Interactive Digital Storytelling Navigating the Inherent Currents of the Diasporic Mind

Valentina Nisi[1,2 [0000−0002−8051−3230]], Paulo Bala[1,2 [911F−BB1A−C970]], Miguel Pessoa[1,2], Stuart James[3 [0000−0002−2649−2133]], and Nuno Nunes[1,2 [0000−0002−2498−0643]]

[1] Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal
[2] ITI/LARSyS, Lisbon, Portugal
[3] Durham University, UK

Abstract. Due to a recent increase in conflicts, natural disasters, and economic crises, a growing wave of migrant populations has been searching for asylum in Europe. For this population of asylum seekers, the migration process, like currents and rapids, can be dangerous, uneven, and violent, and the integration into their host communities can add to the preexisting trauma. Extending on HCI increasing attention to the caring understanding of human life values, this paper presents initial research focused on refugees' storytelling activities to support their well-being. Here, we describe and discuss the results from a set of studies with the *Portuguese Center for Refugees*[4] to design and refine a bespoke interactive digital storytelling authoring tool. This study aims to promote social cohesion and equal participation in European society by using Digital Storytelling to allow migrant communities to share and connect their stories and experiences. The authors contribute with a novel digital storytelling prototype tool and the discussion and reflections stemming from the user-centered design approach. The insights gained from this work are relevant for interaction designers and researchers seeking to support vulnerable populations through Interactive Digital Storytelling.

Keywords: Migrants · Refugees · Interactive Storytelling · Research through Design · Social Integration.

1 Introduction - Digital Storytelling for Social Inclusion

The European Union is experiencing its most significant influx of migrants since 2015, with Italy and Greece witnessing unprecedented numbers of arrivals, significantly challenging their reception capabilities. Reports of migrants perishing in the Mediterranean, the detainment of rescue vessels, and the maltreatment of migrants have become focal points of media coverage, attracting criticism from civil society, NGOs, and political figures [17]. In the spirit of much HCI research [5,18], attentive to the caring understanding of human life values, our

[4] We have anonymized several elements in the text (e.g., *BRA - Portuguese Center for Refugees*)

research turns to Storytelling [23] as a powerful tool for communication and connection, in support of displaced and marginalized communities. Storytelling is a human construct to record life [12,50,55] and lived experiences are one of the most versatile materials for stories [42]. Migration reflects human movement and resettlement dynamics, not as dichotomous endpoints or superficial cause-and-effect relationships, but as intertwined aspects of a globally interconnected system characterized by continuous currents, flows, and networks [28]. Sharing memories and storytelling is a crucial strategy for migrants to safeguard their hybrid identities through diasporic trauma and contribute to more socially cohesive communities. In his book Accented Cinema, filmmaker Hamid Naficy talks about the storytelling of postcolonial, Third World, and other displaced individuals and how their personal experiences of exile and diaspora translate into cinematic storytelling. The cinematic artifacts exhibit stylistic similarities from their aesthetics to their nostalgic and memory-driven multilingual narratives and their emphasis on the political agency to their concern with identity[44].

Life stories play a crucial role in migration discourses: they serve as testimony in journalistic work, form the ambassadorial storytelling delivered by non-governmental organizations, and inspire collaborative writing projects to express solidarity towards migrants and refugee populations [27]. However, drawing on migrants' experiences for such purposes also creates an ethical dilemma: speaking about–or even for–rather than with migrants assigns them a passive role and tends to recycle existing narrative patterns. The authors contribute articulating a distinction between what we call stories of migration (various forms of self-expression granting migrants authority and control over their narrative) and narratives on migration (external perspectives, e.g., academic, economic, political, and legal approaches, detached from lived experience).

Plugged in this broad framework, the work presented in this paper stemmed from research that occurred under the EU-founded *MEMEX Project* (2019-2022), aiming to facilitate social cohesion and equal participation in European society by using technologies such as Digital Storytelling as a form of self-expression, granting migrants full authority and control over their narrative. Through a study of a digital storytelling system, individuals at risk of social and cultural exclusion can retell, share, and connect to others through their stories and experiences. This work is located at the intersection of HCI, social inclusion, and digital storytelling. We contribute by presenting the design and evolution of the bespoke digital storytelling tool and discussing relevant insights from this work, which we deem interesting for researchers seeking social inclusion through digital storytelling.

1.1 The case of the displaced refugees

According to the UN definition, "*A refugee is someone who has been forced to flee his or her country because of persecution, war or violence. A refugee has a well-founded fear of persecution for reasons of race, religion, nationality, political opinion, or membership in a particular social group. Most likely, they cannot*

return home or are afraid to do so. War and ethnic, tribal, and religious violence are leading causes of refugees fleeing their countries."[5].

The refugee migrant journey is particularly harsh since the migrant's main problems, such as language, housing, access to medical services, and cultural differences, are exacerbated by the involuntary displacement. This can lead to increased alienation and isolation resulting from difficulties integrating into a country and culture they did not choose [54].

