Participatory design experiment: Storytelling Swarm in Hybrid Narrative Ecosystem

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ABSTRACT

This paper describes a participatory design experiment that is influenced by the swarming activity. The paper introduces a new approach to writing narratives in virtual learning communities of the social Web 2.0 and contrasts it with traditional storytelling approaches. In the participatory design experiment we developed a hybrid virtual storytelling playground that augments the real world – a hybrid ecosystem of narratives. It consists of social software tools freely available in the Web, such as microblogs, social repositories of images, and blogs, the real locations in the city, and the storytellers who leave their digital contents. The results of writing narratives as a swarm in a hybrid ecosystem are presented. In our experiment, instead of bending old novel formats into the hybrid ecosystem, the evidences of new evolving narrative formats of this hybrid space were explored.

Introduction

The explosion of social software – blogs, wikis, social repositories and -networks – started the era of the participatory Internet, or the so called Web 2.0, that enables participants to actively reflect, publish and share their experiences; gain awareness of and monitor other individuals, communities and networks; publicly store and maintain their artifacts; and personally retrieve socially gathered information online (O’Reilly, 2005; Constantinides & Fountain, 2008). Such environment is hybrid in many ways – it interconnects people virtually, unites their everyday experiences in geographical and web places, and combines their personal selection of social tools into networks that enables the peers to monitor their daily activities and meaning-making that goes across such environments. The particular activity, gaining popularity in the participatory web, aims at creating personal and collaborative narratives. This paper introduces a participatory design experiment of writing narratives in the new hybrid environment. It was investigated how people write narratives using the uncoordinated behavior of swarming. Using the swarming approach highlighted certain aspects in the participatory design methods. The results concretized new storytelling standards emergent in social web, which are in contrast with traditional storytelling approaches.

Hybrid ecosystem

The concept of hybrid ecosystem consists of two parts. First, hybrid refers to the structural property of the world that is achieved by deliberate blending of geographical spaces with collaborative environments such as blogs, microblogs, wikis, social repositories and -networks. In this new environment the borders of geographical spaces and participatory software environments can be blurred.
or eliminated whenever purposeful, allowing embedding artifacts across the borders to create an augmented and more interactive world in the context of community activities.

The second, *ecosystem* term together with its explanatory sub-concepts *place* and *niche* describes how such hybrid geographical places and participatory software environments together with their users also represent a complex functional system. *Place* is a personally meaningful spot in the surrounding environmental space. The place involves conceptual construction and knowledge building. The augmented concept of *place* not only refers to a geo-position, but to the holistic conglomeration of events, objects, emotions and actions of an individual in the place, and includes both natural, e.g. geographical elements. In our experiment we constructed a setting in which individuals defined *places* by associating artifacts such as impressions, historical content, images etc. with geographical locations. A feasible method of associating contextual metadata with space information is *artifact-centered*, in which the contextual annotation is added to the artifacts that are simultaneously geo-located. With *tags*, that is, descriptive terms associated with content items by members of the community, geographical positions can be related with meanings and activities shared by the members, and places can be searched by such aspects.

It is possible to create immediately such *locative content* using GPS-equipped mobile devices that are situated simultaneously in a physical and a virtual environment (Tuters & Varnelis, 2006). Locative content can also be accessed from virtual environment and used to trigger social interactions with a place (Tuters & Varnelis, 2006; Kaipainen & Pata, 2007). Many common social Web applications have integrated locative functionalities, e.g. Flickr.com, Google.maps.com, Brightkite.com, while most of the blogs and wikis still lack this possibility. For a community this kind of link between geographical and virtual spaces and meanings is a way to build their identity, determine their particular territory as a place, and distinguish themselves from other communities. Notable is, that this community territory is not defined only by their location in geographical or software places. This territory is also defined by meaning- and activity aspects, which bring in extra dimensions to the space. For marking this abstract space we can use *niche* term.

Niches may be conceptualized as particular abstract spaces for taking community specific actions, holding and recreating community meanings. Thus, niches contain meaningful community places. The concept of niche is used in biology to describe an abstract space in which certain species have optimal living conditions for performing actions related to their life. Hutchinson (1957) defined niche as a region (n-dimensional hypervolume) in a multi-dimensional space of environmental factors that affects the welfare of a species. Niches appear as generalizations and they become evident if many similar individuals live, interact and evolve in certain conditions. Each individual keeps constantly adapting itself to the niche of the species. A *niche* in our context is a community-specific and community-determined *subspace in hybrid ecosystem*, an optimally meaningful region for the community. We can define a niche as the n-dimensional hypervolume delimited by the range of each tag that is optimal for meaning sharing. Niches may have, but do not have to have geographical coordinates in real world. This is in line with Hoffmeyer’s concept of *semiotic niche* (1995) intended to signify semiotic spaces that are actualized by certain organisms in species’ specific semiotic processes when interacting with their environment. Magnani (2008), and Magnani and Bardone (2008) in turn use the term *cognitive niche* to point at the distributed space that participants create by interrelating individual cognition and the environment through the continuous interplay through abductive processes in which they alter and modify the environment.

We can summarize that participatory media environments together with geographical locations can be conceptualized as a *hybrid ecosystem*, provided that participants of social media have ecological dependence of the particular set of “tools” that they use as their *niche* for taking action. Here the concept of tool should be interpreted as it is used in an activity theory (see Leontjev, 1978), which considers artifacts (eg. digital narratives, images), software (eg. social software tools) and language (eg. user-created ontologies such as tags) as mediators of action. Hybrid ecosystem is an ecologist view to the dynamic system consisting of an augmented space in which activities of people with various artifacts in
geographical locations using participatory social software create a feedback loop to this space that influences the evolution of communities and determines their interaction in this space.

How does the hybrid ecosystem emerge and function? A hybrid ecosystem is by default too many dimensional to be made sense of directly. We assume that the observer can only perceive it by taking a perspective at a time. A perspective is a personal prioritization of shared dimensions of an ecosystem. The dimensions that a person has previously found meaningful and taken into account will determine her perspective. To return to the level of storytelling, we assume that in each step of the storytelling activity, a participant takes a perspective, which determines the aspects of the story to be elaborated. Taking perspectives is the defining feature of the community dynamics in the process of the online narrative-construction, to be discussed below. A perspective is by definition individual, but sharing perspectives determines niches. If noticing such priorizations to be shared by more than one individual, these perspectives become community-defining and facilitate some community actions more than the others, and contribute to the determination an abstract community-specific niche.

