AUGMENTED REALITY IN PHOTOGRAPHIC STORYTELLING

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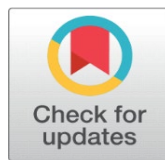[2] Assistant Professor, School of Business Management, Noida International University, India
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ABSTRACT

AR has transformed the visual and experiential aspect of the photography story telling by uniting the definitions of both in one place, blending the static visuals with the interactive spatial based stories. AR turns the viewer into an active participant instead of the passive one, because of its capacity to extend photography into a multisensory, three-dimensional space, and is creating new avenues of meaning, feeling, and interaction. Embodied interaction, spatial computing, and visual composition merge to create AR-based photography as an art form of hybridity where action, perception, and interest come together to create the narrative. This amalgamation does not only add deeper aesthetic qualities but also the communicative power of photography by reaching out to the physical and virtual. Photography has long been a medium of remembrance and representation; AR is currently bringing it back to the reality as a medium of participation and presence. The paper follows this development in museum installations, interventions in the urban storytelling, and personal memory project demonstrates how spatial narratives will make art more democratic and create empathy and cultural continuity. The presented structure and analysis findings emphasize the role of AR in engagement, emotional appeal, and interpretive cognition that is backed by both quantitative analytic data and qualitative audience feedback. Although the technical calibration, data ethics, and cultural authenticity have been problematic, the emergent technologies based on AI adaptivity, WebAR platforms, and blockchain provenance have the potential to further streamline the field. Finally, AR photographic storytelling is a meeting of artistic vision and digital intelligence which makes photography living and responsive as a form of narration that builds a bridge between image, space, and human experience.

Keywords: Augmented Reality, Photographic Storytelling, Spatial Interaction, Visual Culture, Digital Art, Interactive Photography, Audience Perception, AI-Driven Media

1. THE EVOLVING LANGUAGE OF PHOTOGRAPHIC STORYTELLING

Photography has always been a memory, an emotion and a story a visual medium in which the reality is remembered and recreated. However, with the ever-increasing use of technology which is obliterating the physical and digital divide,

photographic storytelling has entered a phase of reinvention Ryan (2015). The introduction of Augmented Reality (AR) has enhanced the conventional photographic frame into a full-sensory and inclusive space where pictures are no longer considered as fixed depictions but as moving and spatially conscious ones. This change is not merely a change in technology, but a radical re-corporation of the work of authorship, viewership, semiotics of the photographic image itself. In the most basic terms, augmented reality is the superposition of digital content in the form of animation, sound, text or 3D objects on actual images, generating a collage between the real and the virtual Lee et al. (2015). In its application to photography, this blending makes possible the narrative possibilities of images to be developed in three dimensions. Having a smartphone or an AR headset in hand, the viewer is transformed into an active user, experiencing the strata of visual and audio sense as opposed to passively watching a framed scene Figueiras (2016). In this respect, AR reshapes the act of photography as documentation in space as a story, where point of view, motion, and interaction are used to remake the emotional and thinking process of the viewer towards the picture.
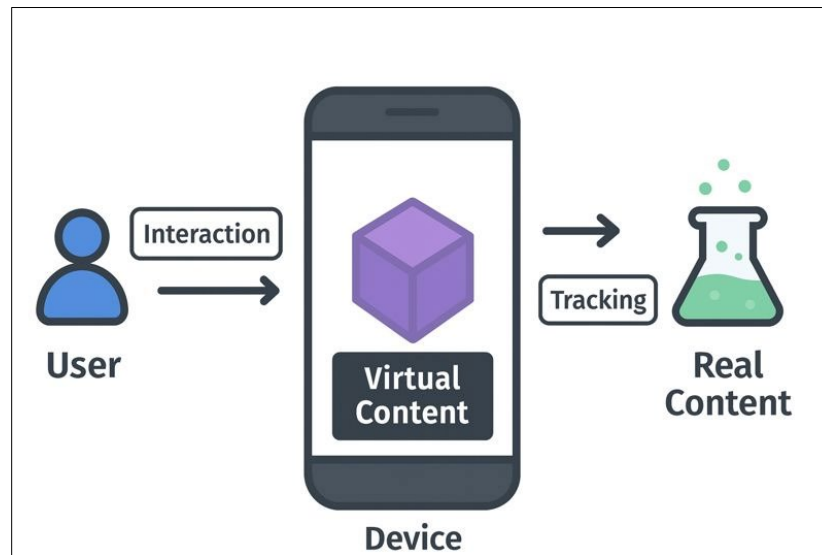
Figure 1