In the last few years, the number of refugees in Europe has been increasing, reaching the highest numbers ever[6]. Their journeys are complex, often harsh, and painful – differently from other kinds of migrants – and as the number of refugees grows to unprecedented numbers, the aid and support for their journeys and integration do not match the proportions. From an ethical and human point of view, we feel the urge to try harder to support these communities. Generally, the refugee integration process is supported by the local authorities and NGOs, but social community integration still relies on each migrant individual's responsibility. This social integration depends strongly on one's gained social capital, which consists of the relationships and connections a person creates in their living and working environments. Although government agencies can help with the integration process, each migrant's social capital is still up to their efforts. We turn to digital storytelling tools to assist the forced migrant populations to share their present and past experiences through stories and storytelling activities. For this purpose, we paired with the *BRA* to co-design and deploy a bespoke Interactive Digital Storytelling tool. Through our research, we contribute to interactive storytelling systems design research with a working prototype of a novel Interactive Digital Storytelling Tool that affords the co-creation of interconnected webs of stories as cultural artifacts, stimulating social bonding and connection with migrants and refugees facing similar complex journeys. Moreover, we reflect on how co-creation activities provide refugees with support and opportunities for building social capital and kinship, siding the difficulties and harshness of their journeys. Finally, we think with theory [35], plugging in texts from Ingold's Meshwork's theory [33,34], Ang's concept of the Diasporic Mind [4] and Byrne's cross-border connectivity [13,40,63], to contribute to deconstructing colonialist cliches [38], illuminating opportunities for practitioners and researchers that engage with the complexities of designing interactive storytelling tools in support of migrants communities.

2 Related Work

Research in digital technologies is increasingly looking at supporting vulnerable populations [24]. However, research related to migrant communities has predominantly focused on their short-term settlement needs, such as healthcare, employment, and housing. Nevertheless, storytelling, documentary practices, and

[5] `https://www.unrefugees.org/refugee-facts/what-is-a-refugee/`
[6] `https://dtm.iom.int/europe/arrivals`

gaming can also play a role in facilitating short and long-term settlement processes and integration by creating spaces for feelings of empathy and compassion. In this section, we look at intersecting areas of research which have inspired our work.

2.1 Human-Computer Interaction and Digital Storytelling caring for displaced populations

As Human-Computer Interaction (HCI) continues to engage with studies, design, and development of computational systems for displaced and marginalized communities [16,59,57], over the last decades, an increasing flow of migrants, and refugees have led Europe to prioritize this issue as a pressing societal challenge [17]. Much of the research is concerned with the role of technology in supporting the migrants in various phases of their journeys: facilitating the mobility process [21] and how to monitor, protect, or support the migratory journeys [31]; underpin the settlement processes, fulfilling health [11] and educational [64] needs. Nevertheless, Hsiao and Dillahunt highlight how often technology addresses migrants' immediate settlement needs [32], leaving the cultural and emotional aspects as ancillary issues. Recent work has started to fill this gap. For example, Sabie et al.'s [58] started to engage migrants with long-term needs, such as safeguarding and expression of heritage. Nisi et al. work with second-generation migrants to understand their relationship with the hosting and original heritage through storytelling practices [50,46]. Moreover, Transnational HCI [59] draws attention to how different actors construct and cross borders; this allows us to examine migration as social ties, social classes, cultural practices, and narratives that construct hybrid identities. Inspired by the above, through a reflection on the potential of Digital Storytelling, our research engages with first-generation refugees as they construct their hybrid identities, belonging to the hosting and their original culture and society simultaneously.

2.2 Socially aware digital storytelling and gaming

Digital Storytelling tools and practices started to flourish at the end of the last millennia [19], with the general recognition that widespread and less expensive digital tools could lead lay people to make enormous creative contributions to the field. To this realization, artists and engineers responded by creating tools and storytelling processes accessible to all, especially those traditionally left behind [36]. The work of these artists and a broad range of collaborators gave voice to powerful stories of harm, healing, and hope amid social and political conflict. More recently, researchers have been exploring grassroots approaches to Digital Storytelling. For example, *Urban and Social Tapestries*, by Proboscis [37], a project centered on public authoring and grassroots storytelling. *Trading Mercators Stories* [45], a locative storytelling project involving the multiracial communities of an inner-city neighborhood in Amsterdam. The authors collected locally sourced grassroots anecdotes, memories, and success stories to form a location-aware collection of short videos available to the broader audience through mobile

devices borrowed at the local library. The project evaluation highlights the role of Digital Storytelling tools in foregrounding the cohesiveness and pride of the local multicultural communities. Through applying Digital Storytelling in the critical neighborhood of District 6 in Cape Town, South Africa, Marsden et al. [7] examines how digital technology can inspire, record, and present oral stories in an African context. Similarly, *Yasmin's Adventures*, designed around the neighborhood perceptions of the multicultural community of Marien Platz in Berlin, invites the audience to take on a mobile device at the nearby Jewish museum and follow an AR guided walk around the surrounding area, inhabited mainly by first and second generation migrants [22]. Finally, *Storybank* [51] champions the power of memories and storytelling in supporting activism and participation, transforming a spatial construct into a socially relevant place.

