perspective of the main character. (This results in a challenging style because clichés and prejudices play a vital role in this part of the novel but are presented without the explanatory authority of an omniscient narrator.)

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[13] Said, Edward: Orientalism. New York: Random House (Vintage Books Edition), 1979. Interesting enough, right in the Introduction Said presents a literary example: „*He* [Flaubert] spoke for and represented her. He was foreign, comparatively wealthy, male, and these were historical facts of domination that allowed him not only to possess Kuchuk Hanem physically but to speak for her and tell his readers that she was 'typically Oriental'." (Said, p. 6)

[14] Baumann, Gert (1996): Contesting Culture. Discourses of identity in multi-ethnic London. Cambridge: Cambridge University Press, p. 7

[15] Benda, Johannes (2008): Interkulturelle Beziehungen im Integrationsprozess : am Beispiel des Integrationswohnhauses Kaiserebersdorf. Wien: Universität Wien, p. 91

Still with the choice of the narrative perspective the problem that the main character speaks for and about "cultural" Others – which in itself can be seen as impossible and illegitimate[16] – is not solved. But this topic is also dealt with as a part of the story: In the final part of the novel the main character concludes his "cross cultural" experiences and observations by saying that it possibly might be the best for "cultures" to leave each other alone. Especially, if the people involved in cross cultural encounters cannot or do not want to spend more time together than a two week holiday. When one looks at all the collateral damage – such as social and economic injustice – that is done by tourism and other trade relations in an (in this case) African country it might be easy to agree with a statement like that. On the other hand it seems far more troubling if everybody locked themselves away in their own worlds, as Derek Gregory puts it.[17] In the case of SENGHOR ON THE ROCKS the main character finds that it is rather the people themselves that count than whatever they or anyone else refers to as "their culture" and that trying to understand the culture of other peoples is unsuitable as an explanatory model for the chances and menaces in interpersonal relationships.

These "findings" are presented in the very personal and subjective view of the main character, which in SENGHOR ON THE ROCKS is the only perspective accessible to the reader. This very narrow point of view brings us back to the main topic of the paper, the electronic format and what happens to the media used in the project rather than the itinerary content of the book or its interpretation. But still the consistent first-person perspective, the resulting linear narrative structure, and the movement that happens throughout the text led to the idea to transform the novel into the first online "geo-novel", a novel being presented together with an animated map.

Literature and Maps

As Robert Stockhammer shows in his recommendable monograph on maps and literature published last year,[18] there is a long tradition in mapping literature in a geographical sense starting with attempts to surveying Dante's Hell in the *Divina Commedia.*[19] In some cases, authors created maps displaying the sets of their plots, in other cases publishers enhanced later editions with maps or scholars created them for research.[20] In this context, it has to be stated that Google Maps and other sources of satellite imagery by strict definition are not maps.[21] The satellite imagery is a base layer

[16] Gregory, Derek: Preface. In: Geographical Imaginations. Cambridge: Blackwell Publishers 1994, p. X

[17] see above

[18] Stockhammer, Robert: Kartierung der Erde. macht und Lust in Karten und Literatur. München: Wilhelm Fink Verlag, 2007

[19] Stockhammer, p. 67

[20] Stockhammer, p. 62, 63

[21] Stockhammer, p. 27

not annotated with cartographical information. SENGHOR ON THE ROCKS makes use of this "blank map" and fills it with the movement of the novel's main character. By that we create a map solely presenting information relevant to the novel in the very moment of its action. This aspect will be discussed in greater detail in the sections "Maps and literature".

A further important assumption is that the images or maps delivered by Google Maps are not illustrations. An illustration would interfere with what Wolfgang Iser addresses as the "stream of imagery"[22] in the reader's mind the letters one perceives translate into. Illustrations provide a visual representation of things, persons or landscapes in the novel and by that directly contribute to this stream of imagery, which to our understanding is not the case with the Google Map used in the Senghor project. Also, Stockhammer points out a function of maps in literary works that separate them from illustrations: Maps, he says,

> *„ermöglichen dem Autor, kohärente Ereignisse durch ihre ‚richtige' Verortung zu erfinden, und dem Leser, diese Ereignisse durch ihre Verortung zu verifizieren."*[23]

