nARratives of augmented worlds

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In the following section we take a look at interactivity and scripted behavior; how can interaction occur when the result is already known and pre-written in the text? We also look at immersion in a virtual world or a story world, and of the perception of fiction and non-fiction in different media, which are of particular interest to narration technology that looks to mix real and virtual objects.

We focus our discussion around the concepts of metalepsis, a blurring of the levels of narration, and remediation, borrowing conventions from other media, to propose that existing narration conventions can be used to strengthen the feeling of a blurred boundary between reality and fiction, instead of relying on picture-perfect computer renderings to increase the sense of immersion.

Section 3 presents a survey of existing projects that implement AR-based narratives and shows how AR supports the delivery of narratives, based on the elements presented in section 2. We then conclude by projecting AR-supported interactive storytelling to a foreseeable future, informed by current trends in interactive narrative and AR technology.

2 nARrative, Metalepsis and Interactivity

“Interactivity describes the collaboration between the reader and the text in the production of meaning ... reading is never a passive experience”
– Marie-Laure Ryan, Narrative as Virtual Reality

AR is a new medium for narrative, however it was not conceived out of thin air. In the next sections we will show that AR presents great similarity to preexisting media, chiefly computer games but also theatre, documentary film and others. With some of these media AR shares specific traits that we wish to focus on from a narratology point of view: metalepsis, interactivity, immersion, fictionality and remediation. Each element presents a different aspect of narration that occurs in AR, thus we explain their definition, origins, similarities to other media and how they impact the readers.

Before going deeply into sub elements of narrative, we should find a grounding foothold in narrative itself. H. Porter Abbott defines: “story is an event or sequence of events (the action), and narrative discourse is those events as represented” [1]. According to Abbott, narrative is comprised of two elements: story and discourse – events and their representation. Ryan adds that narrativity (how well a story can be told) is not a binary feature but a continuous scale, and narratives should contain: a story-world, intelligent characters, a timeline, and meaningful events [31]. We can think of narrative as any medium-independent text which is used with intention to reconstruct mental images of a fictional world in the mind of the reader [11].

Note that the concept of “text” is used in a very broad sense throughout this paper, so it may mean actual written text, but may nevertheless be pictures, paintings, videos, plays, computer games, AR applications and even buildings, in fact anything that can hold symbolic meaning can be a “text”. Similarly, “readers” may be people who actually read written words, but under our broad definition can be theater spectators, computer users, or generally people who are exposed to a “text” through any medium.

By definition AR is about blending the real physical world with an embedded, sometimes fictional, computer generated world. In narratology, a blending of narrative levels, such as the narrated events and the narration itself, is named metalepsis, and is quite
widely explored in conventional media. Metalepsis occurs, for example, when the characters are suddenly aware of the narrator, the medium, the fact they are part of a story, or when they speak directly to the readers, and many other types of metalepsis yet exist. In the case of AR, the boundaries of the world of narration and the narrated events may be blurred [11], as fictional objects and characters are transported into the world where they are narrated, our reality.

However, metalepsis should be viewed in the context of its medium. It is not surprising to see a fictional computer game character guide and approach the real world player, and we do not consider it a transgression of a level in narration. Similarly in AR, we will not be shocked to see a creature of fiction appear in the real world by using AR, quite the contrary, we would expect it. The AR medium itself does not make a conspicuous transgression of narration boundaries, rather the real and fictional blurring is the convention in the medium.

Once AR characters break into our world and the metalepsis is obvious, we may expect them to then be fully aware of objects in our world, be responsive, reactive and interactive. The matter of interactivity on its own is of utmost interest in narratives, as the most common types of narrative (think of regular stories) are not interactive. Interactivity may be simply described as a situation where the user’s input is used, but it need not be binary, one can use a continuous scale to mark the degree of freedom the user has to act within or upon the text. Ryan claims “the fullest type of interactivity [is when] the user’s involvement [...] leaves a durable mark on the textual world.” The level of authority a user has can range from standard written and non-interactive books, texts with multi-paths and hypertexts with binary choices, and up to open-ended online multiplayer games with vast virtual worlds to (almost endlessly) explore and also impact [30].