More recently, digital games have also started contributing to this space [6,30]. Several contemporary video games (mainly 'indie' games) explore migration in ways to elicit productive discomfort[15]. Supported by the EU-funded project Opportunities (https://www.opportunitiesproject.eu/), Caracciolo looks at four indie games within different genres: *Papers, Please* (2013), *Bury Me, My Love* (2017), *Frostpunk* (2018), and *Where the Water Tastes Like Wine* (2018). By putting the player in touch with various fictional migrants, these games build empathy and understanding of the large-scale factors that shape the lived experience of migration and the discourse surrounding it. Finally, crucial social impact games may not all result in publication. However, they are still worth mentioning for inspiration. *Workeen* [3], for example, is a serious game launched by SIRIUS – Skills and Integration of Migrants Refugees and Asylum Applicants in European Labour Markets – that guides migrants through finding a job. *Oasis* [1] - created by and for refugees - allows migrants to access a map to consult location-based information on fundamental services - legal aid offices, medical services, and finding a place to eat or rest. As Caracciolo reflects, these games about migrant experiences immerse the player in moral dilemmas with no clear solution; games thus mirror the real-world complexity of migration and afford opportunities for more critical reflections than is possible through the factual representation in the media.

2.3 Digital Storytelling Tools Capturing the Heritage of Disadvantaged Communities

Tangible and intangible cultural heritage is a crucial facet that must be valued and preserved for all humanity, especially for displaced, vulnerable populations. Several EU-funded projects, such as Culture Labs[7], SPICE[8], MEMEX[9], Opportunities [10] address Cultural Heritage (CH) as an essential instrument for social cohesion and seek to address the needs of community members most disconnected from dominant CH. The communities of immigrants in their various

[7] https://culture-labs.eu/
[8] https://spice-h2020.eu/
[9] https://memexproject.eu/
[10] https://www.opportunitiesproject.eu/

subgroups represent a prominent target of CH participatory initiatives [29]. The recent discourse on CH accentuates Grassroots Heritage and Indigenous Knowledge to support the expression and sharing of content from the communities whose heritage is being discussed [20]. Technology and digital tools in CH often resort to Storytelling to deliver Heritage content. In the rest of this section, we present some of the work of heritage-driven storytelling that has inspired our research.

Visual History of the Holocaust [2] renders public film records produced mainly by Allied military troops available for analysis, research, and curatorial re-use. The project enhances the context of a user's location by mapping the mentioned records around them using location-based services. Projects such as *Media Portrait of the Liberties* [52] and *Hopstory* [53] capture the life and lore of Celtic-speaking Irish migrant communities during the first half of the twentieth century when moving to the capital, looking for work. Their intangible heritage, made of puns, specific sense of humor, superstitions, and oral histories, is captured in a location-aware mobile collection of short multimedia story fragments. Several authors highlight the importance of capturing the tangible and intangible heritage portrayed by the communities through grassroots storytelling activities [50,39]. More recently, results from the MEMEX project report on designing and evaluating Digital Storytelling authoring tools to facilitate inclusion and cohesion of communities at risk of exclusion [47,49].

2.4 Thinking with Theory

The authors of this article build their reflections and discussion on storytelling in support of migrant and refugees populations by thinking with theory [35], reflecting on refugees' journey through plugging in Ingold's Meshwork theory text [33,34], Ang's concept of Diasporic Mind [4] and Byrne's cross-border connectivity [13,40,63]. We briefly summarise these concepts below. Ingold describes realities as complex interconnected actions and relationships rather than a linear movement from one context to another. Meshwork transforms people's thoughts about places by shifting attention from a spatial location to complex, interlacing development paths. In this article, the authors reflect on designing Interactive Storytelling technologies in support of displaced communities, reflecting on the complex and interconnected actions of migration movements, [33,34], highlighting cross-border connectivity as a reality and a necessity for the migrant's journeys [13,40,63]. Finally, we reflect on how interactive storytelling could support what Ang refers to as the 'diasporic state of mind', where home and abroad are part of a continuous spectrum, influenced by memories, emotional attachments, and feelings of belonging [4]. In the minds of migrants, the places of origin and destination extend beyond physical locations and create a sense of place in both settings simultanously[13,40,63].

In line with Jackson and Mattei, we reflect through a 'thinking with theory' method, borrowing and reconfiguring concepts (plugging in text), inventing approaches, and creating new conceptual assemblages that demonstrate a range of analytic practices of thought, creativity, and interventions [35].

