Innovative Story Models for Ambient Media

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ABSTRACT

Recent advances in technology have generated new paradigms and potentials for multimedia story environments. Among these the realization of a wired nomadic consumer heralds the disappearance of the desktop metaphor in favour of one that highlights immersive wearable media and wireless connectivity. As we progress toward the goal of immersive multimedia experience, research into virtual reality is eclipsed by research that focuses on mixed reality at the interface – so called ambient multimedia. Using multiple senses of the human, ambient multimedia is able to distribute the interface more naturally into the fabric daily life. As nomadic experiences offer an increasingly rich media experience, there is a need to introduce denser and more complex multi-sensor networks as well as feedback strategies for evaluation of the experience. The goal of the current research is to elaborate story models that are enabled by ambient multimedia paradigms. A special focus is given to sensible media stories, where the benefits of matching content to sensing technologies and location will be considered. A review of relevant research and its implication on the design and structure of sensible story will be discussed.

1. INTRODUCTION

Over the past two decades, we have seen visual immersion progress: media integrated into an interactive graphical interface developed in parallel with computer graphic environments; often these simulated environments were experienced using head-mounted displays (virtual reality). In the past five years, progress in virtual reality has been all but eclipsed by research that focuses on the physical surround as interface (ambient multimedia). Ambient multimedia as defined as goal for European R&D in [1] leaves the consumer staunchly located in the real-world. In ambient multimedia, invisible sensing is integrated into the every-day world and people experience visual media using their personal handset or on public displays [2].

With the consumer increasingly on the go, multimedia systems need to disambiguate information in order to understand not only the consumer's location but also her intention. This often requires some combination of wearable/mobile computation and sensor fusion using some combination of IR, sonar, vision, GPSand/or 802.11 triangulation [3]. In short, the more authors wish to respond to the human state, the more the system itself must know about context and content. Sensor data that currently holds promise includes location, time, weather, heart rate, eye movements, other body gestures, ambient sound, detailed profiles of human actions and interactions.

A *synthetic universe* refers to "body of things and phenomena observed or postulated [for] the world of human experience [created by humans]" [4]. Humans perceive the reality as well as the synthetic universes as *world*, meaning "the sphere or scene of one's life and action" [4]. The world sphere thus refers to the reality (real-world) - the world where our everyday life is taking place – or a humanly created artificial world (synthetic universe) or a combination of both. In virtual reality, we model synthetic universes that can be perceived by humans using computer graphic displays. The existence of an artificial computer graphics landscape can be likened to music in that it shifts the boundary between real and synthetic universes. We believe that with the advent of ambient-sensing and intimate interfaces this boundary will continue to erode.

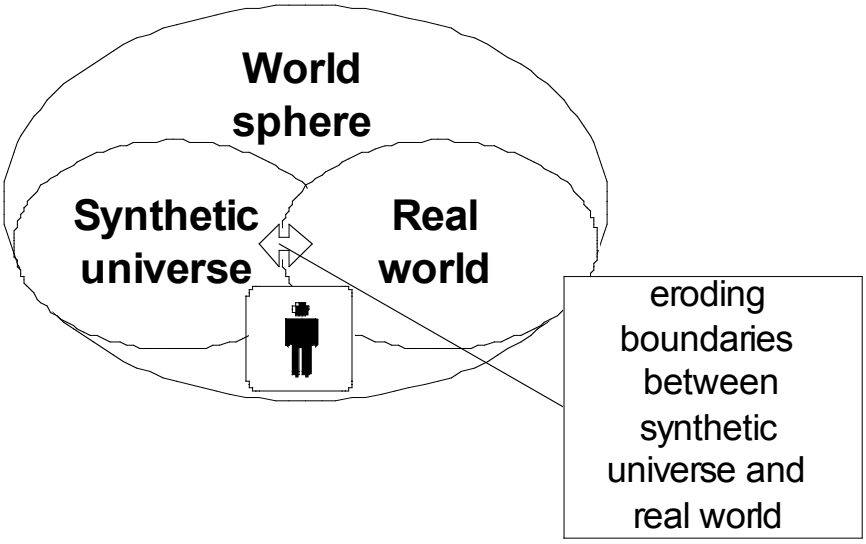


Figure 1. Humans in the world-sphere, synthetic universe and real-world

Future sensor-rich ambient environments promise to support the rediscovery of our essential nature which is both mobile and invites imagination. Today virtual reality displays that can visually over lay the synthetic world on the real world (micro optical) [5] and force feedback haptic devices are becoming available. In addition, researchers are beginning to probe a variety of bio sensing that will specifically measure everything from heart rate to some select kinds of brain waves. As these sensors become state of the art, a new type of multimedia is beginning to emerge.