Immediately visible, one possible clash between the definition of narrative, metalepsis and interactivity is that in a metalectic-interactive environment, as in AR, events are no longer told or represented, but are as reactive and continuously occurring in real life, where the rigid definition of narratives restricts it to the representation of pre-known events in a story-world. How then can an interactive narrative exist? The next two sections, which discuss the matters of interactivity, metalepsis and computer games narrative, will give us clues to such a compromise.

2.1 Interactive narratives

Insofar as AR is regarded an interactive experience it shares key features with interactive narratives. AR gives the user control at the level of the point-of-view (what Ryan defines as an Exploratory experience,) or at the level of manipulating virtual objects (which she defines as Ontological [31]). However interactive narratives with reader involvement at multiple levels existed long before computers allowed humans to explore virtual or augmented worlds, and we may learn from these when designing new interactive narratives.

A number of pre-digital forms of interactive narratives exist: Children games of make-believe, adult fantasies or role-playing games, amusement parks, religious rituals, some forms of drama and even architecture. All of these allow for corporeal participation in an immersive, many times imaginative, environment in which the rules or events are presupposed and the plot often cannot be changed [30]. Another non-digital form of interactive narrative is the multi-path narrative, where the audience may, at specific branching points, determine the continuation of the story. In written forms these are “Choose your own adventure” books, in cinema these are films that offer a choice of one or more endings to the movie [11], and some dramatic performances incorporate the audience as part of the show [30] or in deciding the fate of a character (for example the modern play “Sheer Madness”).

The home-computing revolution did not skip the world of interactive narratives, and one of the earliest kinds of computerized interactive narrative manifested as interactive fiction (IF) systems, which offer text-based exploration and interaction within a story-world via typed-in commands. With the advent of the World Wide Web, Cybertexts that utilize hypertext appeared, which allow users to follow hyperlinks and in this way interact and explore the story world. Such Ergodic texts, those that change with dependence on the reader’s choices, are questioned for being narrative or simply narrative fragments put to form a playable experience [11] and also for their limited re-readability [24].

The history of interactive narration, which was discussed in this section, demonstrates a plethora of ways to incorporate the reader in a fictional world without usage of screens, computers or graphics. Authors invited the reader to freely explore in an immersive story-world without being able to affect the story or characters, gave shallow control over the story via branching, or simply made way for imagination. The proliferation of computer graphics rendering and real-time animation capabilities, brought upon a new medium for interactive narratives: video games. Arguably, they hold the highest semblance to AR in terms of graphics and interactivity out of the computer-based interactive narratives.

2.2 Computer games as Interactive Narratives

“The reality has always been too small for human imagina-
tion.”

– Brenda Laurel, PhD Dissertation

If taken at face value, modern computer games seem to elegantly solve the problem of situated interactive narrative. Naturally, games allow interactivity for the player, but very much like traditional narrative media they: provide a fictional but realistic story-world, construct the story to a scripted path of events, and even contain actual narrated cut-scenes. Should we then consider them to be the epitome of computerized interactive narrative?

Theorists try to come up with a formulation for the relationship of games and narrative. Jesper Juul once argued that games are not narrated but experienced in real-time and have varied outcomes, thus they are not stories [14]. On the other hand, games, the same as stories, have a well-defined beginning and end, and a series of meaningful events and resolution of conflicts in the middle; even if they do not make use of an obvious narrator, narratee and storyline they are probably perceived by players as some form of narrative [11].

Another point of view on games is that they do not pertain to be narratives in the first place, but simply fictional worlds, whose content is selected to be narratively rich. Some computer games excel in creating those rich fictional worlds that allow exploration, such as quest games and online collaborative role-playing games [11]. AR experiences share this feature of exploratory games, by letting the user walk around the augmented world. Especially interesting are AR platforms that allow an essentially endless capture of more and more augmention and interactive space [12] similar to real life.

Metalepsis in computer games is in many cases a tool for blending the fictional with the real, used to heighten the suspense or realism of the game. At times characters of the game are aware of the player that controls them, or even directly instruct the player in how to play, forming a temporary metalepsis [31]. Furthermore, gaming platforms that extend beyond the screen and reach into the player’s living room [13] or body [32, 34] are considered a welcome addition to the gaming experience as long as the metalepsis remains at the appropriate level of physicality (ontological [31]) and fictional characters do not spring out of the screen to raid the kitchen cabinets for food.