2.5 Positionality and Reflexivity statement

We are designers, interactive digital storytelling scholars, and HCI researchers from different nationalities who strive to understand, include, and support a set of communities at risk of being excluded from the main benefits of our society. Some authors have voluntary migration backgrounds and have been conducting research in this area for some years, developing tools for inclusive Cultural Heritage; we reflect on these issues from the standpoint of supporting migrant populations' burdens through Interactive digital tools. We aim to reflect critically on the research outcomes, generating space and insight for future researchers to take this work further.

3 Methodology

In this section, we describe our user-centered [41] research through design (RtD) [65] approach. The study was approved through the *MEMEX Project* ethics approval.

3.1 Preparation: Interviews with *BRA* staff

Mindful of the triggering potential of the study on vulnerable users such as refugees, we started our process by interviewing the *BRA* staff to understand how to integrate our research into their existing activities. A set of short interviews was conducted regarding using digital tools and storytelling to support some of *BRA* existing processes. We interviewed five staff members involved with *BRA* as judicial coordinators, migrant reinstallation and integration professionals, social department coordinators, and the organization's president. All had daily interactions with migrant refugees.

Summarizing the findings from the interviews, *BRA* staff recognised the benefits of the participant's involvement in our study as potentially generating a sense of togetherness and relatability as they shared their experiences through the evaluation of storytelling tools. Nevertheless, concerns about language barriers and the triggering effect of stories that recollected painful memories or clashing values between users were raised. Hence, the staff suggested testing the application in a setting where the users learn how to use it together, rather than in a one-on-one session. The staff of *BRA* was also concerned about the application's accessibility, as the targeted user population can display some digital illiteracy.

3.2 First Digital Storytelling Prototype

We used a custom-built basic digital story writing and viewing tool for the first study. By evaluating the prototype with refugee participants, we were interested in understanding their general experience with a storytelling application, highlighting desirable features, and identifying barriers to usage. The prototype (See

Fig. 1) was built using Flutter Framework[11] for the front-end, Dart[12] for efficient programming logic and Google Firebase[13] for the back-end infrastructure; this combination allowed for rapid prototyping and cross-platform development. The prototype permitted users to act as guests (who could only view stories) or authenticated users (who could write and view stories). When creating a story, the user inserts a set of inputs to structure a story: geographic location, a story title, a cover image, a story body text with a WYSIWYG interface, and a set of tags (choosing from an *BRA* approved curated list). Users can find stories in a list, on a map, or in a journey (aggregated stories by the same user).

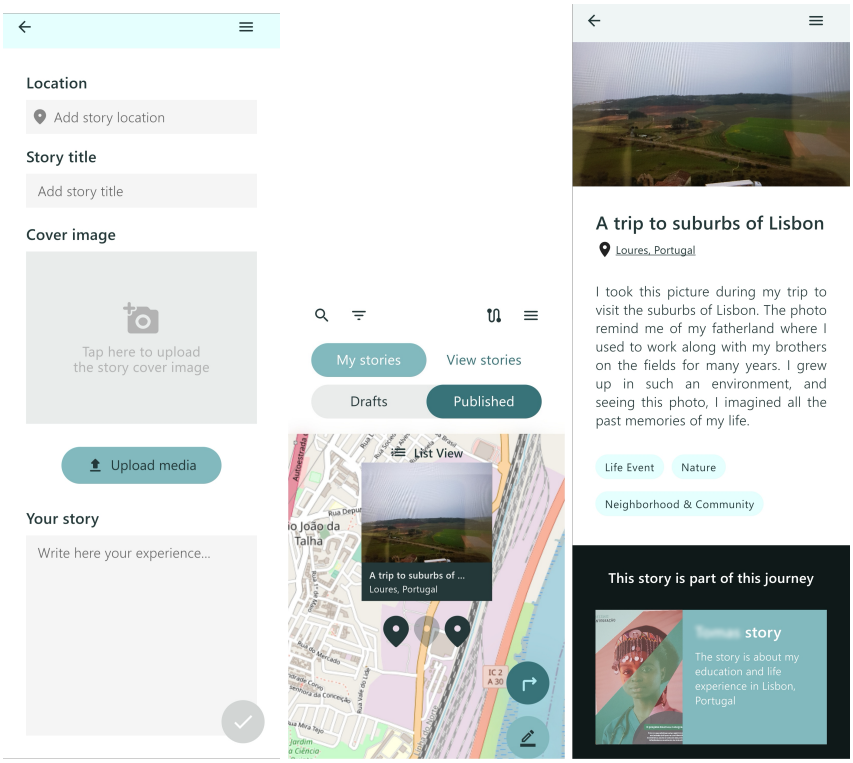

Fig. 1. First Iteration of the basic digital story writing and viewing prototype app. From left to right: Interface for writing a story based on user inputs; Interface for geo locating stories on a map, as in journeys (aggregated stories) or a list; Interface for reading a story.

[11] https://flutter.dev/
[12] https://dart.dev/
[13] https://firebase.google.com/

3.3 Evaluation of the First Digital Storytelling Prototype

The first testing session took place in the *CPR*, a refugee reception Centre managed by *BRA* on the 31st of May and 1st of June of 2022.