Within the scope of this paper we further evaluate how and which innovative story models for ambient multimedia exist. This article contains a review of relevant research and the implication on the design and structure of sensible stories in the context of ambient multimedia.

Within the context of this paper we define narrative as conveying perspective in time, space that evolves according a certain causality network.

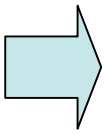
2. RELATED WORK

Three related works are presented within the scope of this paper – one is Nature Trailer [6], HopStory [7] and ambient interfaces in [8]. In terms of modern and new media related research work it is referred to [9]. Artistic film work is excellently described in [12].

3. SENSIBLE MEDIA AND AMBIENT MULTIMEDIA

Focusing a bit on the history of how stories have been told to viewers, many new technological developments changed the way how content is created tremendously. Table 1 gives an overview of different multimedia types and their way how humans are placed in the world-sphere.

Table 1. Different multimedia types

Virtual Reality The synthetic world becomes a temporary world-sphere but is distinguishable from the real-world	**Sensible Media** The real-world becomes a temporary world-sphere integrating a synthetic universe		**Future Multimedia Pathways** (e.g. Bio-Multimedia) World-sphere, synthetic universe and real-world become undistinguishable
Conservative Multimedia Clear border between media and synthetic world and real-world	**Ambient Multimedia** The real-world is the synthetic world and becomes a world sphere		

Story as humans have created and understood it, is by nature an aggregate of characters, places, actions, interactions, causalities and spaces. As film industry introduced audio-visual media as story telling environment, the idea of the sequence came to be defined as a series of one or more shots and sounds that make up a single action, happening or change to the story state.

Developments of multimedia – especially coming from new and rich media – resulted in many new pathways of how stories can be told. Interactivity, advanced graphical and audio capabilities increased the possibilities for artistic minded creators of synthetic worlds. Especially "*interactivity"* gained more and more importance as e.g. in computer games. We can say 'conservative multimedia' draws a clear border between media and synthetic world.

The basic idea behind sensible media is to create sensor rich environments to generate new approaches for interacting with and presenting content. Sensors act as interfaces between the viewer, the system or technological implementation and the ambient environment of the viewer. The way how content is presented in time, space and causal dependencies is depending on sensor input.

Ambient multimedia tries to integrate efforts done in ubiquitous computation and pervasive computation. Pervasive computation makes computers and sensor networks available throughout the natural or real-world of the consumer with a high degree of communication between each system element [10]. Ubiquitous computation on the other hand, attempts to make computer systems available throughout the real-world but making them to a high degree invisible to the viewer [11].

Import is to consider that different parts of ambient sensible media include a collection of suggestive sequences or graphical transformations, as well as certain pieces of information derived from the perceiver and/or from the environment, computational programs that act as a meta-level to communicate between the parts. A special importance is on information and data obtained from the perceiver and/or from the environment through sensors and ambient interfaces.

3.1. CRITERIA FOR CREATING AMBIENT SENSIBLE STORIES

This section is an attempt to specify the criteria of ambient sensible story such that if any story satisfies all criteria listed, we can unhesitatingly say that it is an ambient sensible story.

- the story is an aggregate of different interacting parts;
- the interaction of the parts is triggered by measuring/observing actions of the individual perceiver in life and/or by measuring/observing natural changes that take place naturally in the real world;
- story is recognized by individuals through cognitive and emotional sense of transformations;

- the triggering of the transformations require changes in the natural environment (real-world) or based on human inferred
- the categorization of the narrative and its transformations discloses a framework that is integral to the sensible story.