Communities may have different niches for particular types of activities. Further, one may assume that in the process of an activity, a niche is never static but is always in the stage of evolution as the community members explore different perspectives. We assume that a niche for writing hybrid narratives is constituted when individuals share some common online storytelling culture. These amount to similar ways of telling stories and looking at things, that is perspectives. Implicit perspectives have impact when the participants relate themselves with locations by means of tagging. As a collective activity, tagging determines shared subspaces in the narrative space. Other participants, active in the same subspace, may find these places by tags and use such contents as triggers of their emotions or action. They may also integrate the existing digital contents in hybrid ecosystem into new stories, contributing with their own perception of the places. These contributions constitute ‘evolutionary’ feedback loops to the niche (Pata, 2009a,b). The dynamic hybrid ecosystem shapes its participants and itself, and allows the evolution of the community ‘habitat’ for community actions and meanings.

**Narrative-construction as online activity**

Learning through developing and discussing *narratives* in the social Web spaces has become a new form of learning. As Kirsti Ala-Mutka (2009) puts it, writing narratives or storytelling is one of the innovative aspects that learning in Web 2.0 communities has introduced to education. Bruner’s (1996) cultural-psychological approach to education emphasizes narratives as vehicles for meaning making and identity-determination. Recently, Bryan Alexander and Alan Levine summarized in their white paper “Web 2.0 storytelling: emergence of the new genre” that: “Web 2.0 storytelling in education serves as composition platform and as curricular object”. They considered Web 2.0 storytelling as a distributed art form that can go beyond the immediate control of an initial creator. They encouraged educators to give Web 2.0 storytelling a try and see what happens (Alexander & Levine, 2008). This was also the initial starting-point for our experiment about narrative ecology.

While the boom of narrative-centered social software environments is obvious in the Web culture, there is not enough understanding of how participants actually use such environments while storytelling. This paper focuses on a new way of collective narrative construction. To keep the idea of *narrative* open enough for further discussion the definition is not fixed in the beginning of the paper but let it open along the following chapters.

According to Kurland (2000) the following are the general characteristics of traditional stories:

1) They have a plot, a geographical setting, where and when the story takes place, and characters who are involved into the plot by taking actions.

2) The plot of the story usually involves conflicts and its resolution.

3) Stories are generally read and appreciated only in their entirety, to understand the story we must follow the complete unfolding and resolution of the plot.
4) The structure of the story may be linear progressing from unfolding the conflict, rising action, climax and resolution. Alternatively, the patterns of actions and interrelationship of characters may occur throughout the story.

5) The author of a story plays often an active role in the story either as the first person narrator who participates in the story as an observer, minor character or even the major participant or the third person narrator, who stands outside the story itself and can be all-knowing and might describe action from many character's viewpoint, evaluating participants and actions in the story.

These characteristics of novels are deeply rooted in our minds. They may also reappear in the transformed shape if different modes of writing are used in hybrid ecosystem. For example microblogging (eg. Smallplaces in Twitter http://twitter.com/smallplaces; Twiller http://twiller.tcrouzet.com/), mobile text-messaging (eg. Novel Idea http://www.mobfest.co.za/novelidea/default.html) and blogs (eg Protagonize http://www.protagonize.com/) are among the newly adopted means for writing narratives. A typical approach in these environments is to segment and order the story into small chapters or *tweets* and make it available to a broad audience that is allowed to rate or comment the story. Jay Bushman has been experimenting with translations of famous authors’ stories into the microblogging format (eg. The Good Captain http://www.loose-fish.com/waipole/the-good-captain/) with the aim at embedding fiction between the streams of nonfiction that is constantly present in our daily lives. His goal is to blur the line between the real world and the story world (Shaer, 2008).

However, Crang (1998) has noted that different modes of writing may express different relationships to space and mobility. This may affect the standards of writing narratives, and perceiving them as novels in participatory web. Spatiality that is common to both stories and human geography is a key concept in new emerging narratives in hybrid environments. On one hand, human geography is filled with emotions about places. On the other, stories contain a set of geographical associations that plays a key role in shaping participants’ geographical imaginations (Crang, 1998). Using this commonality extensively, some authors (eg. Carlos Ruiz Zafon, “The Shadow of the Wind” http://www.carlosruizzafon.co.uk/shadow-walk.html) have embedded their novels into the real geographical locations and provide itineraries for exploring the novels parallel in real and virtual world to enable for the readers embodiment of the fictional story as part of city reality. We may take the previously described storytelling approaches as examples of reintroducing old formats of fiction in the new social software environments. Yet, it is important to find out, which completely new storytelling standards might emerge in participatory web.

**Swarming as a bio-metaphor for writing narratives**

While looking for the new models to depict the nature of storytelling in hybrid ecosystems we arrived to another biological phenomenon – *swarming* (Bonabeau, et al., 1999; Kennedy, Eberhardt & Shi, 2001). As we assume, many activities in hybrid ecosystems can be characterized as *swarming* phenomena. Swarming refers to self-organizing behavior in populations such in which local interactions between simple decentralized agents can create complex organized behavior. A *swarm* is a community in which every agent is only responsible for its individual actions, but the actions altogether cause shared intelligence to emerge. Such swarming systems can accomplish global tasks and form complex patterns through simple local interactions of autonomous agents. Individuals in swarms have ecological relations to the collective. They maintain their individuality and viability in case if the collective swarm intelligence and viability emerges (Sauter et al., 2005). Swarming relies on using the environment as a shared memory, and on reading information both from the environment and from the swarm members’ signals to maintain individual wellbeing. Thus, swarming is one of the main mechanisms how hybrid ecosystems function and evolve. In other ways, swarming can be viewed as the dynamics of creation of perspectives using tags for annotation, and perceiving certain signaling perspectives from the hybrid ecosystem.
In this study we initiated writing narratives in a hybrid ecosystem (see Figure 1) as swarming. To use a biological metaphor, a hybrid narrative ecosystem can be imagined like viewing through a prism of foraging ants.

Figure 1. Swarming: Foraging behavior of ants (above) and writing narratives in hybrid ecosystem (below)
The foraging example is illustrative because it provides a generalized model for the various behaviors that have been observed in social software environments where participants create and use textual and visual artifacts. “A central place food foraging” is a swarming behavior that consists of two main phases: an initial exploration for food, followed by carrying it back to the nest (Sudd & Franks, 1987). The foraging ant is randomly searching to explore new area. If an ant collides with some food it picks it up and leaves a certain pheromone on the trail. If foraging, each ant is alert for this pheromone as a food marker that may have been left by other ants in the trail for finding food. They are always moving towards the direction where there is a greater concentration of that pheromone. However, the pheromone dissipates over time. If there are not enough ants collecting food and dropping pheromone on the way home, the trail may disappear. The system of diffusion and evaporation leads of a competition among food sources for available ants, because the number of ants is limited and the trails need a steady walking of ants along them to stay stable. The shorter the distance of a feeding place to the nest, the shorter is the trail, the more often ants walk from nest to feeder and back per time unit. This leads to a stronger positive feedback loop and race conditions among the feeders, selecting for the nearest one. The pheromones similar to those signaling about food may also be used to allure ants from the track. An enemy trying to conceal the search target, may spread false signals to attract the ants to a location of little interest. To avoid this trap, the signal is responded only if it reaches to certain threshold value (Marshall, 2005).