Games and AR experiences create an ontological metalepsis by fusing the real world with the world of the narrated, but even the best efforts still fall short of a deeper kind of transgression, a total, immersive experience that narratologists and technologists alike are
Immersión acontece quando os espectadores estão absorvidos em um estado mental ou atividade induzida por um texto1 a um ponto em que eles o tratam como uma situação real. Por meio desta realidade, estamos imersos em tudo, inclusive, muitos textos como livros, não oferecem nosso senso muito ou qualquer informação em absoluto, mas todos podem conseguir um alto nível de imersão em um mundo fictício. A imersão, portanto, não é uma sensação sensorial, é suportada por nosso poder para suscitar nossa viscerais do real mundo e conscientemente se juntar ao narrado mundo [11].

AR apresenta um grande potencial para a imersão, já que ele usa o real mundo como um base para ação fictícia. O mundo não é um espaço limitado ou quantificável de coisas, mas um infinitamente interconectado totalidade, como Michael Heim afirma [30], e isso traz um sentimento de imersão. Em AR, a sensação de imersão é intensificada porque os usuários já sabem sobre a mudança com o mundo e seu efeito físico sobre eles, no entanto, a augmentação gerada pelos objetos computacionais requer algum trabalho para quebrar este senso [16].

Se definição AR como uma dualidade de realidade + augmentação, podíamos pensar em imersão en AR como dual como real. A realidade é imersiva, mas o nível de imersão da augmentação depende da tecnologia e das capacidades dos programadores. No outro lado, AR pode ser visto como uma imersão conjunta, onde o mundo aumentado e real são mundos diferentes, mas um que pode ser descrito como constante dos objetos do real mundo com a computação de computador gerados objetos. Esta fenômeno é explicado na narrativas pela conceito de minimal departure, donde um mundo fictício story-world é compreensível para os leitores porque parece ou derivado de seus próprios mundos reais, onde eles estão sobre a superfície real [11].

Podemos, portanto, fazer uma distinção entre um meio, dual e híbrido de AR, que pode depender do tipo de dispositivos que implementam: que replace realidade (realidade virtual equipado com câmeras), que overlay realidade (usando transparent-screens tecnologia ou projeção) [27], e que combine a pair of these two, que pode ser não-tecnológico, (por exemplo: live actors ou tangible props). Dispositivos que são imersão por substituir a realidade ou deixar os usários perceber visualmente, que pode ser considerado algo que cria um mundo novo para o usuário, e que pode ser um amálgama de realidade como capturada por uma câmera e incremento fornecidos por computador. Este novo mundo aumentado, no seu contexto e fictício e non-fictional elementos, serão o centro de discussão deste capítulo sobre a ideia de ficção e a função de tecnologia contida.
Technology. We see Facède as an elaborate experiment in creating a full-blown computational interactive drama system. It incorporates interactive graphics, artificial intelligence (AI) engine for believable characters, natural language processing and a drama manager that determines the progression of the plot. In a later project, Facède was ported to an AR experience to become AR/Facède, allowing users to inhabit the same physical/virtual space as the drama’s main characters, Tripp and Grace, while wearing an AR headset and a portable computer. Facède pushed the boundary of interactive narrative by giving the user a very high level of agency, and in AR/Facède even more control by letting them control the point of view (POV) to create a true ontological-exploratory experience. Interestingly, the creators chose to deliberately avoid metalepsis by not allowing the virtual characters to respond with administrative sentences such as “Invalid input” or “Illegal command” (thus making them aware of the user being from a world external to the story,) to maintain the illusion of real dramatic action. Mateas defines Facède both as drama, and at the same time as an open-ended simulation, which conflicts with the definition of narrative, but he concludes by defining it as a middle ground between the two [21, 7].

Three Angry Men (TAM) is an AR narrative experience that is not interactive on the level of plot but allows the users to explore the story from different physical points of view [17]. Change in location changes not only the visual point of view on the characters but also the characters behavior, without interrupting the predetermined plot. The experience makes use of the social situation, a meeting in a profession setting, to guide the user in interacting appropriately with the system. A similar project that preceded TAM was the Mad Tea Party (MTP), which was similar in terms of setup; the user sits at a table and interacts with the augmented characters that also inhabit the table. MTP differed from TAM in not allowing a change in the behavior of the characters or the plot [25].