Looking deeper onto the meta-level aspect and how the different parts of ambient sensible stories integrate, we can develop following criteria to create this new media form:

- Story is always perceived as a progression in time. Ambient sensible stories use measurements/observation of actions/changes of the perceiver and or changes to the ambient environment to progress the sensible story.
- Like other stories, sensible stories require the perceiver to identify using their own cognitive and emotional faculties some sense of transformation.
- Unlike other stories, the narrative transformation is brought about through changes in the ambient environment or through explicit (through the viewer) or implicit (by intelligent system decisions).
- Most importantly we can categorize all the elements of the sensible narrative into new story models which is necessary for the realization of the ambient sensible narrative.

4. EVALUATION OF EXISTING RESEARCH WORKS

Existing research works have been evaluated to try to extract abstract features and characteristics of ambient sensible media stories. These resulted into new story models explained in further sections of this research work.

4.1. NATURE TRAILER

"Nature Trailer" attempts to embed a network of story pieces about a seal woman into the landscape of the Cape Clear Island in Ireland. A hiker can explore the different story pieces with mobile PDA hardware. The system software adapts the presented story automatically to current weather conditions such as wind, rain, sun, etc. The major question attempting to be answered is to find out how the audience connection to the content can be increased and how the audience can take added value [6].

Story and narrative composing	Scene based location dependent narrative connected to weather conditions (wind, rain, sun, clouds) where the intensity of silk emotions is dependent on the strength of the wind
Sensor network	GPS location data, solar radiation, leaf wetness and anemometer
Software	Flash software including a multimedia database for story pieces
System solution	PDA including a Bluetooth wireless sensor network

4.2. INTERACTIVE LOCATION-BASED NARRATIVE: HOPSTORY

A viewer orchestrated narrative, where the audience edits its own cinematic story sequence, is realized by HopStory. Each viewer passes wireless connected cat sculptures relating to different characters. By using mobile devices the viewer can collect story pieces via sensor technology embedded into sculptures. Afterwards the viewer can see his own directed cinematic piece in a central room [7].

Story and narrative composing	Viewer directed story sequence based on different characters represented by cat sculptures; the viewer has to explore the building and creates his own story bound to local time/space
Sensor network	iButtons by Dallas Semiconductor for storing information

System solution	6 laptops wirelessly connected and attached to the cat sculptures

4.3. NEW (RICH) MEDIA CONCEPTS

Another approach towards ambient interfaces and narrative is done within the works of PHILIPP EIBACH. The viewer can explore different video sequences of happenings in a hotel room. The way how film sequences are presented as well as the intensity of happenings can be altered via arm movements and noise levels [8].

Story and narrative composing	Hotel room scenes presented as different video sequences where narrative flow is controlled via arm movements and noise levels
Sensor network	Noise sensors and arm movement detection
Software	Flash software including film sequences
System solution	Back projected video content with

5. POTENTIALS FOR NEW NARRATIVE MODELS

This section tries to attempt to create a new story model for ambient sensible media stories. In principle a narrative is a "*fundamental way that humans make sense of the world*" or a "*chain of events in cause-effect relationship occurring in time and space*" [12]. They simply exist "*to convey perspective"* [9]. At this stage of the research work we can say a narrative consists of the "ingredients": perspective – causality – time – space.

Let us take a look at the previous example "Nature Trailer", conveying a new perspective for hikers while they are walking through the coast of West Cork in Ireland. The added technical system changes the way how the hikers make sense of its environment along the walking route. Focusing on the causality of "Nature Trailer" - or the cause-effect relationships of events - it is much more complex to explore. Causality is influenced by weather conditions, the choices of the hiker or how sensor data is processed. Timing constraints and the space where the narrative takes place is more complex than in currently existing – more "conservative" – story telling environments. Before analysing the components of perspective – causality – time – space for ambient sensible media stories a bit more detailed, let us approach the problematic a bit differently.

Before showing potential new story models it is wise to compare *ambient sensible media stories* with another well-established artistic medium: film art. Film art is very well established as well as its structural and theoretical aspects widely formed.