As an analogue to ants’ foraging behavior, human storytellers in their hybrid ecosystem search for and are influenced by the attractors (interesting perspectives) in the hybrid space. In a similar manner, the participants of a narrative-constructing activity may choose the strong attractor places in the hybrid ecosystem that may be defined by themselves or by other participants of this community. The perceived similarity with respect to the chosen perspective with some previously perceived perspective might be used as the criteria of orienting to the next action. This may trigger participants to continue exploring similar perspectives, providing a narrative trajectory that is fluctuating around certain meaningful places for them in hybrid ecosystem.

When finding something of interest, the objects are captured in textual or digital image format using microblogging programs (Brightkite.com, Zannel.com) in mobile phones. Alternatively, digital cameras could be used and artifacts would be uploaded later. Microblogging environments enable to pull digital contents automatically also to the social repositories (Flickr.com) or social networks (Facebook.com). Stories uploaded from microblogging environment can be mashed using special tags, and pulled as RSS feeds to the other social software environments for monitoring. This may be done for extracting various stories from the collected artifacts individually or for the community. The artefacts can be locatively geotagged in microblogging systems (eg. Brightkite.com, Zannel.com), and connected to stories either by simple linking, tagging with keywords or merging them and providing longer explanations in personal blogs.

The attention of an emerging story is caught by various trace-leaving techniques like mashing, pulling and aggregating, tagging for social retrieval, social awareness technologies or hybrid maps etc. These collected and personally meaningful artifacts with tags serve as signal trails for the narrators themselves to continue with certain story aspects, and also for other storytellers to contribute for this story or to trigger their own stories. The application of microblogging environments and social mashups with tags enables for other participants an immediate access to the new signals of potential attractors, causing selective noticing in the hybrid ecosystem. Following the signal trail opens the possibility of accumulating more content for a particular story, especially if several individuals start to strengthen the signal. The more similar content is accumulated, the more attractive and visible the story trail becomes as a trace in the narrative ecosystem. This trace attracts other individuals and thereby reinforces itself. Strong signal trails may also be attacked and reused, for example by alluring the crowds away from the original trail with various similar signal baits. The initial story may thus become modified into many paths.

Adopting traces of other individuals of the swarm depends on analogy or closeness of the attractor narratives to one’s own. Various forms of collaboration may appear. One is agglomerating stories in the manner comparable to how termites build the nest (Kennedy et al., 2001). Termites build high dome-like
termite nets following the swarming behavior. They take some dirt in their mouth moistening it and then start to move in direction of the strongest pheromone concentration. They deposit dirt when the smell is strongest. After some random movements searching for a relatively strong pheromone field, the termites will have started a number of small pillars. The pillars signify places where a greater number of termites have recently passed, and thus the pheromone concentration is high there. The pheromone dissipates with time, so in order for it to accumulate, the number of termites must exceed some threshold; they must leave pheromones faster than the chemicals evaporate. This prevents the formation of a great number of pillars. As termite pillars ascend and termites become increasingly involved in depositing their loads, the pheromone concentration near that pillars increases. The termites are attracted to let the dirt between the pillars that attract them from several sides. Termite arch-building contains two kinds of behaviors: cue-based and sign-based. In the cue-based case the change in the environment provides a cue for the behavior of other actors (eg. growing pillars provide such cues). In the sign-based swarming the pheromones are used as signals.

In the hybrid narrative ecosystem tags (like pheromones) are glued to the soil material (geotagged content of the narrative pieres, text, images). This provides signals and makes story elements attractive. The artifacts that are marked with same tags or artifacts that contain certain significant elements for the storytellers will be noticed and integrated into stories. However, these stories are not linear, but can be viewed rather as story dimensions.

Secondly, such artifacts from certain story dimensions that are available in the geographical locations will become gateways to other geographical locations where artifacts with similar tags have been embedded. Such geo-locative story dimensions form an ecological knowledge of the hybrid narrative ecosystems, influencing how participants will interact with the environment.

**Participatory Design approach**

*Participatory design-based research*

Design-based research has become one of the leading methods in developing and investigating the characteristics and user behavior with new technologies. Traditionally, design-based research exhibits the following characteristics (Design-Based Research Collective, 2003):

- The central goals of designing environments and developing theories or “proto-theories” of cognition are intertwined;
- Development and research take place through continuous cycles of design, enactment, analysis, and redesign;
- Research on designs must lead to sharable theories that help communicate relevant implications to the involved participants;
- Research must document how the design is functioning in authentic settings;
- The development of such accounts should rely on methods that can document processes of enactment to outcomes of interest.

The design process contains both developing a practical environment and activity design (Reigeluth, 1999), as well as, testing the theoretical framework underneath this design (Cobb, 2001; Edelson, 2002; Sweller, 2004). As to the epistemology of the design process, Cobb (2001) has focused on the role of design as a strategy for testing theories. He assumed that the strength of theories developed through design research originates from their explanatory power and their grounding in specific experiences. From the point of view of theory construction, the practical process of applying a theory to construct a design exposes the possible inconsistencies in the theory, and is, therefore, even more effective than the analytical research (Edelson, 2002). Discovering that some activity designs are superior to others can also provide insights into human cognitive architecture that may otherwise be difficult to achieve (Sweller, 2004).

In our case, a specific hybrid narrative ecosystem was developed in the experiment by initiating a narrative swarming process, and its properties and functioning were investigated by the swarm
participants. One reason to run our experiment using participatory design was the concern to avoid that the resulting design and theory stayed apart from the actual user practices. Participatory design approach views technology and technology applications in the context of daily life rather than as isolated products. Participatory design represents an approach to design in which the participants using some methods or technological systems play a critical role in designing it together with the professional designers.

