Modeling Racial and Ethnic Socialization for Interactive Storytelling

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Abstract

This research examined the effectiveness of the use of an embedded computational model of racial and ethnic socialization (RES) for virtual identity representation in an interactive virtual reality (VR) narrative games. This paper reports on a novel VR system called *Passage Home VR* and a user study conducted with the system. The findings of the study suggest a significant relationship between players' RES, their in-game behaviors, and their narrative interpretations. These findings provide a more nuanced understanding of these outcomes than simply considering players' race, ethnicity, or gender categories alone. The results have practical implications for the design of videogames aiming to support players from diverse racial and ethnic backgrounds.

Keywords

gesture, human-computer interaction, interactive narrative, racial discrimination, racial socialization, reflection, roleplay, social identity, virtual reality

1 Introduction

Since the landmark "rubber hand illusion" experiment which used a mirror technique to induce the "transfer" of the subject's consciousness into the avatar [Slater *et al.*, 2010], the application of immersive VR technology for fostering emotional engagement, shifting user perspectives, and developing empathy for others using techniques for body transfer has been in vogue during the last decade. However, existing VR empathy applications commonly use shallow models of identity representations that only afford appearance-based customization to users. This approach loses out on the opportunity to leverage the unique affordances of VR technology for embodied interaction and transformational experiences. Using VR to simply take on the graphical body of someone from a different social identity background limits the potential of this medium for enabling players to more meaningfully understand others' experiences, such as systematic experience related to race and ethnicity. The development of critical embodied identity representations must be grounded in a nuanced sociocultural understanding of how identity shapes the lived experiences of individuals.

Towards these endeavors, the critical design and implementation of *embodied identity representations* – that is, computational representations of social identities in the first, second, and third person within immersive VR experiences – is central to the quality of these experiences and their potential for positive social change.

This paper presents a computational model of racial and ethnic socialization (RES) for embodied identity representation to facilitate compelling interactive narrative storytelling, demonstrated with a software prototype implementing this model entitled *Passage Home VR*. This paper also presents the results of a user study evaluating the effectiveness of the model for engaging interactive narrative storytelling with users of diverse backgrounds.

1.1 Motivation

Videogames and VR are important media forms that are, respectively, pervasive and increasing in popularity. As such, it is important to consider the state of identity representations such as characters and avatars within them and whether they serve the needs and values of diverse users. Race and ethnicity impact many experiences in the physical world, most of which are seldom algorithmically modeled in virtual worlds. Even when race and ethnicity are taken into account for the design and implementation of characters and avatars, they are often only thought of as graphical customizations (e.g., skin color). This approach to the virtual representation of race and ethnicity lacks the depth necessary to meaningfully engage players from a wide range of identity backgrounds in transformational virtual storytelling experiences. This research applies a theoretical framework informed by sociology, cognitive science, artificial intelligence and human-computer interaction for the critical development of embodied racial and ethnic identity representations.

1.2 Race and Ethnicity Representation in Games

Everett and Watkins [2008] refer to the ways in which games heavily rely upon racist discourses, attitudes, and assumptions which are dominant in popular and mainstream culture within interactive games as *racialized pedagogical zones* (RPZs). They elucidate the ways that "video games teach not only entrenched ideologies of race and racism, but also how gameplay's pleasure principles of mastery, winning, and skills development are often inextricably tied to and defined by familiar racial and ethnic stereotypes" [Everett and Watkins, 2008]. If left unaddressed, these troubling representations will propagate the social and psychological consequences of lack of meaningful identification as

videogames become more ubiquitous across the sites where we live, work, and play.

VR has become a very popular medium for developing serious and impact games due to its unique perceptual experiences which offer feelings of presence and immersed first-person perspectives. However, as mentioned above, existing VR-based empathy applications commonly use shallow models of identity representations which only afford appearance-based customization to users. This approach loses out on the opportunity to leverage the unique affordances of VR technology for embodied interaction. Using VR to simply take on the body of someone of a different social identity background limits the potential of this medium for enabling players to more meaningfully understand and develop empathy for others' experiences.