One can say that maps interfere with the relation of a fictitious narration and the "real world" – hence the novel's realism - on a very basic level. Subsequently, Stockhammer asks if the plot of Joyce' Ulysses would be more realistic because the characters routes can precisely be reconstructed on contemporary maps of Dublin.[24] This question remains unanswered even though one can expect the answer would be no. Sadly, Stockhammer doesn't go into detail about the difference between a mappable novel and one that is actually mapped. Even though we are convinced that it makes a difference if an author has the possibility to show the places of action in his fiction as real places (or at least the geographic positions of these places) on a map or if he ‚just' uses real toponyms. Realistic narrations always seduce their readers to take the given content for real. Due to its characteristics a map greatly enhances this tendency. Commenting on Alfred Korzybski's "famous sentence",[25] *The map is not the territory*, Stockhammer states that an obvious fact as addressed by Korzybski has to be pointed out because in the reading of maps it is more common for the signifier to be mistaken for the signified than it is the case with other media.[26] So if the symbols on the map representing e.g. Dakar are (mis)taken for the real city one could easily assume for the Senghor

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[22] Oort, Richard van: The Use of Fiction in Literary and Generative Anthropology: An Interview with Wolfgang Iser. In: Anthropoetics III, No. 2, 1997 (http://www.anthropoetics.ucla.edu/ap0302/Iser_int.htm, last viewed 09.08.2008)

[23] Stockhammer, p. 63 (The sentence could by translated as suggested in the following: „Maps enable authors to create coherent events. At the same time they allow for readers to verify these events by locating them.")

[24] Stockhammer, p. 66

[25] Stockhammer (p. 13) refers to Korzybski, Alfred (1933): Science and Sanitiy. Lakevill (CT: International Non-Aristotelian Library), 1949[3]

[26] Stockhammer, p. 13 (original quote: „Wenn dies ausdrücklich gesagt werden muss, so offenbar, weil diese Verwechslung von Zeichen und Bezeichnetem bei der Lektüre von Karten nachhaltiger droht als bei der von anderen Zeichensystemen.")

project that this projection also works with the fictitious Dakar in the novel. By that the theory would be that the presentation of a realistic novel together with the geographical map of its content might enhance the realism of the novel in that sense that readers would (mis)take the contents of the story for as real as the places on the map.

At the same time maps are not the objective, apolitical display of a "world as it is" they often are taken for. From the very beginning cartographers were aware of the fact that every method of projection has its shortcomings (e.g. distortions of conformality, distance, direction, scale, and/ or area) and therefore every map only could be used for the very purpose it was made for.[27] But still – to give an example – the Mercator Projection established itself as a generally valid representation of the world. Famously criticised by Arno Peter in the 1970s, who stated that the Mercator Projection was Eurocentric because northern areas such as Europe or North America were displayed much larger than Equatorial areas.[28] In this context it is worth mentioning that Google Inc. also established a form of taxonomy of the importance of – or the public interest in – various areas by providing different levels of resolution for different parts of the world. Taken into consideration that thus the "realism" of a map is as virtual as the realism of a novel we tend to say that the presentation of a novel together with a map does not enhance the realism but rather the fictitious character of the novel.

Maps and Literature

But not only does the mutual presentation of map and text affect the text or the reader response to it. The map as well is affected by the way it is presented in the Senghor project. One of the reasons why maps are likely to be taken for a universally valid representation of the "world as it is" is that they pretend to present their content from a non-personal, – as Stockhammer[29] puts it – "transcendent" point of view. Furthermore time is a seemingly irrelevant category on a map[30] and a map normally displays all the possible ways a person could travel in the particular area. In this respect a map is a static state description and – following Stockhammer – can be seen as a text without a subject:[31] As long as no one draws a line on the map – e.g. displaying a ship's heading – the map as a text remains silent.[32] This is not the case with the map presented in SENGHOR ON

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27 see e.g. Stockhammer, p. 20

28 Stockhammer, p. 25f. Peters critic itself is not really consistent because there is no political will behind the fact that the polar areas appear enormously enlarged.