The applications of participatory design vary in the commitment to user participation in design, and the power balance between users and designers. At one end of the spectrum, user involvement in participatory design approach is limited to providing designers with access to users’ skills and experiences, while giving them little or no control over the design process or its outcome. At the other end of the spectrum users can participate as designers and are fully involved in developing the design outcome. For example, Okamoto (2009) has described the inclusive design method in which a designer participates in the “people’s world” and finds an understanding of a problem from the same point of view as the people. Palaigeorgiou et al. (2009) suggest that the participatory culture of Web 2.0 and the implicit empowerment of the users should be associated with participatory design projects. The eco-cultural adaptive design (Phenice et al., 2009) provides another dynamic participatory design approach in which participants are seen as active agents who are capable of influencing their own activities. Users create unique settings, when interacting with new technology. Such settings, common to communities, may be referred to as eco-cultural niches, which can be fully enacted and characterized only by the users of this niche. Using the cultures of participation is yet another method of participatory design (Fisher, 2005). Cultures of participation require contributors with diverse background knowledge who value different ways of participating. This will bring out different eco-cultural niches within the designed systems. Fisher (2009) emphasizes that to increase social creativity in the cultures of participation requires that participants had diverse perspectives, they could act independently without the direct influence of others, their interaction in the design process was decentralized focusing on their own approaches to the settings, and the aggregation mechanisms were existing for turning individual contributions into collections, and private judgments into collective decisions. In addition, participants must be able to express themselves (requiring technical knowledge how to contribute), must be willing to contribute (motivation), and must be allowed to have their voices heard (control). The participatory cultures approach is very relevant in case of swarm behavior.

Fisher (2009) suggests using the method of seeding new technology ideas to participatory cultures. The seeding, evolutionary growth, and reseeding method (Fischer & Ostwald, 2002) postulates that systems that evolve over a sustained time span must continually alternate between periods of planned activity (the seeding phase), unplanned evolution (the evolutionary growth phase), and periods of deliberate (re)structuring and enhancement (the reseeding phase). The seeds should be built in participatory design activities and would evolve over time through small contributions of a large number of people.

**Storytelling as a Participatory Design Instrument**

One argument to use participatory design emerged from the methodological attempt to combine data creation and data interpretation aspects: creating narratives by swarming activity, and investigating this activity in hybrid ecosystem by using the very same narrative activity. We relied to the fact that storytelling has been used as one of the methodological approaches in participatory design research.

At the heart of participatory design is the concept of hybridicity, which relates with the hybrid experiences and the analytical third space idea (Muller, 2008). Hybrid experiences refer to the practices that may take place neither in the participatory domain, nor in the researcher domain, but in some “in-between” region that shares attributes of both roles’ spaces. This “in-between” region is a fertile environment in which participants can combine diverse knowledge into new insights and plans for action.

If to apply the participatory design approaches in which the commitment and responsibility is shifted to the participatory cultures, the designer and the user roles can be viewed as the different voices of same people. This will enable the emergence of the movable analytical third space in the experiment.
In our case, storytelling was used for implementing the design of the narrative hybrid ecosystem. The students’ task in the experiment was not only to try storytelling in hybrid ecosystem but also to reflect about why certain items were collected, what triggered their attention and initiated collaboration in the hybrid space. Thus, images and texts carried attributes of both spaces – they were partially informal and related with personal emotions and experiences in hybrid ecosystem, and partially formal and documentary observing and monitoring why these stories were extracted from other dimensions, embodied and finally embedded to the ecosystem.

According to Muller (2008), story collecting and storytelling generally require a kind of third space to occur. The authors of stories own the stories, they write from their own perspectives, which are sometimes in strong conflict with one another; the authors can make use of one another’s materials, effectively moving away from single-author narratives and into a kind of collaborative collage of materials, which conveys interlinked stories; and the community members can negotiate and define their roles.

Each participant of the narrative ecology experiment could have its own view to the hybrid ecosystem, and would arrive to the experiment with a personal set of research questions. When writing narratives they could operationalize their personal design-based views of storytelling in the hybrid place, and simultaneously monitor themselves and other storytellers. Monitoring the other storytellers could cause unorganized collaboration on narratives. Participatory surveillance term – a new form of gaining awareness, empowering and building subjectivity that emerges in social software environments (Albrechtslund, 2008) applies to describe this monitoring and collaboration in the hybrid ecosystem. Secondly, individuals could investigate the ecosystem collaboratively as designers. This meant that groups could discuss before the design experiment, how to use tools in the experimental settings, and write down their joint research questions about the hybrid ecosystem. These questions might guide them to be more focused as investigators of the system. In the end of the experiment the group members could collect evidences of the storytelling phenomena, discuss the findings and write the report.

Experiment: Writing narratives in a hybrid ecosystem

*Participatory design experiment in the “Narrative ecology” course*

Investigating storytelling phenomena in hybrid narrative ecosystem calls for methodological approaches rooted in participatory design. In this chapter we describe a participatory design experiment of the Narrative ecology course in Tallinn University. Our methodological approach for investigating hybrid narrative ecosystems combines methods from Design-based research and -learning (Design-Based Research Collective, 2003; Wijnen, 2000; Ning, Williams, Slocum and Sanchez, 2004) and Participatory design research (Kensing & Blomberg, 1998; Muller, 2008) with those of the Swarming principles (Bonabeau, Dorigo & Theraulaz, 1999).

The participatory design experiment in our case was organized as a university course “Narrative Ecology” targeted for master students of Interactive Media and Knowledge Environments. The course aimed to give learners an experience of the design-based research and competences in initiating and planning various kids of experiments in the city space. We used the design-based learning approach (Winjen, 2000) because it enabled simultaneously to achieve research aims and the educational goals, embedding teaching into the contextualized design-oriented research. Ning, Williams, Slocum and Sanchez (2004) have assumed that design-oriented learning takes a unique approach of a combination of objectivism/behaviorism and constructivism because it is a mix of understanding of explicit design parameters and conducting conscious and yet implicit creative activity. Design-Based Learning is characterized as integrative, going beyond individual disciplines, multidisciplinary, practice-oriented, creative, leading to differentiation, co-operative (teamwork), motivating, competence-oriented, furthering creativity, activating, fostering responsibility, synthesizing in a creative way and leading to professionalization (Wijnen, 2000).
The “Narrative Ecology” master course was planned and run two times with slightly different settings and time-period in Tallinn University in Spring 2009. At the first run of the course a group of Estonian students with various backgrounds from interactive media, art and semiotics and two supervisors (N = 13) started the participatory design experiment about ecosystem of narratives in the face-to-face meeting. This was followed by individual explorations of the hybrid ecosystem of narratives for 1,5 months. The final meeting was used to summarize the results of the design experiment. The second run of the course followed the same structure, however it was more intensive and lasted 1 week. Participants of that course were 15 international students visiting Estonia as part of their studies, and 5 local master students of Interactive Media and Knowledge Environments program.