5.1. COMPARING FILM-ART WITH AMBIENT SENSIBLE STORIES

According D. BORDWELL and K. THOMPSON in "FILM ART", a film consists of a story and a plot. A *story* is the "sum of total events in the narrative". We can distinguish between *inferred events*, where the viewer interprets events that are not explicitly presented in the film; and *explicit events* being events presented from the directors or storyteller point of view. A *plot* is "anything visible audibly presented" through either *explicitly presented events* extraneous to the story; or *non-diegetic* via additional information and film material (e.g. credits) [12]. The plot in film art can be seen as the perspective the gifted movie director attempts to convey. In ambient sensible media stories the film whole narrative corresponds to the synthetic universe perceived in a real-world movie theatre.

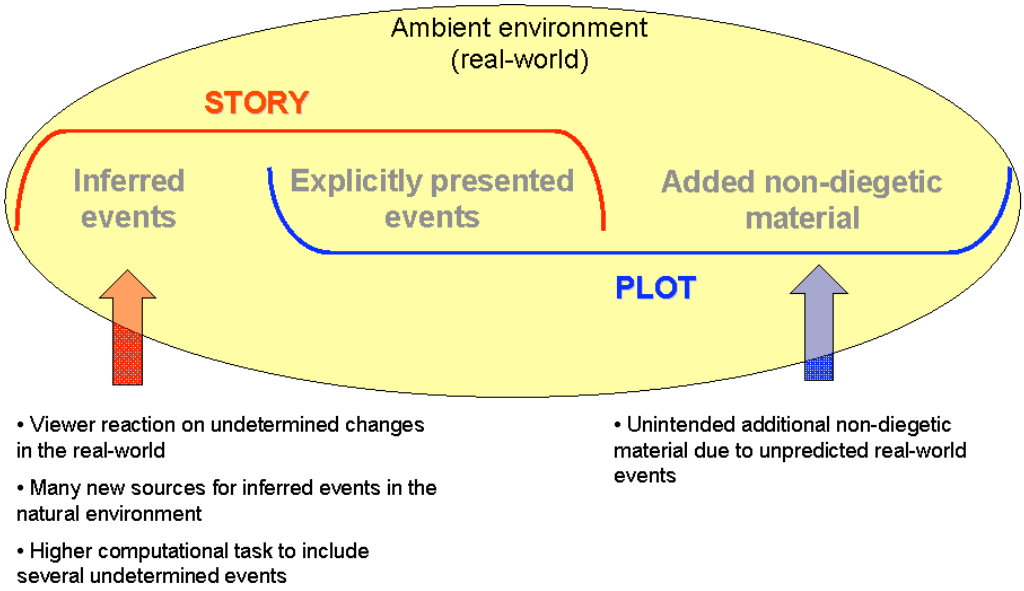


Figure 2. Relation between ambient sensible media and the medium 'film'

An ambient sensible media story (see Figure 2) implicates a higher degree of inferred events as well as added non-diegetic material. In an ambient environment the amount of inferred events increases due to higher feeling for presence and a more realistic perception of real-world events. There are much higher demands to the system, as it has to deal with an increased amount of data obtained by its sensor networks to maintain a useful plot – thus a for the viewer a useful story.

In film art the cinema screen draws the line between the real-world and synthetic world. In ambient sensible media stories the line between the real-world and synthetic world vanishes more and more. More pervasive and ubiquitous embedded devices let the borders between story, plot and environment increasingly vanish. Currently there are still devices such as PDAs, mobile phones or head-mounted-displays drawing the borders between story, plot and environment. Increasing technological capabilities might lead to ambient devices not perceived by the viewer anymore. The narrative is a mix of story, plot and real-world environment – the nature itself becomes a narrative world or synthetic universe. In other words there are eroding boundaries between synthetic universe, real-world and the perceived world-sphere.