The lack of sufficient technical and cultural resources supporting the design and implementation of these racial and ethnic identity representations in videogames often leads to *prototype effects*, or "deviation or adherence to ideals [defining] perceived centrality to categories," [Harrell, 2010] a concept grounded in the prototype theory of psychologist Eleanor Rosch. Rather developing characters/avatars based on prototype-based groups, the development of critical embodied identity representations must be grounded in a nuanced sociocultural understanding of how identity shapes the lived experiences of individuals. These issues motivate the research questions investigated here.

1.3 Racial and Ethnic Socialization

In contrast to traditional approaches to racial and ethnic identity representation in videogames which may rely on inherently flawed classification systems, the technology presented in this paper implements a computational model of racial and ethnic socialization (RES). RES refers to the "mechanisms through which parents [and other relevant caregivers] transmit information, values, and perspectives about ethnicity and race to their children" [Hughes *et al.*, 2006]. Scholars have demonstrated through studies of African American, Latinx, Asian, white, multiracial, and cross-racially adopted youth that significant outcomes including self-esteem, academic motivation and achievement, coping strategies, and other behaviors are heavily influenced by racial identity development and socialization experiences [Utsey *et al.*, 2000]. The following major RES themes emerged from Hughes et al.'s extensive empirical research study [2006] on prominent literature focused on racial and ethnic socialization from the fields of psychology, sociology, and related fields between 1975 and 2005:

- *Cultural socialization:* a proactive RES strategy teaching children about their racial history, legacy, and heritage, and to be proud of their culture.
- *Colorblindness:* an adaptive RES strategy which seeks to promote racial equality by avoiding any mention of race in discussions and ignoring issues of racial privilege.
- *Egalitarianism:* an adaptive RES strategy explicitly encouraging children to value individual qualities over racial group membership and ignoring issues of structural inequity.
- *Alertness to discrimination:* a proactive RES strategy Teaching children to be aware of the barriers of racism in society.
- *Preparation for bias:* a proactive RES strategy preparing children to be aware of and prepared for discrimination.
- *Promotion of distrust:* a reactive RES strategy socializing children to be wary of people from other races.

This understanding of how RES impact behavior is applied in *Passage Home VR,* an interactive VR narrative game developed by the authors, with the narrative content reflecting the various coping strategies employed by individuals when encountered with racial discrimination. The process of racial and ethnic identity development is characterized as "coming to an understanding of one's position vis-à-vis their racial and ethnic group [through] the process of actively exploring one's ethnicity and race and of determining their meaning in one's life," which is heavily influenced by what youth learn about their culture from family, their community, the media, and other sources (contributing to their RES) [Hughes *et al.*, 2006].

2 Procedure

This section presents an overview of the system and user study design of *Passage Home VR*, an interactive VR narrative (shown in Figure 1) which seeks to understand the efficacy of a computational model of racial and ethnic socialization (RES) for interactive storytelling.

2.1 *Passage Home VR* Narrative Engine Design

The narrative engine design for *Passage Home VR* was, in part, inspired by George Lakoff's work in cognitive categorization [1987] and Harrell et al.'s computational elaboration of Lakoff's theory of category gradience [2014], which takes into account "the degree to which an actor deviates from a prototypical member of a category" and assigns "concrete categories to abstract ones differently at run-time

Figure 1: Screenshot from *Passage Home VR.* In this videogame, players take the role of an African American student who must respond to her teacher's accusations of plagiarism.

to encompass multiple worldviews." The narrative engine uses four empirically-based themes of racial and ethnic socialization (1) *alertness to discrimination,* (2) *cultural pride,* (3) *mainstream fit,* and (4) *promotion of distrust*) as RES-related categories. Players' choices impact the degree of membership each category. The identity representation model evaluates the degree of membership in each RES-related category and assigns players into one of three narratively salient categories: *(1) Colorblind, (2) Cultural Coper, (3) Distrusting Coper* and one of three engagement categories: *(1) Disengaged, (2) Moderately engaged, and (3) Highly Engaged*.