Figure 1 Circular Framework Depicting How Digital Layers

The new mode of narration is in dispute with the ontology of the photograph. The photo has conventionally been seen as an indexical trace a mark of an actual event or moment. In AR-based narratives, though, the image goes beyond its evidence purpose and becomes a living interface Galatis et al. (2016). AR photography is a way of bringing fluidity to the visual storytelling through interactive triggers, temporal sequencing, and user-driven exploration which allows new interpretations to change with each engagement. The story is no longer determined by the frame of the photographer but it is constantly rewritten by the audience. In terms of culture, the fusion of AR and photography also rearranges the representation of memory, identity, and place Chatzopoulos et al. (2017). The augmented photographic spaces enable anchoring the personal stories into the physical space which transforms the public spaces into the living archives and personal photographs into the shared and immersive experiences. The distinction between the storyteller and the audience is blurred and the narrative ecology produced is co-creative.

2. HISTORICAL AND THEORETICAL FOUNDATIONS

The history of photographic narrative is closely connected with the historical path of visual rhetoric and mediation by technology. Whereas the analog darkroom culture of the 19th and 20th centuries presented a series of darkroom practices that defined the mode of photography, its capture, construction, and meaning, the current state of the art of augmented reality (AR) overlays has redefined the mode of photography, its capture and meaning construction in addition to its construction. The materiality of the photograph film grain, and the feeling of the prints were inherent in the analog era and were part of the authenticity. This materiality led to the feeling of permanence and indexical truth, which anchored images as a witness of time and space which was reliable Panou et al. (2018). The emergence of digital imaging in the 1990s has brought photography to the era of dematerialization. Silver halides were substituted by pixels, printing was substituted by the screens, and this enabled manipulation, and immediate distribution. The photograph

ceased to be an object of stone; it became a moving digital fluid, which can be reproduced, edited indefinitely. This shift erased the distinction between documentation and the act of creation, introducing some new aesthetic paradigms where the image authenticity was a bargain between perception and computations Dd Goh et al. (2019). To follow this change in a systematic way, Table 1 illuminates the developmental phases of photographic narration, matching the most important technological changes with their artistic and narrative impacts. The whole process of augmented reality integration is the culmination of these historical changes Liestøl (2019). Based on phenomenological, semiotics, and space narrative theories, AR erases the two-dimensional border of a photograph and places it in real-life explorable spaces. These theories were used to get a base on how AR is able to replace a visual story telling that is just followed by observation into a form of participation. Table 1 below puts these frameworks into context and how they directly relate to AR photography.

Table 1

Table 1 Theoretical Frameworks Influencing AR Photographic Storytelling			
Theoretical Lens	**Key Proponents**	**Core Concept**	**Relevance to AR Photography**
Phenomenology Aliprantis and Caridakis (2019)	Merleau-Ponty, Husserl	Embodied perception and lived experience	AR engages bodily movement and spatial awareness
Semiotics Tejedor-Calvo et al. (2020)	Roland Barthes, Umberto Eco	Signs and meaning in image interpretation	AR layers create polysemic narrative contexts
Postmodernism Russo (2021)	Baudrillard, Lyotard	Fragmented, participatory narratives	AR dissolves fixed authorship and authenticity
Spatial Narrative Theory Tong et al. (2018)	Ryan, Jenkins	Story unfolding through space and interaction	AR storytelling integrates location and movement into narrative flow

All these theoretical approaches explain the reason why AR storytelling cannot be limited to the sole effect of visual enhancement it is a paradigm shift in the phenomenology of viewing. The picture turns out to be a spatial and interactive interface as opposed to a picture. Movement, gesture, and perception allow viewers to become participants to recreate the story in real-time. Hence, the photographic storytelling by AR, is not the break in the tradition but the logical continuation of the historical development of photography in terms of the move of the application of photography as a means of representation towards the experience of being in the image and as the seeing towards the being in the image.