In both cases the students were prompted to plan the design experiment and raise by themselves various theoretical questions about writing narratives in the hybrid ecosystem. Testing the applicability of the narrative swarming framework in hybrid ecosystem was one goals of our design experiment. The deeper understanding of nature of hybrid ecosystem, and its functioning for writing geo-locative narratives was another goal of our investigations. We also wanted to clarify the new evolving narrative formats and collect evidence how narratives appear in a hybrid ecosystem.

A four-step strategy for testing theories in design-based research, introduced by Cobb (2001), framed our narrative swarming experiment in hybrid ecosystem. This strategy of design-based research started from developing a theory of swarm-like actions in hybrid ecosystems, and hypotheses of the new narrative standards (this can be referred to as a seed); continued with deriving some design principles from the theory and translating these into concrete designs using the participatory cultures (the evolution of the seed); and ended with evaluating the designs in relation to the theory (preparations for the reseeding phase). Elaborating the Cobb’s suggestions, the concrete steps of the design process were developed using the participatory design approach:

1. Developing the framework of possibilities provided by the hybrid ecosystem for writing narratives (the seeds), and highlighting the objectives of the design experiment as researchers in the focus group discussions of participants.

2. Selecting technology components suitable in the experiment, which were available for all the participants.

3. Using participatory culture the participants individually interacted with the hybrid narrative ecosystem, and created the ownership of the design experiment from their own perspective. In this step simultaneous observation and documentation of the process took place.

4. Evaluating the narrative hybrid ecosystem in focus groups, using the initial objectives, as well as, the objectives that were created by each participant in action.

Neither the preferred technology use in hybrid ecosystems nor the characteristics of the hybrid narrative ecosystem were clear when the participatory design experiment was initiated. In the design experiment, no initial story topics were deliberately decided. This decision was taken to investigate natural processes that appear in hybrid ecosystems. Using the swarming as a model for writing narratives brought several questions about the nature of the hybrid ecosystem into the students’ focus. As part of the design experiment, students had to raise initial research questions to guide their observations. Some of the questions were the following:

What are the perspectives in the hybrid ecosystem that storytellers use in their narratives?
Which forms of collaboration will occur in narrative swarming?
What are new emerging technical and literary standards of storytelling in hybrid ecosystems?
Would the storytellers distribute the stories across the hybrid ecosystem parts and how do other participants discover and follow distributed stories?

Simultaneously, new questions could appear in the cause of action. Students’ final group reports opened some of the issues and characteristics of hybrid narrative ecosystems. Running the participatory design experiment in a swarm-like manner could mostly provide rather vague qualitative answers to these questions and highlight the possible limitations of our theoretical approach.
Data Collection from the Hybrid Narrative Ecosystem

Our experiment served as the first step of investigating what the important characteristics might be that a technological implementation should contain in order to enable and support storytelling in hybrid ecosystem. Therefore, we took mainly a qualitative approach of collecting and analyzing the accumulated data and participants’ experiences. In the results part we also propose an ontospace approach of representing community data in hybrid ecosystem as a future approach.

First, the tags as personal and shared perspectives in hybrid ecosystem were used for getting an insight look to the ecosystem of narratives. The tagged story content could be monitored in Flickr and Blogs. Second, the sequences of perspectives and themes in personal narratives were analyzed from personal microblogs (Brightkite), blogs, and image repository feeds (Flickr). The attention was also on the combination of various data-types into story sequences. Third, various collaboration evidences were under investigation – eg. comments, references, links, reusing each other’s content etc. The qualitative analysis was conducted using the focus group discussions in which the participants investigated the accumulated hybrid narrative ecosystem together, using their initial research questions, and the questions that had risen during active participation in the experiment.

For analyzing the uncoordinated and self-organized action of participants in online communities we can distinguish the phases of the swarming processes in hybrid narrative ecosystem as following:

a) Passively monitoring others in personal networks without taking action eg. using friendfeeds;
b) Leaving traces of meanings and action in networks (eg. embedding artifacts annotated with texts and tags, interconnecting artifacts);
c) Using actively the traces left by other participants for taking perspectives, while composing individual narratives. This can happen by: Monitoring certain individuals in personal networks and using these cues (eg. texts, images, tags) for taking action or selecting perspectives for personal stories; Monitoring the global community patterns (eg. tagclouds, tagged perspectives from the maps) by pulling out datasets about certain perspectives of the narrative ecosystem, or using specific visualizations etc.
d) Monitoring other participants for actively taking centrally non-coordinated collaborative action.

These actions suggest that the analysis of the hybrid ecosystem data is not only useful for the post-activity investigations, conducted by few investigators in order to understand what happened. We claim that the analytical tools to get guidance from the community niche, and finding signals left by the community members should be available for the participants during their active participation in writing narratives. We assume that the members of the swarming community would behave like investigators of their activity niche in order to better adjust themselves into the hybrid ecosystem. They should adjust their perspectives with the community-suggested perspectives in order to be guided in their personal narrative writing or to be involved in the collaborative narratives. By doing so this activity both stabilizes and shifts the community niche. Thus, participants should be provided with the proper support systems to monitor the signal traces of narratives (eg. locative tags in the hybrid ecosystem).

In general, community activities in certain niches may be viewed both from time- and frequency aspect. The temporal view as a trajectory may consists of the sequence of taking perspectives when people compose their narratives. The frequency view, in turn, might represent the frequency of taking certain perspectives in a defined time period. An individual trajectory may bring them frequently to the same positions in the hybrid space. It is clear that if individuals of one community were active in hybrid ecosystem, some perspectives that define their interaction with the niche would be more frequent than the others. So the frequency, how often community members take certain perspectives, might indicate the patterns of their relationships within an ecosystem and should be visualized in hybrid space.
Results: Towards new ways of storytelling in hybrid ecosystem

Design Solutions for Storytelling in Swarms

Two design settings were collaboratively developed (see figure 2). In the first course a distributed community environment (http://ecologyofnarratives.wordpress.com/) was organized connecting various students’ individual social software tools (Brightkite.com, Zannel.com, Twitter.com, Flickr.com, Facebook.com, and blogs at Wordpress.com) with RSS feeds, and agreeing about the joint tag “narrativeecology”. Using this tag, mashups of collected content could be pulled together and monitored by the participants and participants from outside the community. Each of these social tools enabled alternatively to arrange a set of friends that could be monitored. Each student was asked to contribute to the narrative ecosystem weekly.