The user is initialized in the *Colorblind* and *Disengaged* categories by default. As the narrative progresses, players' choices of body language update the RES-related category and coping response levels, with some choices impacting on changes to degrees of category membership, and other choices used to determine storyline branching. These updates dynamically assign players to one of the three identity categories and one of the three engagement levels, which in turn customize the narrative content and experience as the game progresses. While the core narrative events and decision points remain constant, content and styles of narrative scripts change based on the player identity types in order to shift the tone of both the first-person player-character's thought and speech content. and the NPC's speech content. These narrative changes respectively reflect various ways that prior RES experiences may impact how one thinks about and responds to racial discrimination) and reflect various ways that prior RES experiences may impact the degree of perceived racial discrimination. The narrative experience ends with a possibility of twenty different codas (reflective endings) based on identity category, engagement level, and the narrative outcome.

2.2 *Passage Home VR* Player Experience

The narrative puts the player in a first-person perspective with three degrees of freedom (3DoF) and enables the player to control a 3-dimensional player character named Tiffany. The player character (PC) interacts with the non-player character (NPC), Mrs. Serilda, who incorrectly accuses the PC of cheating. The player is informed of the game mechanics and the story background through various information dialogs presented in the UI. This information includes the establishing that Tiffany spent nights and weekends in the library working hard on her essay, that she is a passionate and high-achieving English student, and that she took this assignment very seriously. The player must select responses to narrative prompts from a set of predefined, 3D representations of Tiffany's body with different body language (which encompasses both facial expression and gestures) using a gaze-and-click interaction mechanism.

2.3 *Passage Home VR* User Study

A user study was designed to evaluate the effectiveness of embedding a computational model of racial ethnic socialization (RES) to support compelling interactive narratives in VR involving discriminatory racial encounters.

Participants

17 participants between the ages of 18 and 40 completed the study. 70.6% of participants were Millennials, 17.6% of participants were Post-Millennials, and 11.8% of participants were Generation Xers. The gender composition of the participants was 64.7% female and 35.3% male. The occupational composition of the participants was 58.8% professionals, 29.4% students, and 11.8% professionals who are also students. The self-identified racial/ethnic composition of participants was 41.2% black, 41.2% white, and 17.6% Asian. 76.5% of participants grew up in the United States (U.S.), and 23.5% of participants grew up in countries outside of the United States.

Study Design

The study protocol consisted of four parts: (1) participants completed a pre-assessment using an online survey which included the Racial Bias Preparation Scale (RBPS) [Fisher *et al*., 2000] and Colorblind Racial Attitudes Scale (CoBRAS) [Neville *et al*., 2000], (2) participants were asked to play through *Passage Home VR* up to two times using a smartphone head-mounted device (HMD) while their in-game behavior was captured using screen recording, (3) participants completed a post-assessment survey which included the Game Experience Questionnaire (GEQ) [Poels *et al*., 2013] Core Module, In-Game GEQ, and Social Presence Module, System Usability Survey (SUS) [Klug, 2017], and demographic questions, and (4) participants completed a recorded semi-structured interview which provided in-depth qualitative data on players' RES experiences, in-game behavioral strategies, and interpretations of the narrative.

Racial Bias Preparation Scale (RBPS)

The racial bias preparation scale (RBPS) measures "the frequency with which adolescents perceive that they experience messages from their primary caretakers in preparation for living in a multiethnic society" [Fisher *et al*., 2000], producing two values representing the frequency of *reactive messages* (focused on increasing awareness of racial and ethnic prejudice), *proactive messages* (focused on reinforcing racial and ethnic pride), and contrast items (focused on racial and ethnic *egalitarianism*).

Colorblind Racial Attitudes Scale (CoBRAS)

The colorblind racial attitudes scale (CoBRAS) is a conceptually grounded instrument which assesses cognitive aspects of colorblind racial attitudes and produces values across three factors: *unawareness of (1) racial privilege (RP), (2) institutional discrimination (ID),* and *(3) blatant racial issues (BRI)*. Higher scores correspond to a greater level of unawareness for each factor.

In-Game Screen Capture

Participants were asked to play through *Passage Home VR* up to two times. During game play, screen capture was used

to record players' game traces and follow the evolution of game state from start to finish. The screen captures showed where and how long participants looked around in the immersive virtual environment, how many times the users played through the game, their interaction behavior, and every game state event (including the identity categorization and coping engagement level at each evaluation point in the sequence).