29 Stockhammer, p. 73

30 Even though maps display an area at a certain time Stockhammer adverts to the fact that maps often lack date specifications. (see Stockhammer, p. 26)

31 Stockhammer, p. 76

32 Stockhammer, p.76. Bezugnehmend auf Lotmann: Die Struktur literarischer Texte, p. 340

THE ROCKS. The way we were using the map reconfigures it in such a way that the places it displays are no longer related to a neutral or impersonal graticule but rather to one another in the way they can be reached by a travelling person.[33] Pulling the focus on this person – the novels main character – and his movement is the drawing of this line that evokes the text in the map. A crucial aspect in this modified use of the map is that time is added to a normally static medium that now suits for paralleling the action in the written text. On the one hand the map lost its general ability to allow for displaying all possible directions a person could go in. This results in a lack of interactivity in the presentation of the map (users/ readers e.g. cannot choose the zoom level they like or change the view as they wish). On the other hand we were creating our own visual story that unfolds next to the novel's text. This visual text is properly scripted with its own set of operations to control the map visualization, similar to the directions in a film script.

Taking into account the definitions of Electronic Literature, this still doesn't make SENGHOR ON THE ROCKS a work fitting the criteria of the field. But still it is a twofold piece of literature that would not be possible outside the context of electronic media.

[33] This principle of configurating maps is known from ancient itineraries described by Stockhammer on p. 71-74. A very exiting example is the *Tabula Peutingeriana*, an *itinerarium pictum* from the 12. century assumingly based upon a late roman map dating back to the 4. century. (A digital facsimile can be viewed e.g. here: http://upload.wikimedia.org/wikipedia/commons/5/50/TabulaPeutingeriana.jpg, last viewed 14.08.2008)

Part 2: Engineering a geonovel

Today a wide range of base technologies can be found that would allow us to attempt an implementation of a georeferenced electronic novel. Since we wanted the project to be available to a broad audience, we constrained ourselves to considering technologies that are platform independent and provide an uncomplicated way of viewing the material online. Furthermore, access to satellite imagery was required because, as discussed above, it was important for the project to be able to create its own cartography on top of a seemingly "neutral" base layer instead of augmenting an already existing map containing abstractions already made by some other authority (besides the pragmatic fact that online maps are currently very sparse in the regions of the main plot).

The space of online geography technology is currently dominated by Google, with their products Google Maps (which runs in the browser without requiring any downloads or plug-ins) and Google Earth (which is a program that has to be downloaded to the user's computer). Both give access to satellite imagery licensed by Google from various other companies, and both provide abstract data such as borders and roads, in varying detail. For both products, similar alternatives from different vendors exist, but the Google suite of products dominates the market and sets the de-facto standards of features to be expected from similar products.

Google Earth and similar products are programs running on the user's local machine which allows them to support a much more sophisticated rendering of the earth and its surface. The Earth is generally represented as a three-dimensional globe, decorated with satellite imagery and even a realistic relief structure in certain regions. This allows the user to take arbitrary viewpoints in virtually any location on the planet. Content to be displayed on top of the virtual earth's surface can be provided in the KML file format, through which the programmer can use and control the same flexibility for presenting one's content to the end user.

Google Earth has been used successfully in the literature context to present georeferenced texts. Armageddon Pills[34] is an example of a travel report presented in Google Earth, using some of its more advanced features. The Google Lit Trips Project[35] presents information about classic works of literature on the virtual globe, targeted towards teachers to use in classroom settings.

While the achievements of these projects are impressive, we quickly saw that the application layout, the impressive and dominant visual display and – most importantly – the limited possibilities for presenting and designing our own content would let the text be dominated by the visual display. We were looking for a way of augmenting the text in a way that would supplement it but not take over the attention of the reader and distract her from reading.

[34] http://www.armageddonpills.com/
[35] http://googlelittrips.com/

Google Maps (and similar products) runs in the user's web browser, available from a standalone website[36] and as an Application Programming Interface (API) that can be imported into external sites. In contrast to Google Earth, using the Maps API allows the author to control all visual aspects of the presentation, the only limitation being that the map is constrained to being a rectangular area within the page. Rotating the map is not possible, and zooming is constrained to discrete zoom levels, from zoom level 0 (whole world) to 18 (most detailed level showing cars and people). On each zoom level change, the tiles that make up the satellite image have to be downloaded from the server to replace the previous image, resulting in a sudden change instead of a smooth transition as supported by Google Earth.

Other literature projects have been realized using the Google Maps API. "The 21 Steps"[37], which was published during our work on SENGHOR ON THE ROCKS, is probably the most prominent and internationally acclaimed example. "The 21 Steps" use the Google Maps API to present a short story on the map, using the "Speech Bubbles" provided by the API for presenting short bites of text and lines drawn on the map to indicate movement.