The “[inbox]” AR narrative installation invites the users to enter a shipping container with a hand-held device capable of reading AR markers, and hear the story of the container itself and of the shipping containers industry at large. The narrative is non-linear and decentralized, which reflects, in a meta discussion, on the vast decentralized world of shipping containers. Readers are free to explore the story-world in any order by performing mini-tasks at each interaction node, all of which contribute to the grand story [2].

Scott Snibbe and Hayes Raffle experimented with a number of low-narrativity approaches in their Social Immersive Media projects [33]. Although a coherent narrative is not presented perse in the projection-based corporeal interactions, which are mostly museum installations, the authors do report of an overarching usage of remediation from cinema and HCI as guidelines for authors of similar experiences. The different Narrative Models, as Snibbe and Raffle define them, only rarely present autonomous characters other than user, however they do situate the interaction in a story-world that allows ontological control. Snibbe and Raffle also used cinematic conventions such as ease-ins and outs, overlapping action, and theatrical actor staging and lighting, which was also utilized to some degree in Mateas, Moreno, McIntyre and Dow’s work [16, 25, 17, 7].

3.2 Location-Based Narratives
The M-views system created at the MIT Media Lab allows readers to experience a cinematic narrative embedded in the MIT campus. Users are encouraged to walk around the campus and view video clips that are triggered by their physical location. This is an exploratory interactive narrative, it lets readers go about the story-world freely and serendipitously discover the story, it has a non-linear progression of the plot as the clips may be viewed in every kind of order depending on the places the readers visit [5]. This project resembles another location-based narrative, “Murder on Beacon Hill”, which takes users on a murder-mystery tour of a city or neighborhood, typically taking place in a single room, and they usually run at a time period of a few minutes and up to an hour. Location-based narratives are more local in nature, typically taking place in a single room, and they usually run at a time period of a few minutes and up to an hour. Location-based narratives augment the real world with a story-world that is accessible only through worn or held devices is claimed to enhance immersion in the augmented story-world and user’s belief in the virtual elements [35, 37].

3.1 nARRative Worlds and Conventions
We propose to examine augmented narratives by the type of worlds they invite the readers into (see the 3rd column of Table 1). Situated augmented narratives are more local in nature, typically taking place in a single room, and they usually run at a time period of a few minutes and up to an hour. Location-based narratives augment the real world with a story-world that is accessible only through worn or held devices is claimed to enhance immersion in the augmented story-world and user’s belief in the virtual elements [35, 37].
downtown Boston, though the clips are not automatically triggered by the system but the user [23]. The GEIST system is another similar project, which allows users to explore the history of 17th century Heidelberg, Germany, via mini-stories spread throughout the modern city with a wearable AR system and a hybrid GPS and vision-based tracker [18]. To form the mini-stories GEIST uses a familiar plot-line such as fairy tale stories (which Abbott calls “masterplots” [1]), or a familiar story arc such as Freytag’s triangle [11].

Nisi et al., who created Hopstory, a location-based narrative, added a higher level of progression to that of the aforementioned projects by allowing the characters in the story to act in their own timeline and move to different locations throughout the building during the user’s exploration of it [26]. This adds the layer of Time and Evolution, on top of the base layer of a story-world, which Ryan requires in her definition of narrative.

The Westwood Experience, created at the Nokia Research Center, tried to find novel ways for integrating physical with virtual in a location-based narrative AR, even though the narrative itself was linear and not interactive. The creators used real live actors and physical setups to increase the immersion, alongside computer vision methods for registration of landmark buildings and locations in the town of Westwood in order to augment them with visuals. At certain moments a metalepsis occurred, where live actors broke from their 1950s characters to explain technical details of the Nokia system the users were using [37].

The Oakland Cemetery experience is an audio only location-based narrative that takes readers on a tour through the cemetery. The system is based on a type of spatial narrative, which is mostly linear with pockets of non-linearity where the user is offered a branch off the main story to explore a local mini-story around a single grave before coming back the “spine” of the story [6].