3. PROPOSED DESIGN FRAMEWORK FOR AR-BASED PHOTOGRAPHIC STORYTELLING

Photographic storytelling using Augmented Reality (AR) is conceptually based on a collision of the visual semiotics, spatial computing, and interactive narrative design. In contrast to traditional photography, in which the narrative meaning is limited by a fixed frame, AR photography exists in a broader field of space where the viewer will become a perceiver and an actor. The structure focuses on merging visual levels, sensory experience, and participation by the end-user by making photographs a dynamic experiential environment, instead of a fixed composition. On the structural level, the AR storytelling process starts with the visual-spatial composition of the picture that determines the contextual anchors of augmentation.
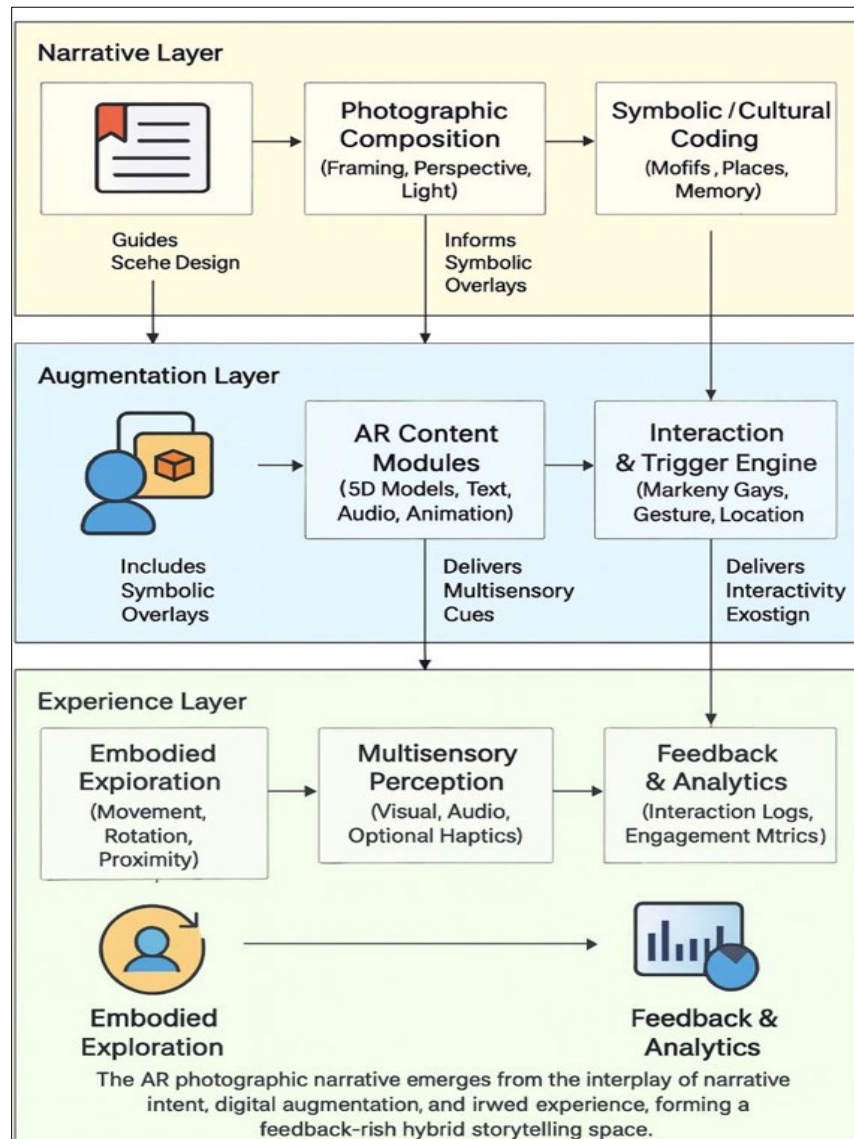
Figure 2

Figure 2 Workflow for AR Photographic Storytelling Creation

Each photo is used as a canvas to digital layertap of 3D objects, animation, ambient sound, or context texts that improve the continuity of the story. These virtual components can be oriented to physical coordinates through the recognition of objects and mapping the scene to make the augmented layer reactive in respect to the viewer and their movement. It is a form of a moving and living dialogue between the real and the virtual produced through this spatial correspondence enabling the storytelling to proceed in movement and perception. An important part of the framework is multimodal fusion which combines visual, auditory and occasionally haptic feedback to produce emotional and cognitive involvement Esser and Vliegenthart (2017). This practice is built on the theory of embodied interaction, meaning of which is created with the help of sensual plunge and bodily discovery. The gestures, gaze or voice input of the viewer becomes a condition and the layers to the story are brought out or altered creating a feedback-driven loop between the audience and the artwork. This interactivity turns spectatorship into co-authorship, which is the viewer as a partner who is active in determining the narrative results:

1) **Narrative Layer:** outlines the thematic content and plotting that is incorporated in the photograph.
2) **Augmentation Layer:** realizes the visual and auditory aspect in relation to the physical setting.
3) **Experience Layer:** reflects the interpretation, movement, and emotional feeling of the user, which is returned into the logic of adaptive stories implemented in the system.

Al the layers depicted in diagram 2, are a continuum of physical image, digital augmentation, and human perception becoming unified. This paradigm places AR not only as a photographic additional feature, but as an aesthetic development of the space of the narrative, as a part of visual art, technology, and phenomenological experience.

