

Computationally Modeling Narratives of Social Group Membership with the Chimeria System*

D. Fox Harrell, Dominic Kao, and Chong-U Lim

Computer Science and Artificial Intelligence Laboratory (CSAIL)
Massachusetts Institute of Technology
Cambridge, MA, USA
{fox.harrell,dkao,culim}@mit.edu

Abstract

Narratives are often used to form, convey, and reinforce memberships in social groups. Our system, called *Chimeria*, implements a model of social group membership. Here, we report upon the Chimeria Social Narrative Interface (*Chimeria-SN*), a component of the *Chimeria* system, that conveys this model to users through narrative. This component is grounded in a sociolinguistics model of conversational narrative, with some adaptations and extensions in order for it to be applied to an interactive social networking domain. One eventual goal of this work is to be able to extrapolate social group membership by analyzing narratives in social networks; this paper deals with the inverse of that problem, namely, synthesizing narratives from a model of social group membership dynamics.

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1 Introduction

Everyone belongs to social groups based on factors such as musical preference, fashion, gender, or race. Narratives are often used to form, convey, and reinforce memberships in such social groups. Furthermore, a robust model of group membership can be an important aspect for modeling many everyday forms of narrative. Additionally, when taking a cognitive science approach to computationally modeling narrative, it is important to attend not only to canonical forms of narrative, such as produced in literature, but also to everyday forms of narrative exchanged in social groups such as narratives of personal experience and life stories. Such everyday forms of narrative are common objects of study in the field of sociolinguistics [10, 15, 12]. Here, we augment such research with insights from cognitive linguistics, computer science, and sociology of classification.

In this paper, we discuss the *Chimeria Social Narrative Interface (Chimeria-SN)*, a narrative generation component of a larger system called *Chimeria*. *Chimeria* implements dynamic computational models of social group membership and narratives associated with group membership. Similar to other research using virtual environments and games to empirically study social phenomena, such as the game *Prom Week*, *The Restaurant Game*,

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and experiments of the Virtual Human Interaction lab (VHL) [13, 14, 1], our aim is to provide a testbed for studying aspects of social and computational identity. Toward this end, we have constructed a computational environment in which narratives of social group membership can be simulated and analyzed for both social scientific understanding and creative expression. The underlying model, grounded in cognitive science accounts of categorization, is capable of representing issues such as naturalization (becoming a category member over time), marginalization (becoming a boundary category member), and passing (being a member of one category, but appearing to be a member of another). Broadly, *Chimeria* serves our aims of both evoking narrative experiences of social group membership and enabling the creation of such experiences by anyone.

2 Theoretical Framework

Chimeria was developed as a part of an ongoing research endeavor called the Advanced Identity Representation (AIR) Project. The AIR Project seeks to develop new models of social identity in computational media to be deployed in technologies like interactive narratives, videogames, and social networks. Social identity can be conveyed through “digital identities” [2] using avatars, social networking profile posts, images, and so on. However, digital identities are limited technically in their expressivity and seldom explicitly mitigate against or model identity-related social ills (e.g., prejudices, stereotypes, etc.) [3, 5, 8], a topic addressed by the AIR Project. Below, we describe relevant research that undergirds the *Chimeria* system.

In [5], it is argued that in many forms of everyday communication, narrative provides a deep and satisfying sense of involvement. Sociolinguist William Labov [10], conducted empirical studies of narratives of personal experience, which can be formally represented as in [4]. Sociolinguist Charlotte Linde built on this work to relate narrative to social identity with “life stories” [12]. Since many everyday forms of narrative are now externalized through social media, we take a data-driven approach utilizing social networking profiles as a site where narratives of personal experience and life stories are performed. Social networking profiles are important sites for both generating expressive narrative content, and for the analysis of social categorization phenomena. *Chimeria* relates a formalization of a sociolinguistics model of narrative to social identity, implemented as a succession of posts on social networking profiles that collectively convey personal experiences related to social group membership.

Chimeria’s generated narrative, implemented in *Chimeria-SN*, is based upon sociolinguist Livia Polanyi’s model of narratives in conversational storytelling. In particular, we model what Polanyi defines as “story sequences” [15], in which multiple members in the conversation contribute individual stories towards the construction of a single, overarching narrative. Polanyi identifies two types of constraints in such conversational narratives: 1) linguistic constraints, which outline narrative structure using a past time storyworld with main line event clauses and contextualizing state clauses and 2) contextual constraints, which focus on making the narrative relevant, coherent, and accessible to recipients (recipient-design). In *Chimeria*, we used these constraints to inform construction of the model implemented in our narrative generation system, adapted to fit the context of a social network.