A different approach on location-based augmented storytelling was taken in [8], where a system was built to engage people driving the backseat of a car with a story that unfolds in the landscape they are driving through. The researchers combined a position tracking system with a handheld directional “microphone” (essentially a pointing device), to trigger parts of a spatial narrative. The narrative progression is linear, however at any decision point there are more than one linear branches ready to trigger, but the branches can only trigger in an appropriate sequence in order to maintain coherence of the story. In this experience the reader does not control the movement throughout the space, rather the driver of the car does, so the narrative must match the changing environment, and not rely on exploration like other location-based narratives.

### Table 1: List of AR narrative projects.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year</th>
<th>Narrative Model</th>
<th>Augmented World</th>
<th>AR Type</th>
<th>Type of Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mad Tea Party [25]</td>
<td>2001</td>
<td>Spatial</td>
<td>Situated</td>
<td>HMD</td>
<td>Exploratory (POV), Ontological (Speech)</td>
</tr>
<tr>
<td>[inbox] [2]</td>
<td>2001</td>
<td>Non-linear</td>
<td>Situated</td>
<td>Handheld</td>
<td>Exploratory (Space)</td>
</tr>
<tr>
<td>M-Views [5]</td>
<td>2003</td>
<td>Non-linear</td>
<td>Location</td>
<td>Handheld</td>
<td>Exploratory (Location)</td>
</tr>
<tr>
<td>The Beast [22]</td>
<td>2003</td>
<td>Linear</td>
<td>World</td>
<td>Live, Online</td>
<td>Exploratory, Ontological</td>
</tr>
<tr>
<td>Three Angry Men [17]</td>
<td>2003</td>
<td>Linear++</td>
<td>Situated</td>
<td>HMD</td>
<td>Exploratory (POV)</td>
</tr>
<tr>
<td>GEIST [18]</td>
<td>2004</td>
<td>Non-linear</td>
<td>Location</td>
<td>HMD</td>
<td>Exploratory (Location)</td>
</tr>
<tr>
<td>Hopstory [26]</td>
<td>2004</td>
<td>Non-linear</td>
<td>Location</td>
<td>Projection</td>
<td>Exploratory (Space)</td>
</tr>
<tr>
<td>Oakland Cemetery [6]</td>
<td>2005</td>
<td>Spatial</td>
<td>Location</td>
<td>Audio</td>
<td>Exploratory (Location)</td>
</tr>
<tr>
<td>AR/Facade [7]</td>
<td>2006</td>
<td>Linear+</td>
<td>Situated</td>
<td>HMD</td>
<td>Exploratory (POV), Ontological (Speech)</td>
</tr>
<tr>
<td>Gustafsson et al. [8]</td>
<td>2006</td>
<td>Spatial</td>
<td>Location</td>
<td>Audio</td>
<td>Exploratory (Location)</td>
</tr>
<tr>
<td>Social Immersive Media [33]</td>
<td>2009</td>
<td>Non-linear</td>
<td>Situated</td>
<td>Projection</td>
<td>Exploratory, Ontological</td>
</tr>
<tr>
<td>Murder on Beacon Hill [23]</td>
<td>2009</td>
<td>Linear</td>
<td>Location</td>
<td>Handheld</td>
<td>Exploratory (Location)</td>
</tr>
<tr>
<td>The Westwood Experience [37]</td>
<td>2010</td>
<td>Linear</td>
<td>Situated &amp; Location</td>
<td>Handheld, Live</td>
<td>Exploratory (Location)</td>
</tr>
<tr>
<td>Conspiracy For Good [36]</td>
<td>2011</td>
<td>Spatial</td>
<td>World</td>
<td>Handheld, Live</td>
<td>Exploratory, Ontological</td>
</tr>
</tbody>
</table>

* The narrative is generative and therefore (to an extent) non-repeatable, but still has a linear course of progression
++ The events in the story are static and linear, however the character behavior is changing