4. EXISTING DESIGN AR DESIGN TECHNOLOGY

The scientific foundation of AR-based photographic narrative is established based on a system of structures mainly ARKit, ARCore, WebAR, and Unity-based toolchains, which allow spatial tracking, surface recognition, and real-time production of graphic overlays. Practically, the platform decision does not come down to pure technicality, but the platform influences the manner in which a narrative can be performed, how it is made available to the audience, and the degree to which the system can be made responsive on the ground. ARKit and ARCore, as an example, provide powerful sensor fusion and plane detection closely coupled with both iOS and Android systems, thus being suitable in location-based photographic storytelling that is based on consistent tracking and high-quality rendering. WebAR, in its turn, focuses more on accessibility via the browser, and the lack of graphical richness in favor of frictionless entrance, which is imperative in the case of intervention in the public art and in the conditions of exhibitions, where some audience may be unwilling to install the app. Unity is an orchestration platform, which enables the artist researcher to create once and run in any of several AR runtimes with custom shaders, particle systems, and interaction scripts designed to fit photographic aesthetics.

Table 2

Table 2 AR Platforms for Photographic Storytelling				
Platform / Stack	**Device Ecosystem**	**Strengths for Photographic Storytelling**	**Limitations**	**Typical Use Case**
ARKit Wang and Zhu (2022)	iOS (iPhone, iPad)	High-quality tracking, light estimation, smooth integration with native camera and gallery	Restricted to Apple devices	Gallery-based AR photo essays, curated museum experiences
ARCore Boboc et al. (2022)	Android devices	Broad device reach, robust plane detection, integration with Google services	Fragmented hardware quality, variable performance	Urban AR street-photography narratives, site-specific works
WebAR (e.g., 8th Wall, WebXR) Gong et al. (2022)	Cross-platform browsers	No app install, easy access via URL/QR, ideal for public engagement	Limited graphics performance, constrained access to sensors	Outdoor AR photo walks, quick exhibition augmentations
Unity + AR Foundation Daineko et al. (2022)	Multi-platform (iOS, Android, some XR headsets)	Single project, multiple builds; advanced visual effects, complex interaction logic	Higher learning curve, longer build cycles	Complex, multi-scene AR photo installations with interactive story branching

AR photographic storytelling design methodology can thus be envisioned as being an iterative pipeline where conceptual and photographic choices are made at the start of the design and the end is interactive deployment and evaluation. It begins with the planning of stories and images where narrative lines, visual patterns and space contexts are established. These choices lead to directed image capture such as consideration of parallax, depth indication and negative space that will subsequently accommodate digital additions. During the stage of producing the assets, 3D, textual overlays, soundscape, and subtle animations are produced or obtained, with the stylistic unity of these elements with its underlying photographs Daineko et al. (2023). The interaction design forms the second layer of the approach that is critical. In this case, gesture, gaze and proximity stimuli are stipulated to disclose narrative levels in a progressively graded manner inviting to exploratory behaviour as opposed to one-time viewing. Prototyping is based on on-device testing at a fast pace to create a refined interaction threshold, realignment of the overlay and performance optimization according to device and lighting conditions Hu et al. (2023).

5. PROPOSED DESIGN METHODOLOGY FOR AR PHOTOGRAPHIC STORYTELLING CREATION

The suggested design process offers a well-organized, stage-by-stage platform, which incorporates artistic creativity, spatial computing, and user experience design into a unity of AR storytelling medium. It is structured around

six consecutive, but repetitive steps, which make sure that the narrative vision, as well as technological implementation, develops simultaneously.

Step 1: Conceptualization and Figuring out of the story

This process starts with establishing the thematic intent as well as the narrative structure of the photographic narrative. At this point, the producer determines the emotional emphasis, message and the required audience engagement. To visualize the way the story is going to progress in augmented space, storyboards, and narrative flow diagrams are created.
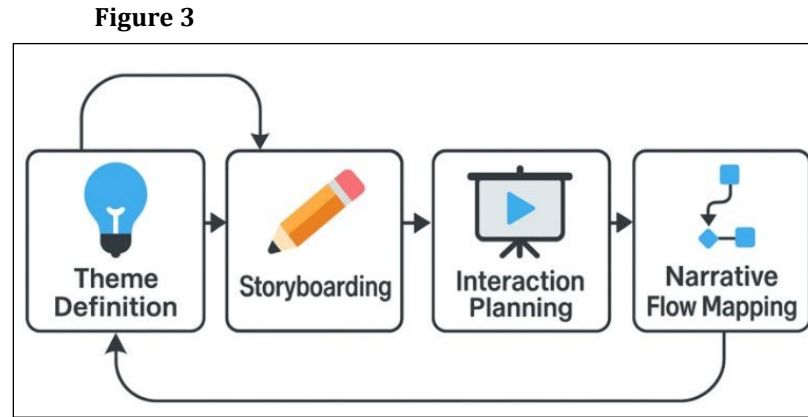
Figure 3

Figure 3 Process of Conceptualizing Narrative Structure and Planning Interactivity in AR Photographic Storytelling

The photos are given a narrative role of either an entry point, transition, or an immersive anchor. Interactive stimuli like gestures, gaze or distance are conceptually designed to determine how the users would interact with the augmented layers. Such tools as Figma and visual scripting block can help to move conceptual ideas into early prototypes. At this stage, it is already known that the story is worth having aesthetic value and interactive logic but not yet ready to be implemented technically.