Game Experience Questionnaire (GEQ)

The game experience questionnaire (GEQ) is a multi-module assessment tool used to better understand players' feelings and thoughts while playing games. In this study, two of the three modules of the GEQ were used: (1) the core questionnaire and (2) the social presence module. The core questionnaire of the GEQ produces a value between 0 and 4 for each of the following seven components: *(1) immersion, (2) flow, (3) competence, (4) positive affect, (5) negative affect, (6) tension,* and *(7) challenge.* The social presence module of the GEQ produces a value between 0 and 4 for each of the following three components: *(1) psychological involvement – empathy, (2) psychological involvement – negative feelings,* and *(3) behavioral involvement.*

System Usability Scale (SUS)

The System Usability Scale (SUS) provides a reliable measure of the overall usability and ease of use of a technical system. The SUS produced a value between 0 and 100 to provide a subjective evaluation of three aspects of usability.

Semi-Structured Interview

During the semi-structured interview, participants were asked questions about their parent-adolescent RES experiences, their impressions and interpretations of the racialized encounter depicted in *Passage Home VR*, and their strategies used during the game. Transcribed interview data was analyzed using Glaser & Strauss' grounded theory methods [1967] by one author and one additional co-rater.

3 Results

The following section presents the quantitative and qualitative results of the user study evaluating a software prototype of *Passage Home VR.* These results include data on system usability and game experience, as well as behavioral and social science results informing players' RES backgrounds and narrative interpretations.

3.1 System Usability and Experience Results

Passage Home VR was given an average usability score of 84.8 by participants with a standard deviation of 0.5. This score, which is well above average, suggests that the user experience of *Passage Home VR* is well above average and sufficiently met players' usability needs during the gameplay experience. It also suggests that the majority of players enjoyed their overall experience using the system.

The average of participants' scores and standard deviations for each of the components of the core GEQ module were as follows: (1) immersion (M=2.8, SD=0.80), (2) flow (M=3.2, SD=0.79), (3) competence (M=2.1, SD=0.95), (4) positive affect (M=1.7, SD=1.00), (5) negative affect (M=1.0, SD=0.69), (6) tension (M=2.1, SD=1.51), and (7) challenge (M=1.5, SD=1.14). This suggests that *Passage Home VR* kept players in flow, was highly immersive, and was more of a positive than negative experience. For the GEQ social presence module, the average of participants' scores and standard deviations for each of the components were as follows: (1) psychological involvement – empathy (M=0.5, SD=0.71), (2) psychological involvement – negative feelings (M=1.8, SD=0.77), (3) behavioral involvement (M=2.1, SD=0.71). This suggests that players held negative feelings towards the non-player character (NPC), Mrs. Serilda, more than they empathized with her, and felt that their actions and choices affected what occurred in the game.

3.2 Behavioral and Social Science Results

The majority of participants self-reported RES practices of *egalitarianism* and the majority of white participants reported *colorblind* RES practices while growing up. The least-reported RES practice in the study was *promotion of distrust* (only 4 participants in the entire study), which is consistent with the finding that this is the least likely of all socialization practices to be self-reported in research [Hughes *et al*., 2006].

By the end of playthrough 1 (detailed in Figure 2), 47.1% of participants (8/17) were placed in the *Colorblind* identity category (for which the narrative content was associated with *egalitarian* and *colorblind* RES practices) by the narrative engine. 75% (6/8) of these players self-reported *colorblind* and *egalitarian* RES practices while growing up, and 25% (2/8) of these participants self-reported explicit *promotion of distrust* towards racial/ethnic minorities (i.e., white supremacist views) while growing up. Of the eight total participants in this group, there were an equal number of white and nonwhite (black or Asian) participants in this group (4 white, 2 black, and 2 Asian participants).