Demographic data. Twelve participants (11 men and one woman) between 18 and 44 years old joined the study in groups of two or three at a time. N=10 were of Afghan origins, one Iranian and one Ethiopian. The Afghan participants were of Dari's mother language, and they helped each other understand the tasks. Six Afghan participants were musicians from the Afghanistan National Institute of Music who arrived from Kabul in December 2021. The occupations of the rest of the participants were varied, going from a "Legal Advisor" or an "Air traffic controller" to a "Web developer". Two-thirds of the participants were familiar with smartphone usage, while the remaining third had an average smartphone experience.

Study design. After learning the scope and details of the study and agreeing to informed consent, participants were invited to perform a list of tasks (from accessing the application, creating credentials, logging in with previously created credentials, exploring the existing stories, creating a first new personal story, etc.). Users performed the tasks using a think-aloud protocol, providing feedback while expressing their thoughts. For the minority of the participants who were not fluent in English, another participant explained the tasks to them in their native language. User interactions were recorded through the screen (therefore, including the interfaces of the prototype). Participants were carefully informed that they were evaluating a piece of technology and not being evaluated themselves, that their names and details would not be disclosed, and that the data would only be used for research purposes. The participants were also informed of the possibility of leaving the session at any point without having to justify themselves to avoid any risk of retraumatization. After the think-aloud protocol, each participant was asked additional questions regarding the application's functionalities.

Findings. The "think aloud" protocol transcripts and the final short interviews were analyzed and discussed by the authors according to Braun and Clarke qualitative thematic analysis [9,10] deriving a set of Insights (Insight N) and Usability recommendations (UX N).

- **Insight 1: Adding co-authors to each story**. Users often mentioned they missed the possibility of adding co-authors to their stories. By doing so, the story would have one primary author and one or more additional co-authors linked to each contribution. The co-authors would have Writing and Reading access to the content.
- **Insight 2: Importance of the authors to be identified**. In the prototype map view, users can see the cover image of each story and how the

stories are connected (collections of stringed stories are called journeys). The users wanted to know the author's profile picture (besides the stories' cover picture) and eventually see how authors were linked through similar stories and journeys.
– **Insight 3: Redesigning the stories and journeys features**. Participants were interested in better understanding the story journeys, but found the journey of stringed stories confusing and asked to improve the clarity of the process.

Usability issues identified through the task-oriented think-aloud session:

– **UX 1**: Unexpected loss of progress while authoring a story.
– **UX 2**: Inaccessible language selection features.
– **UX 3**: Unclear mandatory inputs.
– **UX 4**: Floating buttons disappearing from the screens.
– **UX 5**: Hidden publish button
– **UX 6**: Unclear stories and journeys-related tasks.
– **UX 7**: Unclear process for journey creation.

4 Results - Customization of the storyelling application

Based on the feedback collected during the study, we improved the storytelling tool. We report the refinements in detail below.

4.1 Proposed new Features

User and Story graphs (Insight 1). To enhance users' sense of community and counteract alienation, the authors designed some specific features that allow for the co-authoring and sharing of stories, memories, and journeys. Two graphs were introduced - the "Users graph" and the "Stories graph". In the "Users graph", the logged-in user is the central node, with links connecting to other users. The graph also highlights the users' connectedness by showing the co-authors of each story. The co-authors are represented by their profile pictures and usernames. By clicking on links, the interface displays the co-authored stories. The "Stories graph" highlights the user's stories as nodes and shows larger nodes for the application's story tags. Clicking on the tags shows the stories related to them. The three most used tags by the logged-in user are expanded by default, and that user's stories are highlighted.

Authoring feature refinements (Insight 1 + UX 1, UX 3, UX 5). *Simplified authoring steps.* The authoring tool was simplified into four steps labeled according to the contextual actions performed by the author: media, text production, selecting authors, and story keywords.

Adding co-authors. The authoring process introduces the ability to add co-authors to a story and set up group activities to build collective memories and experiences.

Clarifying mandatory steps. Each mandatory data header was marked with an asterisk. The authors were reminded to fill in the mandatory field when progressing to the next steps of the story creation.

Losing progress while authoring. When clicking backward from the story page, a prompt asks the user to save the story as a draft to maintain progress in the new authoring process.

Stories and Journeys improved (Insight 2, Insight 3, UX 6, UX 7). "Stories Viewing" and "Journeys Viewing" were made accessible at all times through the hamburger menu's drawer list. The author's name and small-scale picture were added to the cover image and title of the story or journey. The story also features the location and date of creation.

Language selection accessibility (UX 2). The language selection button was moved to the log-in page and the global navigation drawer, making language selection possible at any time during the use of the app.

Application buttons improvement (UX 3). Floating buttons are shown according to the color palette of the interface and contain short action words to clarify their purpose.

Accessibility. The color palette was changed to be suitable for color-blind users, to improve accessibility.