Step 2: Photographic Data Capture and Contextual Data Capture

Once conceptual planning has been done, the next step is to capture the content of the photographic material and the environmental metadata on which the AR experience will be based. DSLR or smart phone cameras with depth sensors or LiDAR scanners are used to take the high-resolution images which are needed to provide proper spatial referencing.
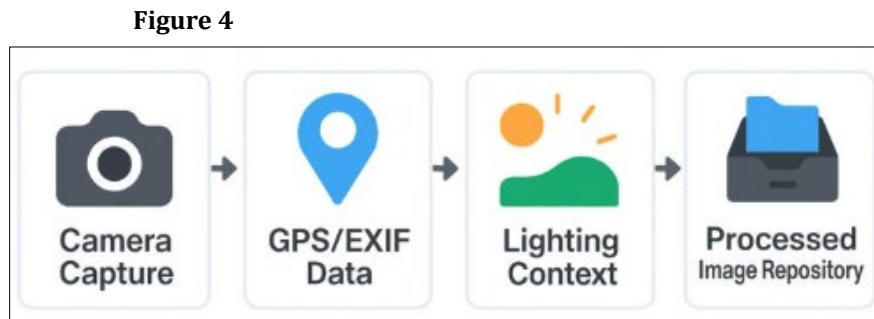
Figure 4

Figure 4 Workflow of Photographic Capture Integrated with Contextual Metadata Acquisition for Spatial Anchoring.

Coupled with the photographs, there are a set of contextual information like GPS positions, brightness of the ambient light, and metadata with regard to orientation. This context information is used later to make accurate spatial registration of digital overlays. Tone, contrast, and detail activation in the images are done using editing software such as Adobe Photoshop or light rooms. The result of this process is a refined visual dataset that could be augmented and also include environmental metadata to be integrated with AR.

Step 3: AR Asset Development and Integration

After the foundation photo material is ready, the design stage progresses to the creation of digital additions to the photos that now broaden the narrative abilities of the photographs. Here, the visual narrative is supplemented with 3D

models, as shown in Figure 5, animation, soundscapes as well as text layers. These assets have been designed in accordance with the concept of narrative coherence in which all digital pieces reinforce the original photograph and not distract the viewer.
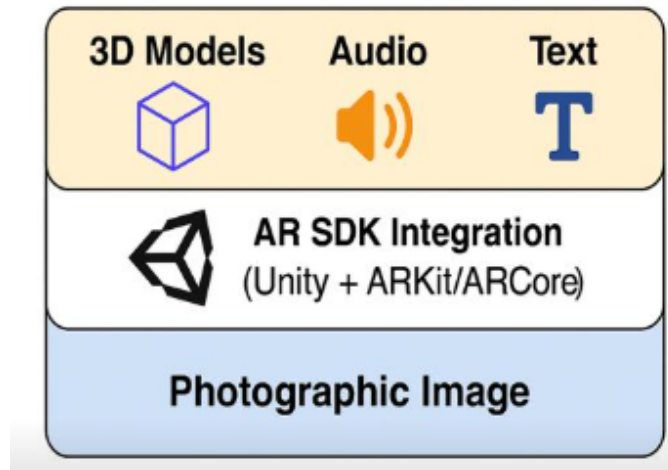
Figure 5

Figure 5 Integration of Digital Assets and Interactive Overlays onto Photographic Layers for AR Storytelling