A slightly lower percentage of participants (35.3%, 6/17) ended up in the *Cultural Coper* category (for which the narrative content was associated with *preparation for bias* and *cultural socialization* RES practices) at the end of playthrough 1. Both race and RES experiences appeared to be linked to in-game behavior resulting in this final category. The majority of these participants self-reported RES experiences centered on *alertness to discrimination* (83.3%, 5/6) combined with either *cultural socialization* (80%, 4/5) or *promotion of distrust* (20%, 1/5). This subgroup consisted of 3 black participants, 1 Asian participant, and 1 white participant. The Asian and white participants in this subgroup represent all of the non-black participants placed in the *Cultural Coper* subgroup, as the majority of participants who were placed in this category were black (66.7%, 4/6).

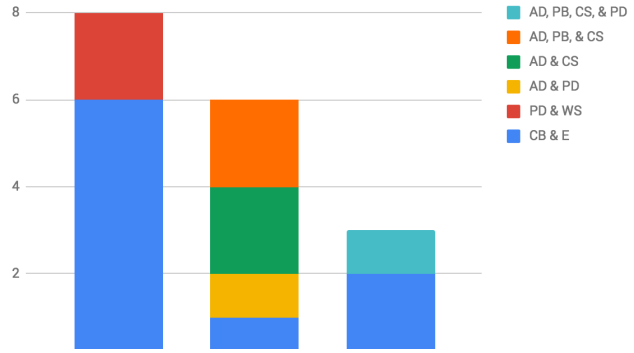

Figure 2: Final identity categories by players' RES for playthrough 1. Abbreviations for RES practices are used (CB = *colorblindness*, E = *egalitarianism*, AD = *alertness to discrimination*, PB = *preparation for bias*, CS = *cultural socialization*, WS = *white supremacy*, PD = *promotion of distrust*).

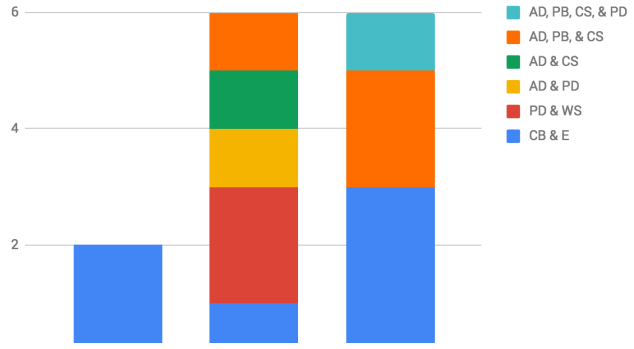

Figure 3: Final identity categories by players' RES for playthrough 2. Abbreviations for RES practices are used (CB = *colorblindness*, E = *egalitarianism*, AD = *alertness to discrimination*, PB = *preparation for bias*, CS = *cultural socialization*, WS = *white supremacy*, PD = *promotion of distrust*).

Finally, only 17.6% (3/17) of participants ended up in the *Distrusting Coper* category (for which the narrative content was associated with *alertness to discrimination* and *promotion of distrust* RES practices) at the end of playthrough 1. Only one of these players self-reported *promotion of distrust* RES practices (in combination with messages of *alertness to discrimination, preparation for bias, cultural socialization*) while growing up.

In contrast to the above results of playthrough 1, by the end of playthrough 2 (detailed in Figure 3), 85.7% (12/14) all participants ended up in either the *Cultural Coper* or *Distrusting Coper* categories, with an even distribution (50%, 6/12) of participants in each category. There was significant variation of self-reported RES strategies while growing up for the participants who ended up in these categories. Only 14.3% (2/14) participants were placed in the *Colorblind* category by the narrative engine by the end of playthrough 2, and both of these participants were also placed in the *Colorblind* category during playthrough 1. These results demonstrate a very notable shift from the distribution of category outcomes in playthrough 1.