4.2 Second Iteration of the Digital Storytelling Prototype

The second iteration of the prototype was developed as an Angular[14] front-end application, using Javascript language for programming logic, and a monolithic Spring Boot[15] for the back end. The back end connects to a PostgreSQL[16] database contained in a Docker[17] container. The front end uses Javascript libraries like Three.js[18] to render interactive 2D and 3D elements as canvas HTML elements. An extension of the 3D Force-Directed Graph component[19] was used to create interactive force-directed graphs of stories and authors (See Fig. 2) – nodes represent stories/authors, showing the cover image or the author profile image; edges connecting nodes represent an existing connection; clicking and dragging nodes forces the graph to be rearranged. The prototype app supports existing features from the first iteration (see section 3.2), like creating, viewing, and searching for stories, but adds more control features and options (see fig. 3).

[14] https://angular.io/
[15] https://spring.io/
[16] https://www.postgresql.org/
[17] https://www.docker.com/
[18] https://threejs.org/
[19] https://github.com/vasturiano/3d-force-graph

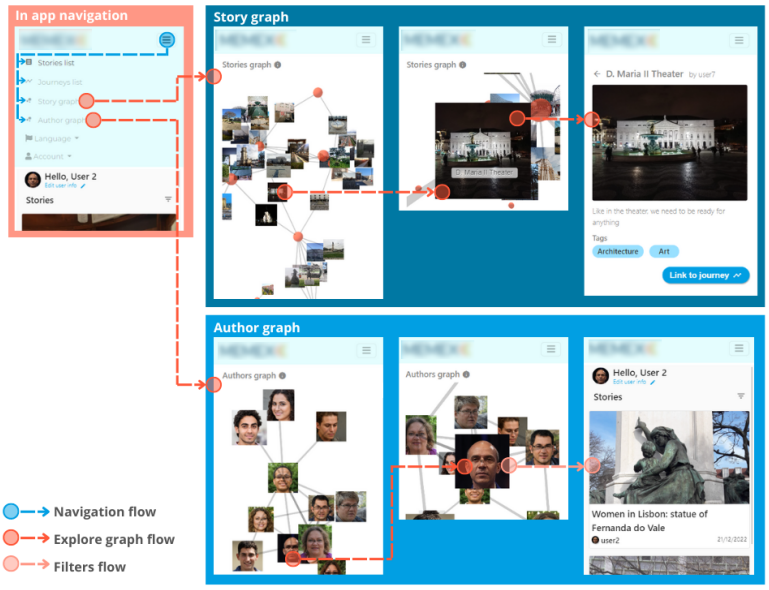

Fig. 2. Second Iteration of the Prototype App, showcasing story graph and author graphs features.

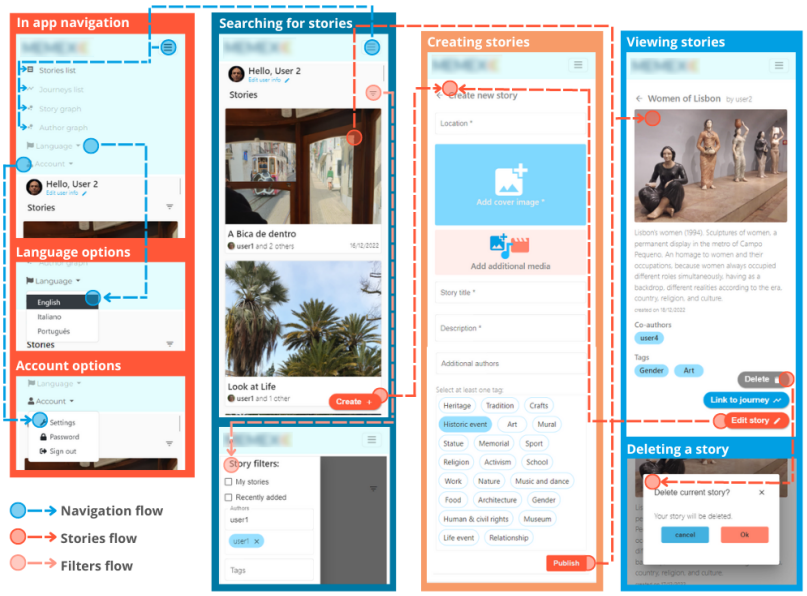

Fig. 3. Second Iteration of the Prototype App, showcasing features for searching, creating and viewing stories.

5 Evaluation of the refined storytelling tool

An evaluation of the redesigned prototype was conducted at *BRA*. The protocol was similar to the one described in section 3.4.2, but since participants were fluent in English and digital literates, they explored the app singularly, as per *BRA* suggestion. The tasks and questions were adapted to fit the refinements. As an icebreaker activity, participants were asked how they experienced their cultural identity in their new hosting country, followed by questions regarding their use of the prototype, which focused on the latest features introduced. *BRA* staff and participants were thanked for participating but not compensated, per *BRA* staff requirements.

