

How An Artist-Scientist Conjurer Thinks, Works and Lives

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D. Fox Harrell, with his crown of red dreadlocks, is an unmistakable figure on the Massachusetts Institute of Technology campus where he is an associate professor of digital media. He occupies a charmed space in the academy, holding a joint appointment in the Comparative Media Studies Program, the Program in Writing and Humanistic Studies, and in the Computer Science and Artificial Intelligence Laboratory (CSAIL).

One question underlies and unifies these pursuits. “How,” Harrell wonders, “can I take advantage of what computers do well — such as representing and transforming information — to help us to better understand, and improve, the human condition?”

“So far we have seen glimpses of that,” he claims, citing Team ICO’s melancholy cinematic Playstation 2 game *Shadow of the Colossus*; Jason Roher’s independent game meditation on mortality, *Passage*; and Erik Loyer’s uncannily pensive, interactive, narrative for the iPad/iPhone’s *Strange Rain*. “But we can go much further,” he insists. Digital technologies can allow text, animation, video, computer graphic and other media to become, not only interactive but, also *improvisational*, in beautiful and challenging new ways.

We met at Harrell’s office in his Imagination, Computation, and Expression (ICE) Laboratory at MIT. The room has five flat screen monitors and several varieties of videogame consoles set up for running experiments. A window looks out onto the Charles River. Harrell invites me to sit at a high-tech oval table while he connects his laptop to a 60" flat screen monitor.

Since childhood, Harrell has been interested in the many of the issues that inform his work today. He recalls playing a video game, “Oregon Trail,” that was based upon the period of conquest of North America guided by “manifest destiny.”

The young Harrell would stop the game from loading on his Apple IIe and alter its BASIC code to subvert the imperial, colonialist themes. He became a hacker with friends, writing and cracking code for fun.

There are many parallels between computer programming and music improvisation, composition, and performance and some are evident in Harrell’s life. As a youngster, he played the double bass and the electric bass. He was mostly interested in improvisational music, but was not confined by style, playing free jazz, funk, and punk rock.

In high school, Harrell joined a special interest group on artificial intelligence, went to a meeting and found he was the only youth there, the rest were computer engineers and professors. Undeterred, he went to the library and checked out a book on symbolic programming in LISP and Douglas

Hofstadter’s famous book on “machines and minds” called *Gödel, Escher, Bach: An Eternal Golden Braid*.

He also read broadly on issues of civil rights, diverse African cultures and empowerment. When he was in the 8th grade, he sent his history teacher a formal letter requesting more books covering the full, diverse range of United States history. A stack of books appeared the next week.

His parents, Douglas and Diane Harrell, encouraged him to pursue such interests. He read their books on sociology, philosophy, and art. The broad, but probing, experiences of his youth combined to inform his aim of making computer games more improvisational, empowering and meaningful. In one telling moment later in college, his professor was discussing a notion of “intellectual anarchy” (Paul Feyerabend’s book, *Against Method*) and Harrell realized that he had first encountered the idea as a child when his father had opened the book in the middle of an everyday conversation.

As he looked forward to college, Harrell knew that he wanted to pursue a degree that involved computer science and another degree in the arts. During his search for interdisciplinary programs, he discovered that Carnegie Mellon was one of the few universities that had a program combining philosophy with computer science. How fortunate that he was awarded a full merit scholarship to attend the university.

During his search, he also learned about related fields such as cognitive science — which combines artificial intelligence research with study of the human mind. Harrell also points out that he is from San Diego and that the University of California, San Diego, is the birthplace of the field of cognitive science.

Following his passions at Carnegie Mellon University, Harrell earned a B.F.A. in visual art *simultaneously* with a B.S. in logic and computation (a major focused on artificial intelligence and mathematics based in the Philosophy Department) *and* a minor in computer science. Each of his degrees was accompanied by highest honors and he graduated as a member of the academic honorary society Phi Beta Kappa. Passion, he demonstrates, is high grade fuel for energetic achievement.

The CMU School of Art program combines studio training where students learn painting, drawing, printing and sculpture with a strong foundation in conceptual art and the leading-edge media. At every stage being awarded nationally competitive fellowships to pursue his graduate education, Harrell went on to earn a master’s degree in interactive communications at the Tisch School of the Arts, New York University and a Ph.D. in computer science and cognitive science at the University of California, San Diego.