The majority of players (52.9%, 9/17) stated that there was conclusive evidence that the narrative featured a discriminatory racial encounter. 55.6% (5/9) of these players self-reported *alertness to discrimination* RES practices (in addition to one or more other strategies) while growing up. All but one of the eight participants who interpreted there was either ambivalent evidence (87.5%, 7/8) or no evidence (12.5%, 1/8) that this was a discriminatory racial encounter self-reported *colorblind* and *egalitarian* RES practices while growing up. The remaining participant (an Asian female who stated there was ambivalent evidence that this was a discriminatory racial encounter), self-reported *alertness to discrimination* and *cultural socialization* while growing up. The sole participant in the study reporting no evidence that this was a discriminatory racial encounter self-reported *colorblind* and *egalitarian* RES practices while growing up, had the highest CoBRAS unawareness of blatant racial issues score (27) and second highest unawareness of racial privilege score (16) of all participants in the study. This participant was a Generation X black female who was raised in East Africa.

4 Discussion

The results of this study suggest that players' RES experiences while growing up influenced their in-game behavior. The strongest relationship was observed between players' self-reported RES experiences while growing up and their final identity categorization based on their in-game choices during playthrough 1 of the game. The majority of participants stated during their interviews that during playthrough 1 they made choices which reflect what they would do during a real-world encounter. During playthrough 2, they made choices which were attempting to meet a satisfactory outcome for their player-character, Tiffany (i.e., the NPC believing that she did not plagiarize her essay). The majority of final identity categorizations at the end of playthrough 1 did correspond to the players' self-reported RES backgrounds. Furthermore, the majority of users took a more subdued approach in playthrough 1 by choosing body language interpreted as de-escalatory, and in playthrough 2 there was more identity play and exploring how outward expression of negative emotion affected the interaction.

The distribution of the players who ended up the *Colorblind* category at the end of playthrough 1 by RES backgrounds suggests that players who grew up with messages deemphasizing discussions of race or the existence of institutional discrimination, and emphasizing "not seeing color" and individuality were more likely to make in-game body language choices associated with the *Colorblind* identity category approach and not emphasize race in their thematic analyses of the narrative, as compared to individuals who experienced RES practices centered on *alertness to discrimination*, *preparation for bias*, or *cultural socialization* while growing up, regardless of race.

Only 1 of the 3 participants who ended up in the *Distrusting Coper* category at the end of playthrough 1 self-reported *promotion of distrust* RES practices while growing up. This participant was a black female who earned the second lowest

CoBRAS score for unawareness of racial privilege (9) of all participants. 2 of the 3 participants who ended up in the *Distrusting Coper* category at the end of playthrough 1 self-reported *colorblind* and *egalitarian* RES practices and were white males. Their qualitative interview data suggests that experiences living abroad may have had a strong influence on their present-day awareness of racial microaggressions and institutional discrimination, despite their RES experiences growing up.

One might assume that participants who self-identified with the race and/or gender of the player-character, Tiffany, who is a black female, would be more likely to interpret the narrative as racially biased in nature, but this was contradictory to the results. The only participant in the entire study who perceived no evidence of racial discrimination was a black female and grew up with *colorblind* RES practices. The distribution of narrative thematic analyses by players' RES backgrounds suggests that individuals whose RES growing up included messages to increase awareness of discrimination were more likely to explicitly discuss matters of race in their thematic analyses. These overall results suggest there is a notable connection between RES (rather than just a player's race or gender) and interpretations of racial discrimination within the narrative as well as thematic analyses that should be further explored.

5 Conclusion

The major contribution of this work is the novel application of RES theory to the design of an embodied identity representation and interactive narrative experience. The goals to strengthen both the technology and theory associated with this research are within the broader scope of future work and potential deployment into interventions focused on strengthening family RES competency [Anderson *et al.*, 2018]. Although much recent research on VR applications addressing social issues has focused on empathy building and the reduction of implicit bias, this research has sought to better understand if VR can be used as a tool for better understanding how players' RES impacts their resulting in-game strategies for coping with discriminatory racial encounters and their perceptions of racial discrimination within interactive narratives. The preliminary results of this study suggest that players' RES, rather than simply their race, gender, or age, has a significant influence on their in-game behavior and narrative interpretations. Results from future studies will lead to a better understanding of how embodied identity representations informed by RES can serve to reach towards the greatest potential of interactive VR narrative for both compelling storytelling and applied psychology research.

Acknowledgements

This material is based upon work supported by the National Science Foundation under the Graduate Research Fellowship Program and the Ford Foundation under the Predoctoral Fellowship Program.

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