As a data-driven application of our model of group membership, we use *musical identity* (e.g., being a fan of a certain genre) as a test case. The music that people listen to is a vehicle for conveying “Music In Identities (MII)”, wherein music is viewed as a “means for developing other aspects of our personal identities, including gender identity; youth identity; national identity; and disability and identity” [6]. Our test case narrates changes of social group membership related to musical identity as expressed via preferences in a social network.

3 Implementation

Chimeria dynamically models group membership and marginalization, and presents narratives generated from that model in a novel social networking interface. It consists of two components: (1) the *Chimeria Engine*: a dynamic algorithmic model of users’ degrees of membership in multiple groups, and (2) the *Chimeria Social Narrative Interface (Chimeria-SN)*: a narrative social networking interface for expressing experiences of membership and marginalization in social groups as represented using social media.

The *Chimeria Engine* models users’ category memberships as gradient values in relation to the membership values of more central members, enabling more representational nuance than binary statuses of member/nonmember [3, 9, 11]. These are calculated from music artist “likes” (binary indications of positive valuation) on the user’s Facebook profile, from which we extrapolate artists’ moods (e.g., cheerful, gloomy, etc.), themes (e.g., adventure, rebellion, etc.), and styles (e.g., film score), which are used to express the identity of the user.

Chimeria-SN is a streamlined, aestheticized social networking interface, consisting of a dynamic collage of photos representing the user’s musical taste preferences (Fig. 1), and a feed of posts that appear in an adjacent vertical timeline (Fig. 2). *Chimeria-SN* generates narratives in a simulated social networking environment that incorporates aspects of a user’s real-world identity collected from a user’s Facebook profile (e.g., real name, pictures, wall-posts) using the Facebook Graph API. The system reacts to the user by generating interaction posts from computer-controlled users who make up the user’s simulated social circle.

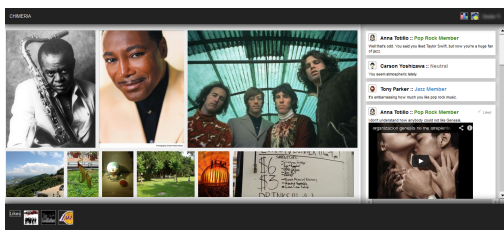


Figure 1 A Screenshot of Chimeria-SN.

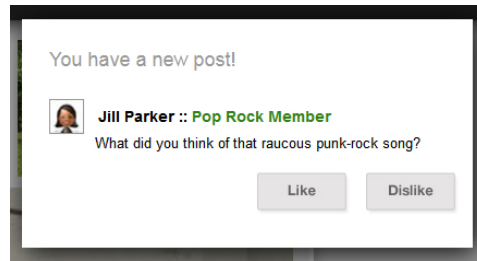


Figure 2 A Sample Chimeria-SN Wall Post.

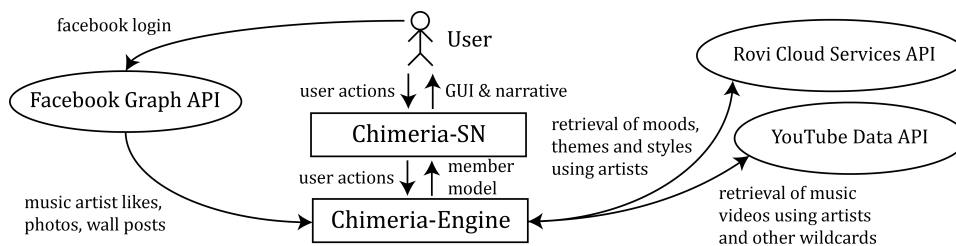


Figure 3 The Chimeria System Architecture.

Fig. 3 gives a system overview and outlines the process by which *Chimeria-Engine* retrieves moods, themes and styles associated with music artists and genres. *Chimeria-Engine* first uses the user’s music artist “likes” to find their preferred (e.g., Pop/Rock), and oppositional (imitation category, e.g., Jazz) genres. The user’s initial genre group membership is calculated using the overlap of common moods and themes between the user’s music artist

“likes” and the genre’s. User actions (such as liking a post from a particular genre) causes the *Chimeria-Engine* to modify membership dependent on the intensity of the action.

3.1 Sample Narrative

The story in Figure 4 below was generated for a user that has the following Facebook music likes: *Ke\$ha*, *Taylor Swift*, and *Justin Bieber*. The “Author Legend” represents the group membership of post authors, while the “Wildcard Legend” indicates dynamic insertions by *Chimeria-SN*. Each post appears on the user’s wall in a manner similar to that shown in Figure 2.