Artists create light and optimized assets that can be rendered on mobile with the use of Blender, Maya, or Cinema4D. These resources are then brought into Unity and connected up with SDKs such as ARKit (iOS) or ARCore (Android), and comprise the augmented layer that will dynamically engage with the real world photographic space. This is where the intent of narrative is turned into spatial interactive experiences. Those photographic and digital resources are put together in a 3D AR representation in Unity whereby spatial orientation is realized via the SLAM (Simultaneous Localization and Mapping) methods. The anchor in the real world coordinates is performed by surface detection and plane tracking which puts the anchor at the correct position in the real world.
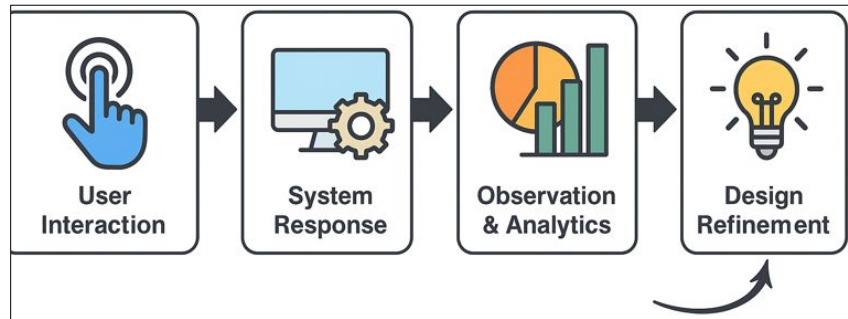
Figure 6

Figure 6 Scene Assembly Process Showing Slam-Based Spatial Mapping and Real–Virtual Content Alignment

The camera angles, lighting, and motion restrictions are predetermined by designers so that the illusion of being immersed into the world is always constant. The interaction points of the scene, including tap areas, motion triggers, audio hotspots, are included in the scene, as illustrated in figure 6 the outcome of this step is the creation of a functional AR environment, which physically and visually interacts with the surrounding environment of the user and converts the still images into spatial stories.

Step 5: User Interaction Design and Testing

After assembling the scenes, the second phase is to test and development of user interaction systems to create a system of interaction that is intuitive and emotionally sensitive. Initial prototypes are tested on various devices to test the tracking performance, responsiveness and also usability. The participants will be monitored when engaging with the AR material in order to determine the instances of disorientation, stimulation, or aesthetic pleasure.

Figure 7

Figure 7 Iterative Loop Representing User Testing, Data Collection, and Refinement of AR Interactions.

Quantitative data, dwell time and trigger frequency is recorded and qualitative interviews are recorded in the form of emotional responses and cognitive impressions. The feedback is applied, which is symbolized by the number 7, to make the interaction design more accurate, asset performance more productive, and the narration sequence more understandable. This would be taken so that experience is immersive, comfortable, and narratively consistent with diverse users and situations.

Step 6: Deployment, Evaluation, and Iterative Refinement

The last process is the publication, surveillance, and enhanced AR photographic experience. The final project will be released on the platform of App Store, Google Play, or WebAR to access the project via a browser. Embedded analytics makes a record of engagement measures, interaction trends, and retention.

Figure 8
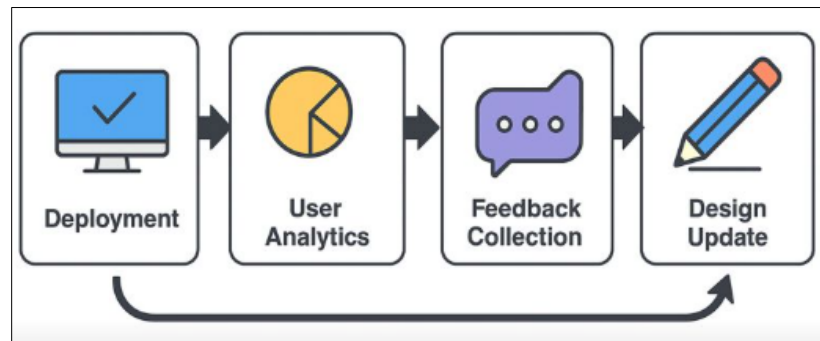
Figure 8 Continuous Evaluation and Iterative Enhancement Cycle for Sustaining AR Photographic Storytelling Experiences.

Surveys and observations done after deployment provide information on the level of user satisfaction, interpretive comprehension, and emotional richness. According to these findings, both the artistic and technical side of the experience are optimized by the design team. The updates can be done iteratively and can be in terms of better spatial accuracy, better visual effects, or adaptive features that are driven by AI. This is a cyclical process, which guarantees constant improvement of the story telling structure and sustainability of the project in the long term as demonstrated in Figure 8.

And last, the deployment and assessment loop is closed, analytical modules know dwell time, hotspots interactions, and navigation patterns and qualitative feedback is made to know the emotional resonance and interpretive richness. The lessons of this stage are used to make changes to the technology set up and narrative form, cementing a research-through-design practice, in which artistic exploration and methodological strictness are developed alongside each other. This cyclical process is shown in Figure 4, which perceives the process of creating an AR photographic storytelling through concept, design, implementation, and feedback in a cyclical way.