### 3.2.3 World-level Augmented Narratives

One especially interesting form of AR narratives is Alternate Reality Games (ARGs), which are mass-participatory interactive narratives that take place in “a fictional world superimposed on the reality of everyday life”. In essence, these games invite players to roam the streets as well as online forums and chat rooms while solving puzzles put forth by the game moderators, themed by a predominant narrative. In “Conspiracy For Good” (CFG), an ARG set in 2010 London, the production involved both online and offline presence, with live actors. CFG did not allow changes in the master narrative, however the players had the ability to change the order or the advent of the next story “beat” (a pervasive method in interactive narratives, essentially a linear mini-narrative that is part of a larger non-linear narrative), which led them to believe it were their actions that were driving the progression of the plot [36]. In the case of “The Beast” game of 2001, the production had a hard time keeping up with the puzzle-solving capacity of the players, when a batch of puzzles planned to last three months was solved within the first day of the game, essentially giving the players high control of the pace of the game [22].

The blending of real and virtual in the case of ARGs is brought forth by the transparency of the medium, effectively – the real world, as it is immersive and viscerally real. While the players are aware they are playing a game and not real life, the action is not a simulation but happens to them corporeally [22]. At the same time the game producers go to great measures to erase the boundaries between game and reality, avoid metalepsis and maintain the illusion of an alternate, but complete, reality.
3.3 Challenges and Solutions in AR Interactive Narratives

Researchers overcome the challenges in AR narratives in many creative ways, some of which were presented in Section 2.5. A recurring theme that arises from the implementations reviewed in the previous section is that narratives often use a narrative model (see the 2nd column of Table 1) of a non-linear exploratory nature. This is a result of the inherent connection AR creates between the story-world and real life, which is arguably non-linear and exploratory. In projects that strive for a concrete interactive storyline, higher-order computational story generators are used, however in some cases we find a certain level of operator intervention (Wizard of Oz, man-in-the-machine) intertwined in the system to alleviate some of its shortcomings.

Traditional interactive narratives pose their own problems, which are inherently replicated in augmented interactive narratives. Controlling story progression according to an overarching narrative, and the level of agency the user has over the story world is a key element in a compelling interactive narrative, to support immersion and belief. To resolve these issues McIntyre et al. used cul-de-sacs and procedural nodes that evolved into story “beats” and goal-oriented behavior programming [16, 25, 21]. Malaka et al. are using a Propp model of fairytale stories to structure the story-arc in GEIST [18], however the authors handcraft the entire narrative rather than the system deciding the progression on-the-fly.

On top of exploring the plot, AR narratives add the layer of exploration of the space by letting the users roam the augmented area freely. Unable to script the free-roaming user, many AR narrative implementations resort to non-interactive linear narratives that demand constant user attention, with the occasional cul-de-sac (to create a spatial narrative,) or simply non-linear fragmented narratives, where the fragments are randomly accessed without narrative control of the camera. The problem of POV control manifests itself when the action is happening where the user is not looking. Therefore, researchers looked into scripting the user. Moreno used physical objects as cues for where the virtual action is going to occur, as well as having the virtual characters gaze in the proper direction of action and a smart usage of lighting, borrowed from theatrical staging [16, 25, 17]. Using visible AR markers is a good solution for letting the user know where the augmentation is going to appear, but goes against the wish to keep the medium hidden and immersive in the content (the story). Indeed most AR narrative researchers used various technologies to support non-marker based augmentation, e.g. user-external tracking systems such as a GPS [5, 8] or an indoor IR-based tracker [7], natural images as markers [2], architecture as a marker [18, 37] or tangible objects [26].

The high level of interactivity that truly immersive narratives demand requires sophisticated input methods to the system. McIntyre et al. made it a quest to see how much an autonomous computational system can support unscripted user behavior, thus they used natural language processing and intelligent computational agents. However other projects opted for either limiting the user’s input or system’s output to selected dimensions [25], Wizard of Oz type of interaction [7], and the usage of live actors for the users to interact with [37].

Problems in AR are inherent in augmented narratives as well. AR takes users out in public spaces donning head-worn gear or waving mobile devices in different directions, lacking conformal social cues this behavior can be awkward. Wither et al. confronted a problem with audio-based augmentation where users wore head-phones that acted as a “do not disturb” sign, and alienated them [37]. Dow et al. faced the challenge of augmenting a functional cemetery, which demands respect to the place and the families or visitors that are using it, and opted for an audio-only augmentation lacking the ability to put up markers or signage [6].