In the second course, the individual blog solution that was used in the first course, was replaced with the joint group blog (http://hybridnarrativeecosystem.wordpress.com/), where all the participants could add their content. This change was mainly undertaken to speed up the story creation as a community and increasing the awareness of participants of each other. The students had to contribute to the narrative ecosystem daily.

Figure 2. Individuals’ social software tools can be interconnected forming the system to monitor each other while writing narratives

After running the experiment, it became evident that the most frequently followed paths in the social applications used by storytellers were the friendfeeds in microblogging environment Brightkite.com, and the mashed feeds arriving from Brightkite and Flickr with the “narrativeecology” tag that could be monitored in blogs. It was found that new geolocative storytelling supports using the tools that provide quick uploading of the content in locations and constant monitoring of other storytellers. The elaborated stories that participants combined in their blogs were triggered of the materials that were initially
uploaded using microblogging tools. These stories were advertised in some cases in the same microblogging channels to catch other students’ awareness.

**Narrative ecosystem formation**

In our experiment we were looking for the emergent collaboratively perceived and used places in hybrid environment that triggered collaborations. It is to be reported that the experiment of writing narratives in swarm-like manner succeeded as predicted. Individual participants actually relied on items posted by others, while processing their own personal narratives.

Mapping personally meaningful places in hybrid ecosystem took place when individual storytellers embedded object representations from geographical locations to the social software environments and annotated these artifacts with tags. For example in Flickr digital artifacts embedded in the hybrid ecosystem were described simultaneously by tags that represent how participants conceptualize these artifacts, how they use the space and artifacts for taking actions, how they give meaning to the places, and with GIS that provides the geocoordinates of the place. Such artifacts became searchable in the Flickr and Google maps with tags, revealing dimensions of the city.

The artifacts from all the participants of the experiment were mashed together in the microblogging environment Brightkite using friendfeeds or in Twitter.search.com with tags (eg. #narrativeecology), and pulled for monitoring into other mediums such as to the personal blogs as RSS feeds. We could observe that often participants did not add the tag metadata for perceived dimensions explicitly, however the content of texts and images still enabled them to perceive and embody some perspectives of the other participants.

When writing narratives in a community of a hybrid ecosystem, some popular perspectives were determined (eg. food, buildings, graffiti, emotions, contrasts, happiness, particular software beyond others, particular geographical locations beyond others). Within this community niche certain places became more preferred than the others, and started to trigger collaboration. The participants started taking similar perspectives – they collected similar contents and annotated these with the same tags and reused peers’ contents in their narratives. Put another way, the participatory design experiment enabled them to collect some evidence about the nature of such shared places.

There appeared to be several challenges for design solutions that could support writing narratives in hybrid ecosystem:

a) Visualizing more favored community places for participants of an ecosystem

We propose that community places may be made visible on the representations of the hybrid ecosystem, for example using ontospace methods (Kaipainen, et al., 2008). This metadata approach defines descriptive feature dimensions (*ontodimensions*) that altogether constitute an ontological space (*ontospace*). Using ontospace, it is possible to represent any type of description of the digital content situated in the hybrid ecosystem, be it a geoposition, or the tag, or a time stamp of an event, and blend them and refer to them in various hybrid ways. Individual entities (e.g. *places*) occupy this space, and each of them can be identified by its *ontoposition* in the ontospace. An ontospace is a means to relate the existence of entities of a domain to each other and to the domain to which they belong in terms of similarity, in turn defined as proximity in the ontospace. Altogether, the ontospace constitutes the referencing system needed in collaborative activities in a hybrid ecosystem.

The ontospatial formalism allows the identification of *niches* for collective meaning sharing. A *niche* in our context is a community-specific and community-determined *subspace of an ontospace*, an optimally meaningful region for the community. The ontocoordinate system allows us to define a niche as the n-dimensional hypervolume delimited by the range of each ontodimension that is optimal for meaning sharing. Visualizations of more favored community places in the community niche would serve as maps for individual community members to find interesting and useful perspectives for their stories or becoming involved in swarm type of collaboration while working on their individual stories.

One interesting aspect that such exploratory use of ontospace representation might provide relates with the community analysis for action potentialities. Ontospace representation would reveal useful
information about community places and actions. This could be used for creative collaboration purposes also between different communities. For example the discussions and negotiations between two contradicting communities, based on their perspectives, might be triggered in digital environments or real actions could be initiated in geographical locations.

b) Representing all dimensions of the hybrid ecosystem space

Up to now, there are means of marking geographical locations and meanings of artifacts in the hybrid space (see Kaipainen, et al., 2008). However, it is not clear technically how to annotate artifacts with the coordinates of the software locations simultaneously with geopositions and tags. For example, for indicating that one artifact of the story is situated in microblogging environment and another is situated in the blog, or alternatively, that artifacts that are combined into a story are situated in the different participants’ blogs, microblogging sites or image repositories. Thus, it is still not possible that all the hybrid ecosystem place coordinates were mapped on one spacial representation and used for social navigation.

c) Sequencing the unique stories

So far, in hybrid ecosystem there are no good means of sequencing story elements as we do in traditional novels. For example, it is not easy to follow the storyline if the story components are situated in different software systems. But we see the possibility of connecting and tracing story elements from one virtual environment to another can be provided with the ontospace representation in future elaborations of the system. A person’s path in an in hybrid ecosystem from one place to another may be described as a trajectory in an ontospace. When writing hybrid narratives, each person moves along personal trajectory in the ontospace, creating particular personal places. This trajectory is not predetermined with the story plot but emerges during enaction with the ecosystem. The trajectory as a storyline is determined by and combined from a limited set of dimensions that the person highlights, and a small number of hybrid places where the person stays during activities. Thus, the trajectory usually fluctuates between the limited amounts of closely situated positions in the hybrid space. Technically the trajectory in hybrid space is currently observable to the others only by means of monitoring such as participatory surveillance in social software (using mashed feeds, friendfeeds etc.). In the experiment it was technically not possible to visualize the story formation as a trajectory. In the future, visualized trajectories in the hybrid space may become powerful guides for community members to better adjust their personal activities in respect to community preferences. Trajectories may serve as new ways of perceiving and sequencing stories.