5.1 Demographic data.

Four Sierra Leone participants aged 18 to 44 volunteered for the study. Three participants were graduate students, and one was a public social worker. Participants were fluent in Krio and English. They all assessed the prototype in English (despite it being available in Other languages). Three participants reported being comfortable using smartphones, while one reported having average experience.

5.2 Findings from the session

Besides an overall appreciation of the prototype, results from the second study foreground further insights and several Ux improvements. We report them below.

- **Insight 2.1: Improving the Graphs to Foster Social Capital**. Users suggested that more information, besides the node's name, could be displayed to improve the graph views. For the Stories graph, participants wished to see the author's name and the story's creation date. They also wanted to know the total number of stories created under each specific content tag. Regarding the author's graph, users wished to see their names, the total number of stories created by each author, and the date of the author's registration on the application. They also wished to know the number of co-authored stories created when connecting two Story graph nodes. Asking for more information about co-authors and their stories denotes a curiosity, if not a desire, to connect with others - this could be considered a starting point towards building a stronger social capital- a much-needed one for the refugee populations.
- **Insight 2.2: Pros and cons of Authors editorial control**. The first authors wanted to have the right to check and approve the co-author's edits before they became public. The co-authors should be able to submit change requests to the primary author, who can accept or discard the co-author's requests. These requests highlight a desire for an internal editorial process that can be harnessed to prevent system abuse. At the same time, this practice can become a form of censorship and cause friction among authors and

co-authors. Still, it is a checkpoint to ensure ownership of the story content, the correctness of the information, its language, and the identification of fake news.
- **Insight 2.3: Mutability of the refugee's context and status.** Participants wanted to be able to fill in and update their profile and cultural identity as many times as needed (not only once at the registration time as the current application allows). Participants voiced the importance of the mutability of their profiles reflecting their changing context and positionality. The cultural background and context of the users were highlighted as of significant importance.
- **Insight 2.4: Boosting creativity and desire to connect through thematic story prompts** . Our users suggested having daily, weekly, or monthly themed story prompts to bootstrap their creative process and stimulate the connection and co-authoring with other participants. A graph view of the prompts and how they connect with various stories could be an interesting additional feature.

- **UX 2.1: Storymaking interface and hidden buttons hyndrance**. The participants had trouble finding the buttons to add new content.
- **UX 2.2: Unclutter screens for authoring stories**. Participants lamented cluttered screens for the authoring interface. They proposed redesigned buttons to emphasize the main authoring actions further.
- **UX 2.3: Difficulties linking the stories/journey's elements**. The stringing of stories into journeys was complicated. The author, co-authors, and tag elements in the Story Details view should be simplified to ease navigation and facilitate content exploration.

5.3 Discussion of the Findings of the Second Digital Storytelling Prototype evaluation

Despite the limited number of participants, evaluating the second prototype unearthed potential and further amelioration of the storytelling tool, foregrounding the power of graph-oriented digital storytelling tools. The authors reflect on the insights by plugging in text from the theory [33,4,14] and connecting with cited related work.

- **Fighting tensions between integration and losing roots**: Losing roots and integration are notoriously in conflict in the migrant's minds [62], and Interactive Digital Storytelling systems can support bridging this tension. Recording and remembering their cultural milieu is necessary for the migrants present. Tools that help them safeguard, celebrate, and connect with their past while fully engaged in their present can alleviate the burden of displacement, particularly heavy for refugees who did not migrate voluntarily[43,48]. Throughout the second study, users voiced the importance of updating their ever-changing context and situation, making this way two statements: i) their lives are in continuous flux, ii) they would want this to be mirrored

in their profile in the storytelling tool. Users also expressed an interest in having more information about other users and their stories (date of issue of the story, the author's name, and when the author joined the application). This information matters to them and possibly helps them connect and empathize with other refugees. Digital storytelling tools enhanced with graph functions can support these needs and the visualization of complex hybrid identities.

- **Connection and kinship to combat alienation**: Besides the creative and personal expression facilitated by digital storytelling, a graph-enhanced interactive storytelling system can facilitate connecting to others. Sharing similar experiences can counteract the alienation generated by being plugged into a new culture, context, and society and contribute to mastering the despair that can originate from it. The authors of this paper hypothesized that the co-authoring features could bring displaced and local communities further together, help to integrate opinions and points of view, and contribute to the weaving of a tighter and more inclusive societal fabric. On the other hand, frictions could also arise, and contrasting points of view could emerge. The tool could also become where these differences are discussed and ironed out.
- **Collaborations to build social capital**: Graph-oriented digital storytelling tools can inspire and support collaboration across the story authoring tasks. Writing stories together by creating open versions of the shared stories and inviting collaborators to contribute is a way to strengthen existing bonds, connect, and meet new people through co-creation. Moreover, facilitating co-creation and co-authoring stories provides a reason to connect to others. In this way, they can rely on a more affluent social capital to be harnessed for support as they settle in a new culture and society.
- **Opportunities for blockchain and DLTs in storytelling**: Allowing marginalized communities and refugees to create and share life-related content in the form of stories opens up risks and requirements for privacy, security, and reliability about the content, putting their vulnerabilities at risk. However, existing crowd-sourced tools and storytelling platforms exist but are predominantly centralized and can be fed with unreliable and untrustworthy information[61]. Blockchain is an emerging disruptive technology with great potential to impact content creation in various fields [60,26], including digital storytelling for marginalized groups. Blockchain technologies are bound to improve collaboration, combat fake news, and improve safe sharing and personalized retrieval of content and media delivery among users of digital tools [56,25].

