Breakbeat Narratives: A Personalized, Conversational Interactive Storytelling System for Museum Education

Danielle Olson
CSAIL, Massachusetts Institute of Technology
Cambridge, MA 02139, USA
dolson@mit.edu

Nouran Soliman
CSAIL, Massachusetts Institute of Technology
Cambridge, MA 02139, USA
nouran@mit.edu

Angela Wang
Wellesley College
Wellesley, MA 02481, USA
awang14@wellesley.edu

Magdalena Price
Massachusetts Institute of Technology
Cambridge, MA 02139, USA
maprice@mit.edu

Rita Sahu
Massachusetts Institute of Technology
Cambridge, MA 02139, USA
ritasahu@mit.edu

D. Fox Harrell, Ph.D.
CSAIL, Massachusetts Institute of Technology
Cambridge, MA 02139, USA
fox.harrell@mit.edu

Abstract

We introduce a novel interactive narrative exhibit for educating the general public about Hip Hop culture and history developed as a collaboration led by the MIT Center for Advanced Virtuality and involving the Universal Hip Hop Museum, TunesMap Educational Foundation, internationally known Afrofuturist artists Black Kirby, and Microsoft. The exhibit's narrative system is personalized by categorizing users based on evaluating their input data light of a social psychology-based model based in musical identity theory. The system uses user input to determine which interactive narrative and customized music playlist to present to the user. The system has been deployed as the central interactive display within the [R]Evolution of Hip Hop for an exhibit of the Universal Hip Hop Museum. Future work will involve analysis of user feedback data from the thousands of local and international exhibit visitors to determine the impact of personalization on visitor engagement, satisfaction, and learning.

Author Keywords

Learning; museums; personalization; interactive narrative technologies; educational technology.

CSS Concepts

• **Information systems~Information retrieval**; *Users and interactive retrieval*; Personalization;

• **Applied computing~Education**; *Interactive learning environments*;

• **Applied computing~Arts and humanities**; *Media arts*

Introduction

The Universal Hip Hop Museum (UHHM) is the first of its kind to provide distinctive educational and entertainment experiences to preserve the history of local and global Hip Hop. Commonly known as a globally influential musical genre (with many subgenres) – it has more accurately been described by its progenitors and scholars alike as a "culture" involving five elements: MCing (conducting audiences/rapping), DJing, breakdancing, graffiti art, and knowledge (of self, community, history, etc.) [1]. Our system, exhibited publicly at a UHHM space located in the Bronx, is composed of a series of multimedia narratives featuring various thematic topics related to Hip Hop culture and history (e.g., the role of women in Hip Hop, globalization, and so on). These narratives are customized based on user input related to their musical preferences and Hip Hop lyrical preferences. In this paper, the system is explained and illustrated via screenshots and documentation images. We conclude with plans for further data collection to study the effect of user input based interactive customization approaches on developing compelling interactive narratives for museum education.

Prior Work

Immersive Digital Learning in Museums

Powerful interactive tools, from 2D displays with interactive audio, to extended reality media forms such as virtual reality (VR) and augmented reality (AR), have been introduced in formal and informal learning spaces, including museums, to create immersive educational experiences. Rather than simply focusing on designing exhibits that center on visitors learning new content in a passive way, instead museums worldwide have been shifting towards interactivity and play to engage visitors in science learning since the mid-1980s [2]. This emphasis on perception-based, hands-on learning [3] in museums builds upon seminal cognitive psychology work on how children acquire knowledge, including Piaget's "constructivism" [4] and Papert's "constructionism" [5], which center on learners consciously engaging with entities and artifacts to build new knowledge in a tangible way.

Previous work in the literature, such as [6] and [7], has defined key design principles for designing effective educational interactive experiences. These principles seek to ensure that the experience motivates users to continue exploring the system by providing a compelling narrative and a series of interesting problems for them to solve by allowing the learner to make interesting and personal choices in the game that have consequences in the play. The effectiveness of interactive educational experiences in museums has been proven by studies showing that visitors found the value in aspects of the AR experience which were educational (observed through visitors' use of cognitive words), engaging and entertaining (observed through visitors' affective attitudes), revealing that they "both value the way that AR helps them gain knowledge and how it makes them feel" [8].