**Popular perspectives for individual and collaborative narratives**

Several common perspectives were identified by the participants of the design experiment while analyzing the results available in the hybrid ecosystem. Popular perspectives appearing in hybrid ecosystem of narratives may be roughly divided into individual and collaborative. The evidence of popular perspectives taken by individuals is presented in figures 3-6. Usually participants of an experiment did not start their stories from themes or topics that were planned beforehand. Many of them explained in the discussions during last face-to-face meeting that the first impression to start the story came from the environment. This impression initiated the deeper interest towards certain perspectives in the hybrid environment and triggered them to continue the story. Personal stories were most frequently formed extracting and documenting perspectives of the locations, and urban design of the city (see Figure 3). Personal memories and impressions were used to find perspectives. Perspectives towards the nature phenomena were taken. Contrasting between the objects and their environment also created perspectives (see Figure 4).
Figure 3. The ‘pain’ perspective is attributed to the geographical location in town (left)

Figure 4. Contrasting artifact with its surrounding opens a new perspective (right)

In several cases emotional triggers were used as perspectives for extracting certain content. For example, one participant searched for the “happiness” images from the Flickr database to understand if this feeling is same for different nations in different locations. Another student focused on the impressions of red color in the environment (see Figure 5).

In Red Narrative, I tried to express my emotions visually (signs, letters, places, abstract shapes). I chose red because this color is expression of hidden hyper feelings and thoughts (trying to come over the sickness, participating in different events, avoiding the depressive moments, some failures in studies, errors in some situations, organizations, contrasts of emotions, lack of sun, winter, spring feelings, etc). This is a conceptual collection of “similar” photos labeled in “red”.

Figure 5. The ‘red’ perspective as a trigger of the story
Loading places and buildings with emotions and personifying them was one of the ways of integrating images to the stories. Another way was to relate existing stories that the narrators had read previously, to the new objects and places found in town. Thus, the perspective was selected because of previous memory of other stories (see Figure 6).

![Gosh! I never thought I would see Voldemort statue... I mean You Know Who... Hope he is not a social network addict :)

From the legend
Estonia is a country of legends. 'When you fly into Estonia, you go over Lake Ulemiste, which lies high up to the east of the city. The lake has an inhabitant, according to local myth -- the "Ulemiste Elder" (Ulemiste vanake), who by legend comes to the city gates every Thursday and asks 'Is Tallinn finished yet?' To which the residents answer, 'No, not yet' -- if they answer 'yes', the figure would then flood the city.'

Figure 6. Literary stories as triggers of finding perspectives

It was notable that some participants tried to embed action triggers to the hybrid ecosystem to trigger collaboration (see Figure 7). Some participants assumed that storytelling triggers in hybrid environment might be embedded into the town as graffiti. In several cases, hybrid graffiti appeared that connected real locations and digital artifacts in social software. The graffiti locations were commented in the computer-based system. Figure 8 demonstrates that the storyteller reused the digital graffiti image from another storyteller’s Flickr account and elaborated the context in his blog, creating a hybrid graffiti that interpreted contents situated in the geographical location.

![Figure 7. Embedding collaboration triggers to the contextual text of the virtual artifact]

Figure 8. Hybrid graffiti as a narrative

As we have mentioned above, monitoring others by friendfeeds, and the formation of hybrid ecosystem by means of tags appeared to be the triggers for individual storytelling and swarm-like collaborating on writing narratives. On top of such social surveillance, one participant in the experiment got an idea of initiating social surveillance activities as part of her narrative. In her blog she wrote the following: 

*I came up with the idea of new narrative using parts of bodies in urban environment and trace the dimension of urban hybrid being, thus research how different participants perceive and participate. For this experiment common tag besides #narrativeecology is mixedbodies and then for particular images*
- head, foot, torso, arm. In flickr you can easily organize photos in a batch (rotate, add tags, geo location to all needed pictures at once and send them to the group sets ;).

Figure 9. Illustration of the ‘hybrid being’ created by collaborative narrative activity

One example, the illustration of storytelling as reminiscent of ants’ foraging behavior was documented with the “hat” graffiti in Tallinn (Figure 10). One participant noticed the signal trail of “hats” and started to follow it documenting such graffiti in his microblog. Another participant noticed the trail of “hats” in the microblog feed, and started collaborating and finding and collecting the “hats” as well. Strong collaboration magnets were food, buildings, emotional scenes, and scenes that triggered curiosity.

Figure 10. The signal trail of “hats” in hybrid ecosystem

Collaboration always appeared without planning suggesting that indeed a swarm behavior was a relevant model for describing it. The main forms of collaboration on narratives were:

1. Becoming triggered by content collected by others and reusing content uploaded by others as part of your stories, giving new interpretations to the content (Figure 11). Such activity indicates that some perspectives in hybrid space may lead narrators to discover new perspectives that may be related with the initial perspective. This develops various possible trajectories in hybrid space that may lead each reader to find and combine new stories using the available story parts.
II. Dedicating the content to other storytellers to be used in their stories (Figure 12) appeared to be one way of agglomerating content related to certain perspectives. This behavior was similar to the swarming behavior of termites, while constructing the nest without initial agreement of actions.

III. Adding content to another story (Figure 13) was another behavior indicating that agglomeration of stories may appear without predetermination of collaboration.
IV. Picking up stories, acting them, and documenting this action in a story (Figure 14) was an interesting behavior which indicated that a result of reading narratives in hybrid ecosystem enaction may also be the real physical action.

V. Commenting on others’ stories was one of the more traditional forms of the collaboration on narratives (Figure 15) that usually appears often in blogs and microblogs. However, such collaboration indicated to what perspectives participants might react emotionally in the hybrid environment.
New ways of storytelling

When starting the narrative swarming experiment in hybrid ecosystem, one of our assumptions was that the new storytelling format differs from the traditional storytelling. Table 1 presents the comparison of the differences of traditional and swarming storytelling in hybrid ecosystem.

Table 1. The comparison of storytelling formats in traditional novels and swarm narratives in hybrid ecosystem

<table>
<thead>
<tr>
<th>Traditional story</th>
<th>Swarm narrative in hybrid ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is created purposefully according to the plotline</td>
<td>Emerges without predetermined themes or plot</td>
</tr>
<tr>
<td>Is integrated uniquely into a single whole story</td>
<td>Is an agglomeration of differently combinable content portions</td>
</tr>
<tr>
<td>Becomes understandable as whole plot is read</td>
<td>Can be understood from portions of content which can be noticed and integrated differently depending of the perspective of the reader</td>
</tr>
<tr>
<td>Has linear or pattern structure organized into chapters</td>
<td>Appears as a cluster of close-bye and interrelated perspectives, but each reader embodies the story differently depending of the sequence and selection of perspectives</td>
</tr>
<tr>
<td>Represents actions in geographical setting</td>
<td>Can be enacted in the hybrid ecosystem</td>
</tr>
<tr>
<td>Represents (tells about, mirrors) emotions and actions of characters</td>
<td>Indicates to some real enactment potentialities for participants of the hybrid ecosystem</td>
</tr>
<tr>
<td>Is written by one author</td>
<td>Appears as a result of many authors’ individual storytelling</td>
</tr>
<tr>
<td>The author in active role in the story as a character or as narrator</td>
<td>Each author strengthens particular personally preferred perspectives, thus changing the hybrid ecosystem and adjusting it for himself and participants alike, thereby allowing community formation and functioning</td>
</tr>
</tbody>
</table>
We could also detect some interesting mutation of old storytelling standards in the new environment. For example, participants agreed that embedding self to narratives, for example adding shadow signatures as digital watermarks on images, appeared as a new form of authorship declaration in stories (see Figure 16). This is comparable to the author’s voice in traditional novels.