Author Legend: N (Neutral Author), P (Pop/Rock Member Author), J (Jazz Member Author)

Wildcard Legend: ■ (Artist Wildcard), ■ (Genre Wildcard), ■ (Mood or Theme Wildcard)

Post: Good to see you on Chimeria! You’ll be prompted with a series of posts like this one. Your actions in subsequent posts will determine the course of the story. Good luck, and have fun! (N, Story Entrance)

Post: Check out this **Wayne Shorter** music video.† (J, Sub-Story Entrance), Post: **Wayne Shorter** is wonderfully **amiable**. ;) (J, Contextualizing State), Post: Please tell me you enjoyed that **Wayne Shorter** song.* (Liked) (J, Main Line Event), Post: So you’re a closet **jazz** lover. (P, Sub-Story Exit)

Post: **Eric Clapton** always makes my day better! (P, Sub-Story Entrance), Post: **Eric Clapton** makes great **passionate** music! (P, Contextualizing State), Post: I don’t understand how anybody could not like **Eric Clapton**.*† (Disliked) (P, Main Line Event), Post: Way to back down on your **pop rock** roots. (P, Sub-Story Exit), Post: You seem **meandering** lately. (N, Sub-Story Exit)

Post: You know who’s great? **Keith Jarrett**. (J, Sub-Story Entrance), Post: **Keith Jarrett** is too **brooding** for my taste. (P, Contextualizing State), Post: Here’s a YouTube recommendation from yours truly.*† (Liked) (J, Main Line Event), Post: I never pegged you for a **jazz** nut. (P, Sub-Story Exit)

Post: I feel like listening to **Van Halen**. (P, Sub-Story Entrance), Post: **Van Halen** is so awfully **energetic**. (J, Contextualizing State), Post: Found this while surfing YouTube, it’s awesome :) *† (Disliked) (P, Main Line Event), Post: You said you were into **pop rock** you poser. (P, Sub-Story Exit), Post: You seem **atmospheric** lately. (N, Sub-Story Exit)

Post: Well that’s odd. You said you liked **Ke\$ha**, but now you’re a huge fan of **jazz**. (N, Story Exit)

* Dialog box with two buttons for the user to “Like” or “Dislike” this post

† Dialog box containing an embedded YouTube video (always a music video of the topic artist)

■ **Figure 4** Chimeria Sample Narrative.

Narrative generation uses a narrative structure specified by a simplified finite state machine, called the Linear Event Structure Machine (or probabilistic bounded transition machine) [5, 7]. Narrative structures are instantiated by a database of narrative templates (content-clauses), each filled in with artist, genre, theme, mood, and style content describing musical items from the Rovi Cloud Services API. An example clause template is:

```
<main-line-event-clause>
  <id>102</id>
  <author>original</author>
  <category-membership-test>any</category-membership-test>
  <naturalization-trajectory-test>any</naturalization-trajectory-test>
  <content>What did you think of that *mO *gO song?</content>
  <intensity>10</intensity>
</main-line-event-clause>
```

The ‘id’ uniquely identifies the content, and ‘author’ indicates the originating category. The ‘category-membership-test’ specifies the current degree of gradient membership within a social group the content-clause narrates (e.g., central, peripheral, or non-membership). The ‘naturalization-trajectory-test’ specifies trajectories of social group membership across all groups the content-clause narrates. The ‘content’ is the exact text of the post to be displayed, including wildcard (indicated by a “*” prefix) replacements using element types of artist, genre, theme, mood, or styles from the Rovi Cloud Services API. “O”, “U”, or “P” in

wildcards references a user’s original social group, current profile, or imitation social group (internally referred to as a Passing social group) respectively.

Furthermore, topics are initiated by sub-story entrance clauses (as seen in the sample narrative in Fig. 4), which can then later be referenced using the *topic wildcard. Since topics themselves can be wildcards (e.g., *aP for a music artist from the imitation social group) any contextual information about them is retrieved at run-time (using wildcards such as *topic-m and *topic-video to find moods and YouTube music videos respectively).

4 Discussion

Building upon Polanyi’s work, with *Chimeria-SN* we have developed a model of interactive conversational narrative. Some adaptations were necessary in order for the model to be computationally implementable and so that it could be used in an interactive framework. Table 1 contains a comparative summary between *Chimeria*’s narrative model and Polanyi’s. *Chimeria*’s grounded narrative model extends Polanyi’s model by involving the user in an ongoing social network narrative adapted to user taste, which necessarily substitutes virtual affordances for physical ones.

■ **Table 1** Comparison between *Chimeria* & Polanyi’s models of Conversational Narrative.