Our first experiments used geometric annotations such as markers and lines like the other projects we reviewed. We quickly discovered that for a story of the length of SENGHOR ON THE ROCKS, this quickly led to a cluttered display leading to confusion. We were looking into different ways of presenting the story on the map as it unfolds over time.

Controlling the Map

While the Google Maps API provides automatic download and rendering of appropriate satellite and map imagery, only rudimentary methods are provided for controlling the movement of the map. The main viewport controlling methods provided by the API are listed in the following table.

`setCenter(center, level?)`	Sets the center of the map to a new position, causing a discrete "jump" of the viewport to the new centerpoint. Optionally, a zoom level and a map type (satellite or map) can be specified.
`panTo(center)`	Performs a smooth „panning" animation if the target position lies within the current viewport. Otherwise acts like setCenter without specifying a new zoom level or map type.
`setZoom(level)`	Zooms in or out to a new zoom level, keeping the same geographical center point.

Table 1: Map operations provided by the Google Maps API.

[36] http://maps.google.com/
[37] http://www.wetellstories.co.uk/stories/week1/

It quickly became clear that these methods are too limited to provide a continuous, dramatic experience to the user. Especially changes in zoom level accompanied by movement of the map's centre result in complete loss of orientation when realized with a discrete "cut" – the only operation supported by these methods. The texture of the satellite image is too abstract to provide enough visual cues for re-orientation after such a discrete change. Furthermore, even on the same zoom level, only movements to a target within the current viewport can be realized in a smooth manner, which would require for longer movements to either always take place on a very high zoom level or to be performed by a discrete jump, resulting in the same disorientation.
Further analysis and experiments resulted in a small taxonomy of possible operations that can be performed at page transitions which is shown in Table 2.
This extension gives the author 8 methods for page transitions (in addition to the trivial "no change") compared to the only 4 supported by the Google maps API through its methods.

- ● Change zoom level (keeping map's centre point) (= `setZoom(level)`)
- ○ Change location
  - ○ With change of zoom level
    - ● Discrete "cut" to new location and zoom level (= `setCenter(center, level)`)
    - ● Change zoom level, then pan to new location
    - ● Pan to new location, then change zoom level
  - ○ Staying on same zoom level
    - ● Discrete "cut" to new location (= `setCenter(center)`)
    - ● Pan to new location (= `panTo(center)`)[38]
- ○ Follow path
  - ○ With change of zoom level
    - ● Change zoom level, then follow path
  - ● Staying on same zoom level

Table 2: The taxonomy of map operations developed for the project. Nodes marked with ● **are mapped to** functions in our implementation.

More importantly, the introduced taxonomy shifts the collection of transitions from a technical point of view (determined by the underlying implementation) to a dramatic point of view, as it would be employed by a camera operator. This can be seen in the fact that the `setCenter()` method turns up in two different places of the taxonomy, reflecting the fact that the same underlying implementation is

[38] Note that the original version of panTo() only supports panning to a point within the current viewport and therefore has been replaced by a version supporting long-distance smooth panning in the project.

used for two different dramatical effects.

For pointing out locations and paths on the map, the Google Maps API provides markers (for highlighting a point in space) and polylines (for highlighting a path) to be used by the application. While these geometric annotations work well for most applications that want to provide an overview or an abstract spatial index to an information set, we found in our initial experiments that using such static, abstract annotations would quickly clutter the map display if not removed after every change, but even then the static nature of the added geometry would not reflect the subjective, searching and sometimes confused perspective of the story. Using pushpins or markers for indication locations always suggests an exact, measured location to the viewer. Since the locations to be used were fictitious and the purpose of the map visualization was not meant to constrain the reader in her imagination, this approach was not suited for our intentions.

Instead of markers and lines, we introduced an arrow to point out locations on the map. While a pushpin needle always suggests an exact point on the map, the location an arrow is pointing to is semantically somewhat more open – it may be referring to an exact point, but also to an area of varying radius, a viewing direction or an object that can be identified on the map like, for example, a building. This semantic openness of indicating locations was increased even more by making the arrow rotatable, allowing the arrow to be displayed in any angle (in steps of 5°) and animated smoothly between these angles[39]. Again, the angle of the arrow cannot be mapped to any definite semantic category. Changes of perspective of the protagonist (either in its spatial or mental meaning) or dialogs in the story can be supported by a turning arrow on the map.