Social Identity Modeling in Education
Social identity modeling in interactive experiences has proven to significantly improve user engagement and learning in domains such as education [9], conversational narratives [10, 12], critical self-reflection [11], etc. In [10], a cognitive science-grounded model of social category membership is used to virtually model social identities in order to drive conversational interactions, available user actions, and story progression in an interactive narrative designed to convey social identity phenomena such as stigma and discrimination.

Interactive narratives and roleplay can effectively support self-reflection as in [11], which is an experience designed as interactive narratives that scaffold and enable critical self-reflection on issues of sexism in the workplace via personalized roleplay [13], where personalization is a principle concerned with the degree to which particularized content is drawn from the participants themselves. By doing so, user engagement of the interactive narrative is improved and, thereby, the reflective impact of Chimeria:Grayscale on users.

User experience and interactions are impacted by identity representation. In [12], a computational model of racial and ethnic socialization (RES) for embodied identity representation facilitates compelling interactive narratives for diverse users. This study suggests a significant relationship between players' RES, their in-game behaviors, and their narrative interpretations, which implicates the significance of virtual identity modelling in improving user learning and engagement.

Motivation and Goals
Our goal was to develop a personalization-based approach to Hip Hop history and education for a museum exhibition setting by building an interactive conversational experience. This system design detailed below is based on the aims of the MIT Center for Advanced Virtuality's NOIR Initiative[1], an endeavor seeking to use AI technologies to forward the art forms of diverse global cultures, and requirements elicited from the UHHM leadership to create an exhibit which (1) educates the public about Hip Hop history and culture from the 1970s through the present day, (2) is interactive and built using cutting-edge technology, and (3) is accessible to visitors from diverse groups.

System Design and Implementation
This section introduces the central aspects of *The [R]Evolution of Hip Hop Breakbeat Narrative Experience* exhibit, a web application for kiosk deployment that is the centerpiece interactive installation for the UHHM [R]Evolution of Hip Hop Exhibit in the Bronx, New York [14]. The *Breakbeat Narratives* provide exhibit visitors with an immersive journey through Hip Hop history and culture, from the 1970s to the present. By collecting and processing information about visitors' music and lyrical preferences, the system enables a customized educational experience by presenting audio and multimedia content curated to fit their specific interests.

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[1] *Breakbeat Narratives* was directed by Professor D. Fox Harrell and managed Danielle Olson and Rita Sahu. The co-authors all contributed to the project's research and development.

SOCIAL IMPACT NARRATIVES
▪ Beyond the Stereotypes: Violence: Hip Hop has both emblematized and challenged violence.
▪ Drugs: Truth-telling, Pain, and Excess: Hip Hop artists have scrutinized the social and political issues involved in substance use disorders and mental illness.
▪ Self-Representation of Women: There is complex, diverse self-representation/gender expression by women.
▪ What Moves A Crowd: Sociopolitical factors influence the aspects of Hip Hop garnering commercial success.
LOCATION NARRATIVES
▪ Internet Streaming, Social Media, and Hip Hop: Hip Hop is an influential global phenomenon.
▪ From the Bronx to Across the U.S.: Hip Hop spread from the Bronx to its popularity to many regions of the U.S.
▪ Global Influence of Hip Hop: Hip Hop has both inspired and been appropriated by artists and consumers.
FASHION NARRATIVES
▪ Hip Hop, Punk Rock, Rock and Roll: There are cross-influences between Hip Hop, punk rock, and rock and roll.
▪ From the Streets to Fashion Week: Hip Hop fashion is influential across class spectra.
▪ Brand Marketing Through Hip Hop: Hip Hop culture has influenced global marketing and its impact on pop culture.
▪ Evolution of Bling: Prominent expensive material items displays in Hip Hop intersect with issues of wealth.