Component	Parallels Polanyi’s Model	Diverges from Polanyi’s Model
Linguistic constraints	Event propositions occur at unique discrete moments. Structured using main line event clauses, contextualizing state clauses and evaluative meta-information. Stories have a “point” (e.g., tale of imitation).	User responses to posts directly affect a dynamic narrative (a narrative referring to both the past and present time in the storyworld). In other words, the user has agency regarding story trajectory.
Contextual constraints	Story is relevant and recipient-designed for the user based on expression of musical taste. Stories consist of entrance and exit clauses for overall coherence.	Story recipients acknowledge tellings through posts on the <i>Chimeria-SN</i> wall rather than physically.
Story Sequence & Sub-stories	Sub-stories are individual, self-contained stories from multiple storytellers (but one primary narrator for each sub-story), which collectively form a story sequence. Evaluation is internal to the storyworld clauses.	Occurs in virtual and simulated social network (e.g., affordances available in wall posts like emotes, punctuation, videos etc.) instead of in physical space (e.g., body language, tonality, etc.) which includes a larger set of story recipients in general.

Chimeria-SN’s narrative model is grounded in Polanyi’s results. This means that we must strive for a high degree of fidelity between our implementation and Polanyi’s empirical results, with only necessary adaptations driven by the differences between real-world conversation and our social networking domain. Furthermore, our model should continuously be reconciled with the latest empirical sociolinguistics results on conversational narrative in social networks.

5 Concluding Reflections

Social group memberships are important aspects of societies. Stories of social group membership are important for constituting our social fabrics. As stated above, robust model of social group membership can be an important aspect for modeling everyday forms of narrative. Reciprocally, narrative generation can be an effective means of conveying a dynamic model of social group membership for both research and applications such as interactive narratives and videogames. *Chimeria* implements dynamic computational models of social group membership and conversational narratives, and we hope that it provides a useful testbed

in which narratives of social group membership can be both simulated and analyzed. An advantage of our approach is that in future work, we believe that social group memberships of users could be extrapolated from analyzing narratives in social networks, the inverse of our current aim of synthesizing narratives from a model of social group membership dynamics. Our longer term hope is that, by computationally modeling issues such as naturalization, marginalization, and passing, we can contribute to scientific approaches to issues of social empowerment and diversity most often served by research in the humanities, arts, and social sciences.

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References

- 1 Jeremy N. Bailenson. Doppelgänger: A new form of self. *The Psychologist*, 25(1):36–38, 2012.
- 2 Nick Bostrom and Anders Sandberg. The future of identity, (2011) report commissioned by the united kingdom’s government office for science, 2011.
- 3 Geoffrey C. Bowker and Susan Leigh Star. Sorting things out: Classification and its consequences. *Inside Technology*, 1999.
- 4 Joseph Goguen. Notes on narrative. <http://charlotte.ucsd.edu/~goguen/courses/275f00/narr.html>, 2001.
- 5 Joseph A. Goguen and D. Fox Harrell. Style: A computational and conceptual blending-based approach. In Shlomo Argamon, Kevin Burns, and Shlomo Dubnov, editors, *The Structure of Style, Algorithmic Approaches to Understanding Manner and Meaning*, pages 291–316. Springer, 2010.
- 6 David J. Hargreaves, Dorothy Miell, and Raymond A. R. MacDonald. What are musical identities, and why are they important. In Raymond A. R. MacDonald, David J. Hargreaves, and Dorothy Miell, editors, *Musical identities*, pages 1–20. Oxford University Press, 2002.
- 7 D. Fox Harrell. Walking blues changes undersea: Imaginative narrative in interactive poetry generation with the griot system. In Hugo Liu and Rada Mihalcea, editors, *Computational Aesthetics: Artificial Intelligence Approaches to Beauty and Happiness*, number WS-06-04 in AAAI Technical Reports, pages 61–69, 2006.
- 8 D. Fox Harrell. Designing empowering and critical identities in social computing and gaming. *CoDesign: International Journal of CoCreation in Design and the Arts*, 6(4):187–206, 2010.
- 9 D. Fox Harrell. Toward a theory of critical computing. *CTheory, Code Drift: Essays in Critical Digital Studies*, cds006, 2010.
- 10 William Labov. *Sociolinguistic patterns*, volume 4. Philadelphia: University of Pennsylvania Press, 1972.
- 11 George Lakoff. *Women, fire, and dangerous things: What categories reveal about the mind*. Cambridge University Press, 1990.
- 12 Charlotte Linde. *Life stories*. Oxford University Press, 1993.
- 13 Josh McCoy, Mike Treanor, Ben Samuel, Brandon Tearse, Michael Mateas, and Noah Wardrip-Fruin. Authoring game-based interactive narrative using social games and *Comme il Faut*. Presented at the 4th International Conference & Festival of the Electronic Literature Organization, 2010.
- 14 Jeff Orkin and Deb Roy. The restaurant game: Learning social behavior and language from thousands of players online. *Journal of Game Development*, 3:39–60, 2007.
- 15 Livia Polanyi. *Telling the American story: A structural and cultural analysis of conversational storytelling*. MIT Press, 1989.