Besides indicating distinct places on the map, the transitions between places may be visualised as continuous panning movements from one place to the other as supported by our taxonomy. Panning has the potential to allow the user to relate new places with already visited places, gradually building a relational model of the geographic space and being able to judge distances between locations. Furthermore it allows the author to indicate the actual route taken by the characters by not just interpolating linearly between two places but following the actual route to the target.

We replaced the limited `panTo`() method provided by the maps API with a much more powerful method, which does not only support linear panning over distances of any length, but also allows the author to define a path of arbitrary shape that is followed by the panning motion. This allows us to follow the roads and routes as the protagonists move along them, placing the arrow in the centre of the viewport to highlight the current position. Obviously, by introducing animated transitions of the map, we are finally leaving behind the possibilities of printed media and challenge our metaphor

[39] Such rotations and fine-grained animation control are usually not supported in HTML. For implementing this feature, we produced a series of pre-rendered images, showing the arrow in every possible angle in steps of 5 degrees, which results in 71 images. A script was developed to load in the appropriate image and control the animations by rapidly displaying different images to the viewer.

of the physical book.

Another feature we added to the Maps API is the display of temporal information on the map. The satellite images used in Google Maps are usually taken during bright daylight on clear days – for scenes that take place in the evening, night or early morning this results in a stark contradiction of the shown image to the scene of the novel. Since it is not possible in the current version of the API to obtain images of different daytimes, we implemented an extension that allows us to blend the base image of the map with a coloured layer of variable opacity, allowing us to simulate the effects of changing daylight on the environment and therefore visualising the passing of time on the map. The colour and opacity values we use for different daytimes were found heuristically by comparing the result at certain times with our personal experience of the mood and lighting situation and adjusting the values accordingly in an iterative process.

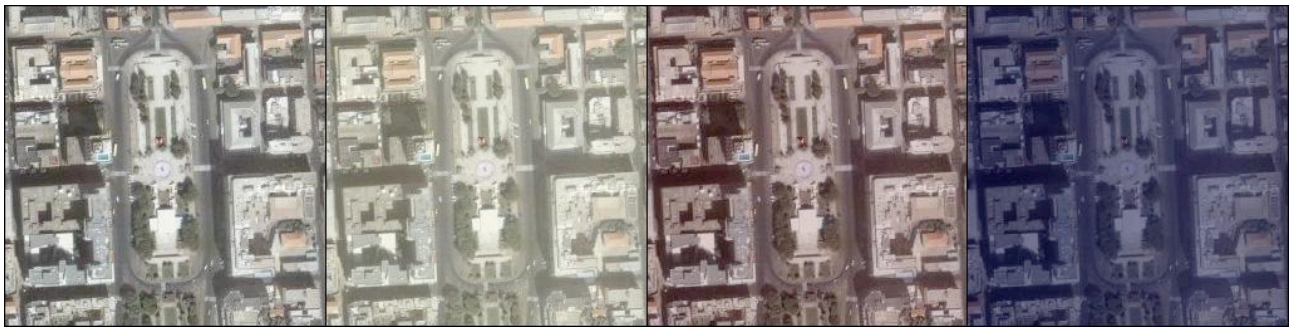

Fig. 2: Time passing at the location of the introductory scene at 10 AM, 12 noon, 7 PM and 11 PM as rendered by adding a semi-transparent coloured layer on top of the map display.

Relating Text and Map

Applications using Google Maps usually store the information to display in XML or JavaScript structures for easy machine manipulation, hampering direct access to the data by humans. For SENGHOR ON THE ROCKS, all data including map positions, zoom levels, routes, arrow positions and daylight information is stored in the main HTML file alongside the text. This approach is inspired by the microformats paradigm[40], a collection of proposals for how to embed computer-parseable metadata in ordinary HTML files. The microformats project includes proposals for embedding time and location information into websites – however, the official geodata microformat was not found suitable to express the metadata necessary for covering all aspects of the taxonomy for controlling the map. We therefore had to extend and modify the existing proposal to cover our needs.