6 Discussion From Heuristics to Sensitising Concepts: Embracing the Diasporic Mindset

Designing and evaluating the storytelling tool was a departure point to scaffold reflections around the refugees' complex and displaced realities. The discussion

builds on the authors' considerations through designing, evaluating, and refining the storytelling tool (making) and the analysis and writing process as a generative knowledge production device [8]. All these activities were critical in deepening our users' understanding, hence the development of the arguments reported in this section. While thinking with theory, we consider the migrant and refugees' conditions through Tim Ingold's Meshwork theory, Ang's concept of Diasporic Mind, and Byrne's transnational and cross-border connectivity.

Our users' longing for collaboration and connection through Digital Storytelling foregrounded how memories and stories can be harnessed to fulfill refugees' need for connection and social capital. We turned to migrant and heritage studies to better understand the emotional condition of the migrants and connect this concept to their everyday lives. Similarly to HCI [32], migrant heritage studies have privileged certain discourses over others. Migration heritage has mainly focused on linear narratives of arrival and settlement over narratives of return, circulatory transnational flows, and cross-border connectivity [13]. The understanding that origin and destination places are simultaneously present in migrant lives [40] is well established in migration scholarship[4,13]. Co-authoring and collaborative features (the graph and story journeys) offer an example of how to engage with migrants' cross-border connectivity and diasporic mindset.

Moreover, heritage practice considers heritage a spatially discrete entity (a site) that is a container of past lives, privileging settlement over movement and relationality. To contrast this view, Byrne proposes to think through Ingold's [33] Meshwork theory. Ingold suggests envisioning lives as pathways shaped by the individual life's journeys. These paths are referred to as 'lifelines'. Lifelines intertwine and become entangled, creating a meshwork composed by an individual's movements through space. Where lifelines intersect and overlap with those made by others, knots manifest [33]. Similarly, reflecting on our storytelling tool, we foreground its potential to embody and support mobility and the relationality of the migrants' lives.

Finally, graph features could be combined with emerging digital technologies like blockchain. Combinations of storytelling with crowd-sourced news and journalism could exploit the inherent features of a blockchain, such as combining personal life stories and journeys with live news and documentary facts, offering trustful, anonymized, and immutable transactions, and guaranteeing transparency. Trustworthy content must be constantly updated and connected with the refugees' personal stories, combining distributed ledger technologies with secure time stamping to ensure online resources' history of creation, ownership, and referential integrity. Extending on [61], this kind of application has the potential to revolutionize the way news content is shared and commercially exploited.

In summary, from the results of this study, supporting the emotional labor of the diasporic mind emerges as a rich avenue for designing storytelling tools for migrants. This labour is intense and often neglected. As Ingold proposes, lives unfold 'not inside places but through, to and from them, from and to places elsewhere'[33] . We believe work can invite designers to capture the flow,

connectivity, and relationality capital of migrants beyond colonial nation-centric tropes [38].

7 Limitations & Future Work

The work is not exempt from several limitations.

- Lack of co-design process with the refugees. Ideally, this study would have been a participatory process alongside refugees to co-design an application closely matching their needs. However, due to COVID-19 restrictions, more frequent contact was impossible; we had to opt for the two-iteration user study as an alternative.
- Small sample of participants. The number of participants was limited. While the feedback provided was illustrative, the small sample can not represent the entirety of a diverse refugee population.
- Evaluation does not correspond to application use in real-world scenarios: The tasks designed for the testing touched on every feature in the application, but they did not correspond to how the application would be used on first contact and in the real setting.
- The project and the study are set and based on one country and association. Further studies are necessary to validate our preliminary findings.

Future work could involve associations and refugees from different countries and help refine the collaborative features. Technologies such as AI, Blockchain, and Mixed Realities could also evolve the tool.

8 Conclusion

In this article, we present the design and discuss the potential of a digital storytelling tool to support migrant refugee populations in their difficult journey toward integration into a new society. Providing the refugees the ability to share their stories and culture can enhance their social interaction and benefit their social inclusion in their host countries.

Acknowledgement. We want to acknowledge the Portuguese Agency for Refugees and the participants in this study. This work is funded by LARSyS (Project UIDB/50009/2020 and BIG ERAChair EU-funded project through Grant agreement ID: 952226 and the Blockchain.PT PRR Agenda PC644918095-00000033. In addition, Valentina Nisi, Paulo Bala and Nuno Jardim Nunes are funded by LARSyS (Project UIDB/50009/2020

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