6. CASE STUDIES IN AUGMENTED PHOTOGRAPHIC NARRATIVES

The real-life examples of the Augmented Reality (AR) use in photographic storytelling show that this hybrid medium can be used to go beyond traditional showing of images and can provide immersive, participatory experiences. AR

photography has been developed over the years through a variety of contexts in the form of museum exhibitions, urban interventions, in addition to personal archives as an expressive language of spatial storytelling that marries artistic vision with computational intelligence. In this section, we consider the exemplary case studies, which exemplify the creative, technical, and experiential aspects of AR-based works in photography.

Case Study-A] AR Photography Exhibitions in Museums.

Museums are now serving as fertile grounds to experiment with AR photography, a controlled and yet fascinating setting where people are able to navigate through historical photographs and digital overlay in the present day. As an example, an AR-enabled installation could have archival images of a heritage facility alongside 3D recreations or oral histories, which could be played as people wander through the installation. Through the fusion of ARKit or Unity systems, curators will have the ability to place holographic layers in space, restoring missing parts of an architecture or showing time-lapse change of the place.

This and the visual understanding is not just enhanced, but also creates mental empathy in the viewers who do not simply watch the past, they enter its recreated atmosphere. Such installations usually provide their audience analytics that reveal a statistically significant increase in dwell time and emotional resonance scores, indicating that AR improves the level of learning retention and aesthetic immersion.

Storytelling in the city and AR Street photography

City AR storytelling makes cities living photographic galleries. Images on walls or computer screens are transformed into geo-tagged narrative doors, which can be accessed by smartphones by means of WebAR links or QR triggers. The city in itself stages out, and in every photograph, a subtextual narrative is played out in the context of place, time, and movement. As an example, an AR street photography experience could enable people walking by to point their phones at an image of a long-gone market and see an overlay in 3D, recreating the historical feel of it, with background noises and soundbites of past traders. This site-specific narrative design recaptures the memory of a city, bringing back photography to the collective heritage as opposed to a lone record. The combination of GPS-triggered overlays and photogrammetric assets suggest a more and more narrative experience of walking, which equates to narrative advancement.

Case Study-B] Personal Memory Narratives with the help of AR Portraiture

When it comes to personal narration, AR portraiture can enable the viewer to save and reprocessing the memory in the form of the interactive photographic layers. Personal photographs may be enhanced with short video clips, voice records, or loops of animation to recreate the emotional background with the help of such tools as ARCore and the AR Foundation of Unity. We can use the example of a portrait that can show a lively entry of the diary or a small secret message when a viewer comes to it. These projects carry the ideas of the photograph as the mnemonic object to the actual experience that combines the sense of the emotional memory and the spatial interactivity. This form of AR storytelling is consistent with post-phenomenological theories, in which digital media determines the definition of human experience of memory, intimacy, and self-representation. In order to bring together the lessons of these cases,

Table 3

Table 3 Summarizes the Comparative Features, Technologies, and Impacts Across these Case Studies Disussed Above				
Case Study Context	**AR Platform / Tools**	**Narrative Strategy**	**Audience Interaction**	**Key Impact**
Museum Exhibition	ARKit + Unity	Temporal layering, reconstruction of historical imagery	Spatial navigation through gallery	Enhanced cultural immersion and interpretive learning
Urban Street Photography	WebAR + GPS	Geo-tagged storytelling and site-specific memory reconstruction	Walking-based discovery and location-triggered activation	Recontextualization of public space and collective heritage
Personal Memory Portraits	ARCore + AR Foundation	Emotional narrative layering with voice and animation	Gesture-based and proximity-triggered exploration	Deepened affective connection and self-reflexive storytelling

The comparison shows that all three contexts are based on embodied interaction, multisensory immersion, and co-creative narrative design in spite of the fact that the technological architectures vary. The institutional to personal variety of AR environments depict the way in which photography may transform into a multidimensional artifact to become a multidimensional ecosystem of storytelling that engages viewers both emotionally and spatially.