![Figure 16. Narrator embedded on the digital artifact of the story](image)

However, most of the collected evidence indicated that narrative writing in hybrid ecosystem without predetermined topics caused the emergence of new standards for writing narratives. New geo-locative stories appeared to be granular and consisting of little content portions. The stories might become evident and appear as a result of accumulation of these portions. The emergent story might not have a start and end. It was a flow of impressions that might eventually obtain a storyline, or even several story lines for different participants. Yet, providing the visibility of stories as linear sequences and composing story plots appeared to be technologically unaided.

Individuals tended to mutate their narratives as a result of ecological perception. Sometimes these could initially be mere errors that took place if individuals tried to repeat an existing narrative in another virtual environment (for example if adding descriptions and tags to the Flickr images uploaded by means of Brightkite mobile microblogging). Also deliberate reinterpretation of artifacts took place. Most often if the narrative was transformed from one environment to another (eg. from microblogging environment to the blog) authors tended to elaborate it. If artifacts were borrowed from one individual to another, the new person and different context could cause different perception of this digital entity. This kind of evolution of stories might have eventually changed the attractor tag concentration to the extent that the original story trace was lost and the individuals needed to start the search for new narrative resources as new attractors.

It would be important to note that swarm-like collaboration did not assume an initially decided goal, but sufficed for collaborative patterns to emerge. Cloning narrative pieces by analogy might also make the trace of the narrative more visible, similarly like pheromone traces are agglomerated due to the swarm activity. Thus cloning could “hype up” some stories.

The most remarkable was the finding that the swarm stories were not traceable as linear formations, which follow a plot. They were formed and perceived as agglomerations of content with certain perspectives, allowing different readers to perceive different stories. Reading the stories provided enactment possibilities in hybrid ecosystem: emotional participation by commenting, contributing to the story or deriving the story by taking the lead as a new narrator in digital environment, and role-playing the story in geographical locations were some examples. This enactment possibility indicated that hybrid narrative ecosystem with participants, contents, and locations represented a new participatory story type that differed from the traditional type of story standards.
Conclusions

In this paper the participatory design experiment of the narrative swarming activity in hybrid ecosystem was described. The research brought up various aspects in respect to developing and testing an activity design for writing narratives in hybrid ecosystem, validating the theoretical swarming framework underneath this design, and clarifying the methods of running a design experiment with swarm members. The main results were presented about:

- Using participatory design approach with the swarm members;
- Using narratives both as the analytical tools in the design process, as well as, the means of creating the design of the hybrid ecosystem;
- The nature of the hybrid ecosystem of narratives, and the naturally occurring participant behaviors in it;
- The best technological designs for writing narratives in hybrid ecosystem, and requirements to better support this activity, and;
- The use of traditional and novel storytelling approaches in participatory web, and the mechanisms of supporting it in future designs.

We applied the participatory design approach by initiating a design-based learning course in which the role of the designers was fully given to the users of the future design. The design objects – the formation of a hybrid ecosystem using a narrative swarming activity, and the development of new formats of writing novels in this environment – were expected to emerge in the course of their activities, however, without initial coordination of individual user actions towards goal-directed collaboration. Thereby, a very open-ended experimental situation was created in which participants had a freedom to investigate the emergence of the design solutions that they could not initially grasp as phenomena. This approach enabled to investigate the new narrative behaviors characteristic to participatory web, and avoid adopting traditional storytelling methods directly to the hybrid ecosystem. It was possible to collect data about the swarming phenomena and of the nature of hybrid ecosystem that emerges as a result of swarming. Using the swarming activity influenced the participatory design methods. The participants acted in dual roles as narrators – as participants of the swarm, and as the observers of the experiment. The new experiences gained while participating in narrative swarming activity enabled them to get a deeper insight to the design objects, and elaborate their initial research questions about the design during the experiment.

The results of the participatory design experiment appeared from the focus group discussions with the swarm members. The results indicated that in order to support the new type of storytelling in swarms, the emerging hybrid ecosystem should provide participants feedback of the appearing perspectives and action niches. This would ensure that decentralized narrative behaviors of the swarm members would be resulting in collaborative creation and action in places. We envisioned that using the ontospacial representation of the hybrid ecosystem might be a useful approach to visualize places, niches and the stories as trajectories in this space for the swarm members. In the future runs of the course “Ecology of Narratives” we will focus on supporting such technical methods that enabled to dynamically map the appearing contents of the stories and use these perspectives as signals in the hybrid ecosystem for navigation, narrative creation and enaction.

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References


KEY TERMS & DEFINITIONS

Hybrid ecosystem: Hybrid ecosystem is an ecologist view to the dynamic system consisting of an augmented space in which activities of people with various artifacts in geographical locations using participatory social software create a feedback loop to this space that influences the evolution of communities and determines their interaction in this space.

Swarm: A swarm is a community of an hybrid ecosystem in which every participant is responsible for its individual actions and relies on reading the signals from the ecosystem and from the swarm members, which causes the emergence of shared intelligence and enables swarms to accomplish global tasks and form complex patterns through simple local interactions of autonomous agents.

Ontospace: An ontospace is a spatial ontology – it is a flexible set of metadata that describes a domain of information by means of spatially conceptualized ontodimensions. Ontospace provides one representation of hybrid ecosystem.

Ontodimension: An ontodimension corresponds to a descriptive feature of an entity within a domain of information, also interpretable as class membership.

Ontocoordinate: An ontocoordinate is the position of an entity on an ontodimension and expresses a value and descriptive feature associated to the entity.

Perspective: Perspective is a personal perception of ontodimensions that can be fixed with ontocoordinates in an ontological space.

Niche: Niche is a range of perspectives of the community members that define a subspace in a hybrid ecosystem, where a particular community can be effective in taking actions.