Using an embedded microformat for storing the spatiotemporal metadata allows the author to edit

[40] http://www.microformats.org

all information in one place. For each page of the book, a special code block in the HTML code defines the operations to be performed on the map, the time of day for adjusting the map's colour and the text of the page. The result is a HTML document that contains the whole novel in regular HTML which can be printed out as such. The book-like presentation and all mapping features are accomplished by a style sheet and script that are loaded at initialisation – even without these components, the code remains a fully functional HTML document as shown in Figure 3.
Adding geographic annotations to the code of the page manually can be a cumbersome task. We developed a special "edit mode" that would provide the author with a control panel to set the available options – operations from the taxonomy, animating the arrow, setting the time of day – directly underneath the book as it would be displayed in the final product. The author was also able to drag and zoom the map in this version, to allow him to set locations and views in a direct way. While this tool remained a "hack" throughout the making of the project and has therefore not been released to the public, it could be extended in the future into an editor software that supports the creation of similar projects by others, including non-programmers.

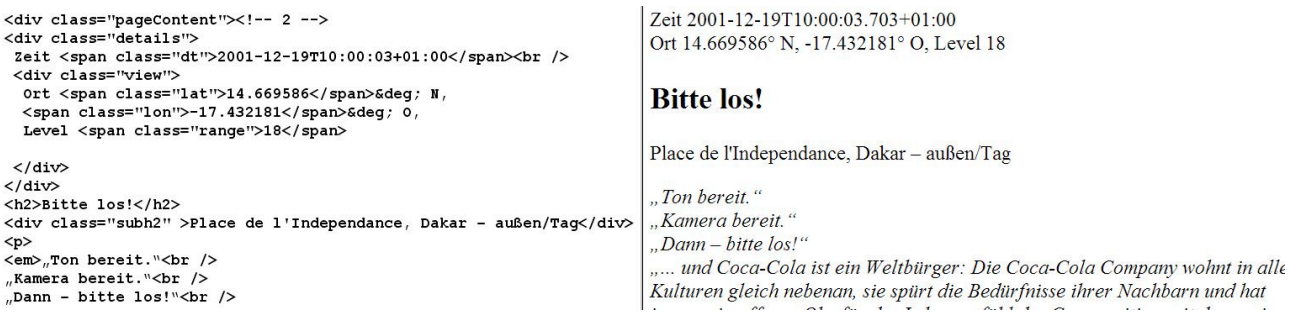

Fig. 3: Geographic annotations woven into the code of the page (left). On the right side, the rendering of the code without additional styling information is shown. Adding our style sheets and scripts, the metainformation is hidden and the book as shown in Fig. 1 is displayed.

The Book Experience

Choosing a book as the visual interface for an online novel must seem ironic on first sight, a quote from the world of analogue books it is trying to replace. The dry humour in the text of the book would maybe be reason enough for this decision, and the plot also hints towards playing with reading metaphors: The first part of the book is formatted like a movie script, inside a novel, which is now presented inside a web browser, a reading device for the screen. But not only playing with different techniques of reading were the reason for a somehow radical design decision; looking at the project more closely reveals how well the book metaphor is suited for designing the user interface of such a project.
The covers that have been designed for the text – which has been split into three parts for the online

edition – advertise their content and serve as the main entry points into the story. The collages for the covers, composed mainly from material recorded at original locations, communicate the style and perspective to expect before one actually starts reading. The seemingly naive compositions create a strong emotional identity and obfuscate the high technical standard realized by the producers. On the top level, the "book" acts as an iconographic representation of the project that increases recognition when quoted in the form of screen shots on blogs and other media.
In addition to the primary function of a book as a container for text, some of its secondary properties have been implemented for its digital counterpart. As with a physical book, readers can judge the position in the novel by looking at the block of pages to the left and right of the current page. A virtual bookmark is automatically inserted when the reader leaves the page, to bring her back to that page with a single click on the next visit. Page numbers allow the precise referencing of every page, a concept that is also reflected by every page having a URL to be used for direct access to the location in the book. Using the book is intuitive and doesn't require additional attention by the user. The possibilities of the new media are focused on the map on the left side which visualizes the unfolding of the story in geographical space.

Feedback and Usage Statistics

To date, we gathered feedback about our project mainly from two sources: analyzing the access statistics of the site and collecting informal feedback and suggestions from users and media. Both of these methods have not been set up for a scientific analysis of the project, but provide some insights and hints that may be informative to other projects and practitioners in the electronic literature community.
For evaluating access statistics, we use the Google Analytics product, which is available for free and provides basic statistical evaluation tools with limited possibilities. For this paper we analyzed the timeframe from May 25, 2008, when the project went online, until August 31, 2008. In the given timeframe the project had 2791 visits from 2271 distinct visitors, who viewed 75795 pages altogether, about 27 pages per visit on average. The average time spent on the website was 7 minutes 16 seconds. The visits were distributed unevenly throughout the analyzed time span – we can clearly identify media events drawing visitors to the site as spikes in the graph.
Since the project gained the attention of literature and mapping communities and blogs all over the world, the website is visited by a global audience. German speaking countries (Austria, Germany and Switzerland) account for approximately 63% of the visitors, the remaining come from 61 different countries led by the Netherlands, France, The United States, Brazil, China and the UK.
The main challenge for analyzing the access data would be to identify how many people were