5.2. ONE ATTEMPT TO CREATE A NEW NARRATIVE MODEL

Analysing the four previous presented projects we can extract following components to create a new narrative model:

- Sensor intensive interaction & feedback
- Intelligent mobile technology & systems
- Presentation & viewer immersion in the natural environment
- Story evolvement highly viewer dependent in time/space
- Sensor based environment for observing environment/human

Ambient sensible stories extend the idea of existing story models tremendously. It is easy to convey new perspectives in the ambient space by either binding time to actual world-time or narrative time. Causality, thus how to evolve narrative is more centred according viewer behaviour and interaction modality. In comparison to film creation there is a

tremendous increase in inferred events as well as non-diegetic material the technological system has to cope with.

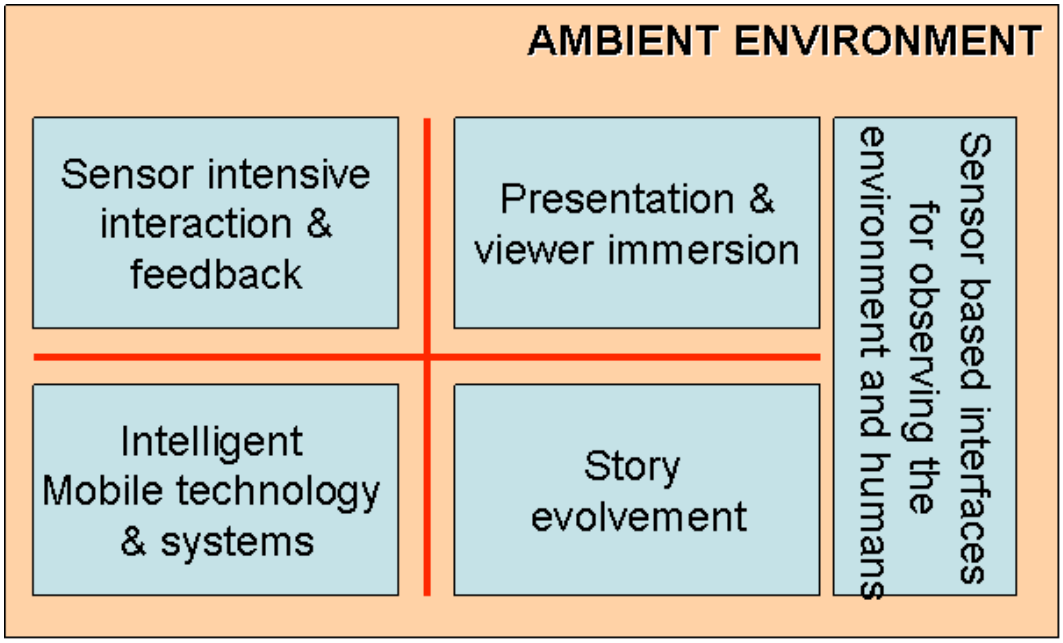


Figure 3. Components of ambient sensible stories

The perspective to convey – which needs an integral consideration for creative artists – is bound to the natural "ambient" environment plus the plot presented plus the technological system embedded into the environment. In comparison to film creation there is also an increase in inferred events the technological system as well as the viewer has to cope with. For creative artists this means to overview a broader perspective that they actually would like to convey. Many unpredicted events and causalities can influence the actual core perspective they would like to present.

The space of the narrative is the actual world-sphere embedding additional multimedia materials letting erode the boundaries between synthetic universe and real-world. The same is valid for the time of the narrative, which shifts timing from the storyteller into the hands of the viewer. Timing constraints for technical systems increase tremendously as they have to process sensor data in real-time with soft deadlines. Also is the space of narrative strongly linked to actual real-world places and the 'mobility' of the narrative itself is rather restricted.

Looking at the degree of causality – the presented plot can get rather high complex and requires high computational power and highly intelligent systems to cope with the complex narrative flows.

6. CONCLUSIONS

There are still many opened research issues to elaborate. It is to be seen what creative and gifted artists make with newly emerging ambient technology and which novel artistic pieces will be created. Let us formulate a few further-leading questions worth for investigation:

- What will be the aesthetics of ambient sensible stories?
- Will the viewer accept increased interactivity in his natural environment?
- Which new categories of story telling are emerging?
- How do technology frameworks look like to enable intelligent aggregating narrative by measuring/observing actions of viewer/environment?

- What does it mean for artists to create ambient sensible media stories?

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