This screen shot from D. Fox Harrell's "Living Liberia Fabric" project shows the graphical elements through which the narration is accessed.

Continuing today to expand his interest in music and improvisation, he plays an ancient instrument called the berimbau and practices Capoeira Angola, an African/Brazilian martial art and dance.

Ghosts, Phantasms and Imagination

In explaining the ghosts of imagination, Fox Harrell points to "Phantasmal Fictions," an article he wrote for the *American Book Review*, in which he says that:

In literary theory and philosophy, ... phantasms are imaginary constructions that structure human behavior and ideas. At the same time, ... phantasmata are deeply akin to the cognitive, psychological notion of mental images.

In other words, "phantasm" means a combination of both imagination and ideology. The mental images and ideas accompanying stereotypes is an everyday example. Another example Harrell offers is the idea of "invisibility" as a way to describe the condition of oppressed people in Ralph Ellison's novel *Invisible Man*.

Harrell is interested in how computation can create powerful new forms of phantasmal media — interactive

narratives, computer games, social media, AI-based art, and "new forms unanticipated by any of those." He believes that digital media can transform users' ideas, improvise new aesthetic meanings, and critique society and culture.

At the School of Humanities, Arts, and Social Sciences, Harrell focuses on interactive, verbal narrative and poetry and constructing social meaning with computer software. Some of his colleagues in the Writing Program create traditional media such as novels and documentaries. Others work in experimental writing and interactive media.

At the Computer Science and Artificial Intelligence Laboratory he investigates how to represent and generate meaning — the intricate, inexhaustible work of a lifetime. A testament to this commitment is his lifetime membership in the Association for the Advancement of Artificial Intelligence.

Combining AI with his arts and humanities concerns, he explores and challenges common phantasms. *Loss Undersea* is an interactive narrative game-like project. Unlike typical video games, this one is not about combat and jam-packed action adventure. Rather it aims to



D. Fox Harrell

PHANTASMAL MEDIA/ SUBJECTIVE COMPUTING

D. Fox Harrell

My work is at the intersection of cognitive science, computer science, and digital media arts.

Fantastic stories, rich metaphors, social relationships, and even our senses of self are all rooted in the imagination. At the same time, many social ills such as prejudice, stereotyping, and social inequity also are products of the mind.

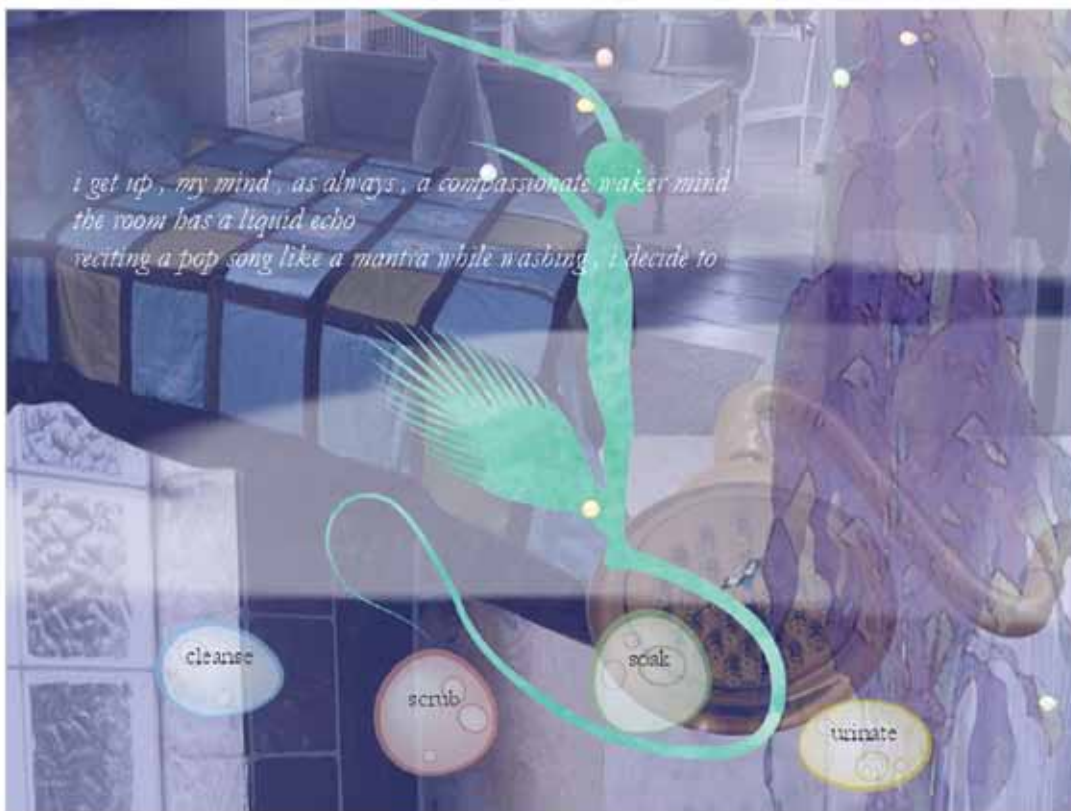
As a cognitive scientist, I am interested in better understanding the mental processes underlying these imaginative phenomena.