actually reading the book instead of just clicking through it. Obviously, in a purely event-based tracking system it is not possible to unambiguously distinguish reading from browsing, but some indications can be found in the data that allow us to hypothesize about the share of visitors actually reading the book. Unfortunately Google Analytics does not provide all information that would be available in the raw data. The main limitation we faced is that only the arithmetic mean numbers are given for a large part of the data without access to other statistically significant values such as standard deviation, median or others. Since we hypothesize that there are at least two groups of viewers with very different browsing behaviours (those who speak German and those who do not) and the arithmetic mean value is not very robust with regard to outliers, the provided conclusions can only be a starting point for formulating hypotheses for further research.

A first starting point would be the time spent on the site. While this is definitely not an indicator for actually reading something, it can be used as a measure for the interest a user take in the site, keeping in mind that outliers may be originating from users leaving their browser windows open and other technical factors. Roughly 27% of the visitors leave the page within the first 10 seconds, correlating with 24% of visitors viewing only a single page. This may be an indication for lack of interest or a problem with the site's usability that prevents people from "opening" the book. 25% of the visitors spend between one and three minutes on the site, 21% between three minutes and half an hour and nearly 5% spend over half an hour with the project.

We hypothesize that visitors who visited all pages of a part until the last page have a high potential for having actually read that part of the book. While part 1 may be "clicked through" by a number of curious visitors interested in the technical side of the project, parts 2 and 3 do not expose any new technical features and are therefore interesting primarily because of their content. This hypothesis is supported by the fact that the visitors who completed part 1 are coming from 11 different countries (including non-German speaking countries), while the visitors that completed parts 2 and 3 all originate from Austria or Germany. Furthermore, the average time spent on each page by those visitors matches the average time it takes to read the text on corresponding pages. As stated above, this has to be treated with care because of the limited significance of the arithmetic mean value.

Up to now, 60 visitors (2.6%) have completed the first part, 22 (1%) have completed part 2 and 18 visitors have completed part 3 of the book. If our hypothesis holds, this would mean that approximately 0.8% of visitors have finished reading the whole novel in their browser. While these numbers do not seem overwhelming at first sight, we have to keep in mind that a lot of our visitors do not speak German and are therefore not able to read the book and that reading the book online takes approximately 10 hours – an amount of time not many people are willing to spend on any online offering.

Informal feedback has been overwhelmingly positive since we launched the project. Besides the personal emails we received, the project has been mentioned and recommended on various blogs, ranging from well-known blogs like the US-based "Google Maps Mania" or the German "Zuender Blog" to niche blogs about literature and maps or smaller, personal blogs. Of the mainstream media, Ö1, the leading cultural radio station in Austria, has dedicated a radio feature of ten minutes length to the project and the "Wirtschaftsblatt" newspaper used the project as a hook for a feature about the possibilities of geographic information systems.
Interestingly, some users took the low interactivity of the project as a kind of provocation. Multiple times, users requested zooming and panning controls for the map or an overview map of the whole story. Our concept was to lead the users through the story, like in a conventional novel, but in digital media interactive possibilities seem to be taken for granted, so that such an approach appears as much more limiting.

Conclusions

The presentation of a map and a literary text reciprocally affecting each other as first presented in SENGHOR ON THE ROCKS could not have been realised without electronic media. The chosen electronic format is therefore not just a replacement for a printed publication, but a genuinely new way of presenting a text. Another fundamental aspect of electronic literature, which is that works in the field always contain a "second text"[41], which refers to the program code defining the behaviour of the system, has been realized in a particularly pure form. The information controlling the map display is interwoven into the HTML code containing the literary text itself. We believe that these two aspects define SENGHOR ON THE ROCKS as belonging to the field of electronic literature. We also hope that the presented concepts and details will be of use for other practitioners for creating projects similar to the one presented or even beyond a simple geo-novel.

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[41] See Winko 2005 amongst others

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