Eliciting the feeling of immersion in a story during an AR experience requires a delicate balance of realism and fiction, perhaps even more so than in utilitarian AR or interactive narratives. On one hand the system must uphold the suspension of disbelief in order to invite users to the world of the story, on the other hand it is the real world the system is using, which is not typically part of stories but reality. Barba et al. and Dow et al. both expressed concerns in regards to augmentation graphics that are “too real” and may actually harm the fictionality of the experience [7], or mistakenly invite the users to try and physically manipulate a virtual object. Barba et al. and Dow et al. opted to keep augmentations in 2D to circumvent the problem of over-realism [7, 2].

3.4 Future projection for AR narratives

Perhaps the strongest ideograph of the future of AR is a totally augmented world, where augmentations can appear at any time and any place to support us through daily life, extend our senses, enhance our cognitive abilities to make us as efficient and effective as we can be and beyond. Being a compelling ideograph, most of research in AR is trending in this direction, and we are sure to see concrete projects advancing this front [19, 15, 4]. However it is not perfectly clear that narratives wish for this kind of total augmentation, in fact narrative is sometimes defined as a discourse whose whole purpose is to elicit emotion in the reader, not necessarily knowledge or efficiency [11]. That is where utilitarian AR technology and narratives diverge, only to reconcile at the interesting point of immersive narratives.

The quest for immersion is ubiquitous throughout out the different media of narration and its importance is unchallenged. augmented reality, as an idea and a set of technologies, offers a promising solution for blending virtual aspects into reality, with the goal of making an augmented world as immersive as reality itself, and immersive narratives can clearly benefit from it. In the idealistic world of AR, as can be seen in popular media [28], all spaces can be augmented and all objects are part of the blended reality. While some researchers contest ultimate realism in narrative augmentation [7, 2], they mostly agree that when technology, not only for augmentation but for an entire full-body interface, will catch up with the dream of a perfectly real augmentation it will be a very welcomed embodiment of interactive narratives [30, 7].

Another evident front for future incarnations of AR narratives is the matter of agency and control over the narrative. Research on interactive narratives shows promising progress towards a truly generative, coherent and believable narrative, albeit short, with the use of smart agents [20, 21, 3]. However, as our discussion has shown, the challenge of narration in AR is greater than in other mediums and poses fresh problems to tackle. We believe that truly emergent situated narratives, those that arise from an unseen physical environment, not only characters and a predetermined set of events, will be the next breakthrough in augmented narratives. Some researchers already proposed solutions for certain environments, e.g. [8] for a car-ride narrative based on GPS positioning, but the matter remains at large for other categories. The task of creating environment-generative narrative is especially obvious in smaller scale, where physical spaces can be mapped or scanned, however then, a special method is required to dynamically align the physical space with the story-world, i.e. staging of actors to support the drama. Recent work shows great potential in automatic scanning and augmentation of spaces in the goal of an immersive gaming experience [13], which is directly related to interactive storytelling.

4 Conclusion

This work presented numerous points of contact between augmented reality and immersive narratives, and surveyed recent implementations of AR-based narratives. The theme emerging from the work is a postulation that AR, by the use of metalepsis and other
forms of reality-fiction blending, creates a unique medium for narration with its own capabilities and shortcomings.

We believe authors of AR narratives can benefit greatly from remediation of elements from theatrical staging, film and computer games to acquaint users with the new medium. Something quite non-intuitive must be done: Rather than making the medium disappear and creating complete immersion, it is necessary to refer to specific conventions and known situations, much in the way that the mockumentary refers to documentary conventions, because only then can the boundary (fiction/documentary or reality/augmentation) be transgressed in a recognizable way. This seems to be the opposite of what most AR developers suppose. Only by use of remediation and in some ways emphasizing the “staging” can we effectively harness AR’s power to blur the boundary between reality and fiction/augmentation.

In conclusion of the discussion in the last section, we believe the future of AR narratives will be greatly influenced by technological advancement in three domains: AR technology (wearable, handheld, projected or other), interactive narratives (believable agents and narrative generators) and lastly physical-space dramatic analyzers that marry physical-space with story-space. All of these areas are under active and prominent research.

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