As a computer scientist, I am interested in developing technologies to help in that understanding, and to empower and challenge users to reflect upon and improve the human condition.

As an artist, I work to develop an untapped potential of computer-based art to express the imagination.

Seeking new ways to address social ills, shared values, notions of beauty and other concerns are the hallmarks of traditional art forms — my medium just happens to be the computer.

I combine visual and literary arts with artificial intelligence



Screen shot from D. Fox Harrell's video game, *Loss, Undersea*. The figures on the right show how they transform.

be a poetic reflection on the state of contemporary life.

The game consists of a tableau — the character awaking and evocative lines of poetry. The user selects what the character does next. The user can make choices that are peaceful, active, aggressive or apathetic. The artificial intelligence that underlies the system then provides the next tableaux and generates poetry in response to the emotional weight of the user's choice. Was the computer *writing* poetry? No, says Harrell. Rather the artificial intelligence system is improvising, generating a poetic text based on an algorithm he created to combine concepts. The system uses logic to describing thematic locations and emotional states.

In the game, Harrell uses conceptual blending, an idea from cognitive science about how the mind brings together multiple ideas. In "Loss Undersea," he is investigating the "apathy," "aggression," "laziness or "peace" that a contemporary "office worker" may experience, hence, the narrator is represented by an avatar who drowns under the weight of aquatic imagery.

Emotion guides the game. The appearance of the character changes in response to the player's choices. An accumulation of emotions continuously transforms it into a grotesque hybrid marine animal. Harrell has observed that a player who consistently selects the aggressive choice, for example, changes the mood of the game to the point that the characters

unexpectedly and independently generate aggressive actions. The mood is like a computational, psychoses.

True to his San Diego roots, Harrell gently waded back into the conversation later to mention that the oceanic theme may spring from his passion for scuba diving and the undersea world. He is a fan of the early 20th-century experimental science documentary filmmaker Jean Painlevé and has been a lifelong reader of books on deep sea life.

Harrell points out that "these remote regions of the earth, inhabited by creatures with evocative names like the 'black swallower' and 'longnose chimaera,' become apt metaphors for difference."

Another project is the *Living Liberia Fabric*, a collaborative work developed in his lab while he was a professor at the Georgia Institute of Technology. This project was produced in affiliation with the Truth and Reconciliation Commission that sought to address the wounds wreaked on that country by years of civil war.

Building on connections of a collaborator in international affairs, Harrell's students heard talks by a Truth and Reconciliation commissioner, a peace museum expert, and people who had lived through the atrocities. They also conducted fieldwork with visits to Liberian-American community meeting spaces. They then set about creating an interactive, narrative experience that memorializes the recent tragic historical events.

This commemoration includes an interactive movie component that was implemented in Flash to be shown on the web but the logic of the system is generated by Harrell's artificial intelligence system called GRIOT (programmed in LISP) for building interactive narratives. He developed the system for his Ph.D. dissertation.

On the initial page, characters are drawn on a batik background with gentle ocean sounds swelling in the background. By selecting the characters, the user accesses corresponding video and text narratives about the civil war in Liberia. The AI system tracks the user's choices and renders the background and graphics in colors that match the user selected theme — both conceptually and visually. The narrative moves from the war to hope for the future.