7. ARTISTIC AND CULTURAL IMPLICATIONS

The fact that Augmented Reality (AR) is integrated into the process of telling stories in photography promises to introduce a radically new shift in the artistic and cultural paradigm of visual expression. Combining the documentary accuracy of photography with the spatial interactivity of AR, a new language is formed a language that questions the concepts of authorship, time, and material space of the image. This part will look into the artistic implications, cultural transformations as well as ethical implication presented by this amalgamation of art and technology. AR photographic storytelling at the artistic level reconstructs the process of seeing. The customary photography seals a scene in a lifeless composition by fixating the eye of the viewer on one point of view. AR destroys that fixity and makes the viewer enter the frame to navigate in the narrative space. The artwork is transformed into an interactive system which reacts to gesture, closeness, and interest and it changes with each encounter. Such a spatial immersion reestablishes a sense of agency towards the audience making spectators co-producers of meaning. The artist thus moves out of being an individual author, into being a narrative architect, coordinating temporal and sensual experiences, which emerge during embodied movement of the viewer.
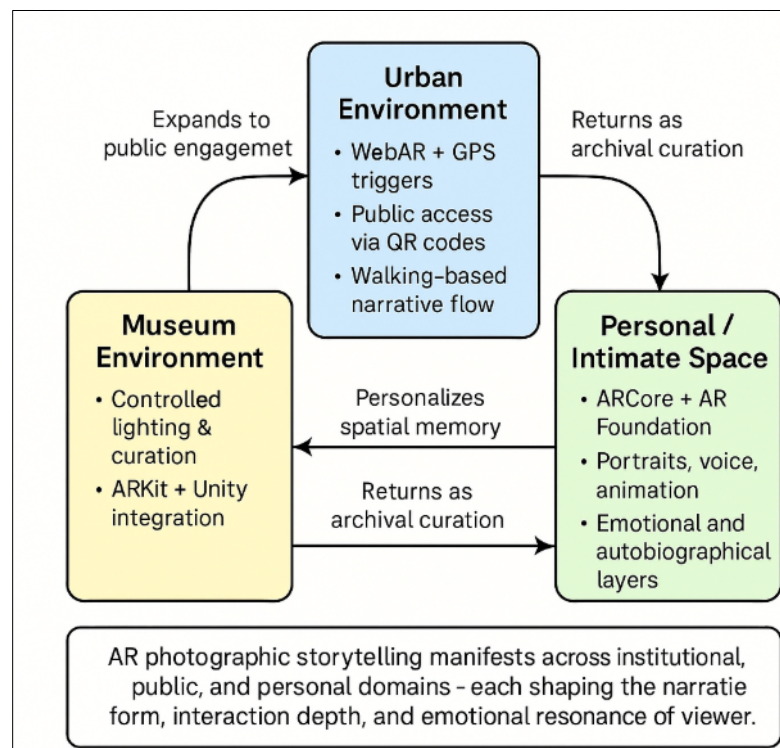
Figure 9

Figure 9 Audience Experience Comparison between Traditional and AR Storytelling

In order to systematize the capture of these transitions, Figure 9 describes the artistic changes that happen when photography shifts to an AR-based mode of narrative. The aesthetic ontology of the photograph is also changed as a result of the transformation. The image in AR-based works is not just the depiction of the reality but a time interface in which the digital and physical layers exist at the same time. This way, the photograph is no longer tied down by its fixed position of a visual record but rather it becomes a performative space a stage of storytelling that is changed by being engaged in. It is similar to the postmodern idea of the open artwork of Umberto Eco, where the interpretation and participation are finished parts of the artistic process. In these regards, AR photography is more than depiction, but

authorship experienced, as time, space and affect are all merged in one creative process. AR photographic storytelling removes the lines between memory, heritage, and lived experience culturally. It brings archives back to life in the museums where historical photographs can communicate with the real space. It serialises the narrative in urban spaces by incorporating the local stories into the common surroundings. At a more personal level, it converts personal snapshots into the interactive memory capes.

8. CONCLUSION

The study of Augmented Reality (AR) in photographic storytelling brings forth a paradigm change in the way the narrative is being conceived, experienced, and remembered. Combining the elements of photographic realism and interactive space arrangement, the AR turns the picture into an interface of a living story, re-constructing the borders between the viewer, the creator, and the surrounding world. The photograph that used to serve as a static time-note turns into a multisensory field which can change in accordance to the presence and engagement of the viewer. Artistically, the AR storytelling places the photographer in the role of a building designer, mixing aesthetics, movement, and visually engaging experiences into unified experiences. With this reconfiguring, the passive viewing act is disbanded and co-creation is established in which the audience directs, interprets and has an emotional contribution in the narrative being played out. Not only does such participatory storytelling renew photographic art but it also makes it consistent with current theories of embodied perception and experiential authorship. The implications are culturally far reaching. AR photography makes art more accessible through entrenching visual stories in museums, on the streets, and in personal space and transforms ordinary spaces into platforms of memory and imagination. The medium forms the gap between historical archives and the present culture, inviting people to recollect together and engage in intercultural communication. However, such authority is accompanied by a sense of responsibility that maintains ethical integrity, transparency of data and cultural authenticity in the process of augmenting and communicating stories. Various technological and design issues continue to exist including variability with devices and privacy issues but more recently emerging technologies like AI adaptivity, accessing WebAR, and blockchain provenance are progressively conquering these obstacles.

CONFLICT OF INTERESTS

None.

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