Table 1: Themes, titles and descriptions of each of the 11 Breakbeat Narrative stories.

Narrative Content and Playlists
The Breakbeat Narratives consists of 11 distinct multi-media-driven stories that educate users about Hip Hop history and culture from the 1970s through the present day. These narratives have been constructed according to a schema focused on providing multiple stakeholder perspectives on historical topics rather than a singular, authoritative narrative. These stories fall under three different thematic lenses: *social impacts, location*, and fashion, which are further described in Table 1. Each narrative experience features media assets (e.g., historical photographs, artwork, etc.), interlude cards (i.e., digital text), and a customized audio experience which plays while the narrative progresses. The

TunesMap platform [15] was used to organize the 11 narratives which were visualized with a custom web application. Fifty-five unique playlists were curated by our team in consultation with UHHM expert curators for the 11 narratives which are played to visitors while viewing the narrative using the Spotify API [16]. These playlists feature songs which were curated based on the specific narrative subject matter, spanning iconic artists and songs from the 1970s through the present day. Following the user's completion of the narrative experience, they are presented with a QR code which they are prompted to scan with their mobile device to enable a more in-depth listening following the visit to the exhibit

Label	Description
Mellow	Smooth and relaxing styles.
Dance able	Rhythmic and percussive music, such as is found in rap, funk, and acid jazz.
Artsy	Classical (from diverse world cultures), operatic, and jazz.
Intense	Defined by loud, forceful, and energetic music.
Rootsy	Comprises a variety of different styles of direct, and rootsy music such as is often found in country and singer-songwriter genres.

Table 2: Labels and descriptions from Rentfrow et al.'s five-factor structure [19].

and social sharing of the playlist via the user's social media accounts (e.g., Twitter, Facebook).

Upon app launch, the user is presented with a chatbot interface guided by "The Elementals," five characters based in traditions of speculative fiction of the African diaspora (often called "Afrofuturism") that were designed and developed through an artistic collaboration between artists/Professors Stacey Robinson and John Jennings (known together as Black Kirby) and Professor D. Fox Harrell. These characters represent the five elements of Hip Hop: MC, DJ, Breakdance, Graffiti Art, and Knowledge [17]. Via chat, The Elementals prompt the user to provide input regarding their preferences regarding musical genres and lyrics from Hip Hop songs. This input determines which of the 11 narratives and 55 custom audio playlists will be presented to the user. For instance, if our user modeling revealed a "rootsy" musical preference and in interest in social issues they would receive a narrative with a soundtrack of 5 songs all featuring both that style and theme (e.g., songs featuring rural/country guitar samples that also critically address stereotypes). The next section describes the chatbot-driven personalization protocol.

Chatbot interface
Rather than using a traditional digital survey interface to enable customization, the Microsoft Bot Framework [18] was used to implement conversation-driven survey experience guided by The Elemental characters, as shown in Figure 1. The first survey elicits users' underlying musical preferences as a way to provide audio

playlist customization during the narrative experience. The second survey is used to determine the user's Hip Hop lyrical preferences, which serves as a proxy to determine their interest level in one of three themes related to Hip Hop history and culture (social impacts, location, and fashion).
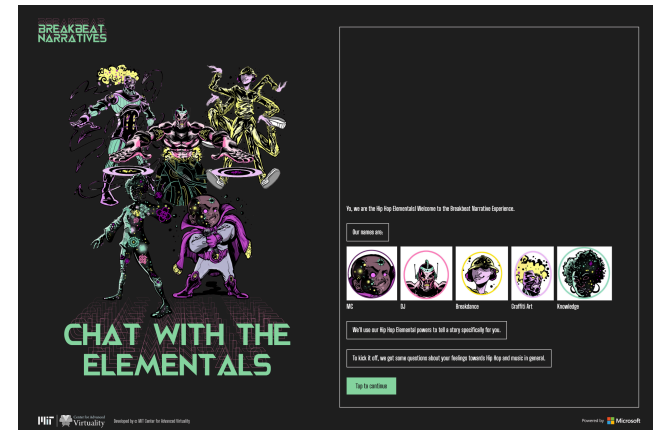

Figure 1: The Breakbeat Narratives chatbot interface.

System Personalization
The musical preferences survey was informed by an empirically-based latent five-factor, genre-free music preferences structure based on users' affective responses to music [19]. The labels[2] describing the styles and characteristics of musical preferences are presented in Table 2, with the label column indicating the adjective used within our application to refer to these styles (which are displayed to the end user). These descriptions were used to subjectively guide the curation

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[2] The labels "Danceable," "Artsy," and "Rootsy" are modified from Rentfrow et al.'s original labels "Urban," "Sophisticated," and "Campestral," respectively to avoid implied cultural elitism.

Figures 2 and 3: A [R]Evolution of Hip Hop Exhibit visitor interacts with the Breakbeat Narrative exhibit on a Surface Hub display; another visitor shows their custom playlist on their mobile device after scanning the QR code presented in the chatbot interface at the end of the experience.

process of five playlists (corresponding to each of the five labels) for each of the 11 narrative topics (resulting in 55 total playlists). The Hip Hop lyrical preferences survey prompts users to select which lyrics they prefer between five pairs of Hip Hop songs. The songs and lyrics used were curated subjectively using the descriptions of the three overall Breakbeat Narrative themes. The narrative cluster presented to the user is chosen at random from the theme in which they are determined to have the most interest. Using the musical preferences category the user is placed in (*Mellow, Danceable, Artsy, Intense,* or *Rootsy*) and the specific narrative they are assigned based on the result of their lyrical preferences survey (one of 11 narratives related to *Fashion, Social Impacts,* or *Location*), the user is presented with a customized narrative and playlist experience following their completion of the surveys.

Deployment

The Breakbeat Narrative experience was publicly launched as the central interactive display at the [R]Evolution of Hip Hop Exhibit in New York's Bronx Terminal Market in December 2019. The exhibit, which is free to the public, attracted over 3500 RSVPs within the first 10 days of its launch, with visitors of all ages traveling from Australia, London, France, Sweden, Brazil, China, Japan and Israel. The interactive display is situated within a physical exhibit space with signage that has been designed using the same aesthetic as the application itself. Exhibit visitors can interact with the

Breakbeat Narrative experience using two touch-enabled Microsoft Surface Hub displays and headphones, with museum docents available on the floor to help guide users through the experience as needed, as shown in Figures 2 and 3.

Conclusion and Future Work

Based on initial feedback collected from visitors to the exhibit directly, via social media[3], and feedback from museum leadership[4], the Breakbeat Narrative experience has been very well-received by the public and coverage by the popular press (television, news, etc.). The next phase of deployment will involve deploying an AB test with two variants of the experience: one which is chosen at random and one that takes into account user input. Feedback collected from users following the experience will be used to determine what impact, if any, personalization using our novel identity model has on visitor engagement, satisfaction, and learning.

Acknowledgements and Credits

We acknowledge the support of our collaborators, the UHHM and Microsoft, and thank the following people for their insightful collaboration: Rocky Bucano, Ed Young, and the UHHM staff, John Jennings and Stacy Robinson, Ryan Gaspar of Microsoft and his collaborators and affiliates, and Omoruyi Atekha (MIT UROP).

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[3] A video taken by a visitor shared via social media of the exhibit in January 2020 was captioned with the text "This thing got me!"

[4] Feedback received from the Executive Director of the UHHM stated: "For 8 years, my team and I have been sharing the vision of not your average museum, but a museum that infuses new technology with classic artifacts, to engage, inform and inspire future visitors in unexpected ways, has been our #1 objective. We have delivered on this critical objective, with the [R]Evolution Of Hip Hop at the Bronx Terminal Market. Our collaboration with Microsoft and the MIT Center For Advanced Virtuality has made the vision a reality. … It is no longer an ambitious dream, it is real."

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