Harrell's work is presented at exhibitions, technical and digital media conferences and online. When it is complete, the *Living Liberia Fabric* project will be launched publicly on the web. Harrell hopes that it will particularly serve the Liberian people, the Liberian Diaspora, and other parties with a need to confront and assuage the impact of the tragedy.

Elsewhere, Harrell shares his GRIOT system through collaborations with artists and publishes papers on it in both technology and social media journals.

In the *Generative Visual Renku* project," Harrell collaborated with the second Ph.D. student he supervised, Kenny K. N. Chow, now a professor in Hong Kong. Renku is a form of Japanese poetry developed around the idea of linking verbal imagery. In this project, Harrell and Chow explored linkage through conceptual and image relationships. A river and a forest, for example, are conceptually linked by being elements of nature. A pyramid and a mountain are image-linked by both being triangular.

The program uses the GRIOT system to generate options for the player to choose where the character goes next. The GRIOT System determines these options by either conceptual or image relationships. The player moves a character through

a landscape generated through linking locations. The character acquires artifacts and is changed by each location the player chooses. For example, after crossing a stream the character acquires a koi fish. It is a different kind of videogame - a system that immerses the player in poetic imagery.

Art before science? Vice versa? Both at the same time?

D. Fox Harrell has introduced three ideas that his idea of phantasmal media builds upon:

- Subjective computing that explores technical aspects of improvisation, meaning and ambiguity.
- Cultural computing that explores using a broader range of cultural sources for developing artificial intelligence and technology. For example, Harrell notes that the literary theory at the basis of many interactive narrative systems is often defined from the worldview of continental Europe. He is inspired by Kenyan theorist and author Ngũgĩ wa Thiong'o who has suggested that traditions of orature (oral literature) might be more relevant to cyberspace. The aforementioned "Visual Renku" project took advantage of cognitive science research by Masako Hiraga exploring how Chinese characters can be image-based and metaphorical.
- Critical computing in which one uses computing to say something about the world.

In discussing his work, D. Fox Harrell is equally interested in the aesthetic/poetic issues and the technological challenges. Ultimately, he does put the art first, but says that programming itself is a form of expression. From his descriptions of his work process, however, it is clear, that the social and aesthetic concerns are inextricably connected with engineering issues. For example, he spoke at a conference in La Jolla, California, where he was struck by the many presentations that were constructed around social binaries such as male vs. female or black vs. white.

technologies to develop new forms of games, interactive narratives, social media and art on the computer. These new forms require new designations altogether. I call my expressive computer systems "phantasmal media" because of their ability to evoke mental imagery and transform ideas. Mental imagery and ideas, like ghosts/phantasms, are intangible, but can wreak havoc (or invoke love in some cases) when they appear.

The systems I've developed primarily focus on narrative, poetry and identity. The types of works I have built include:

- computer games where stories dynamically change based on aspects of user input like emotional tone,
- computer games that can model, and help us to better understand, phenomena such as sexism, racism and stereotyping,
- digital poetry where user input can result in generating many versions of a poem with the same theme but different metaphors each time,
- social networking profiles (e.g., Facebook accounts) that can be customized based on how a user wants to present herself to a particular community or who is viewing it, and
- interactive video art and computer animation that tell stories from different perspectives each time.

The key to all of this is the computer's ability to display media information and to change it around to create new meanings. I use this ability of the computer as the basis for my work. The end result is the form of subjective computing, *phantasmal media*, that highlights the power of the human imagination.

In response, he programmed a computational poem, “A Girl with Skin of Haints and Seraphs.” The poem is interactive with the user supplying input or “calls,” e.g. ‘Africa’ or ‘Europe,’ ‘angel’ or ‘demon.’ The GRIOT system then generates the next line of the poem in response to the user’s call. Each time the user supplies a call, the AI system responds with new text.

In the several runs that I saw, phrases “like black demon feather skin” and “pride and privilege firstborn epidermis” characterized a girl with skin of angels and demons in “opposing” versions of the poem. Run multiple times, the poem generates multiple improvisations that convey an emergent message.

In the face of such multiplicity, one can no longer hold on to stereotypes. Frustrated by simplistic ways of thinking about identity, Harrell imagines an improvisational poem that could only exist in the interactive environment created by technology. Will there come a day when all artists will know how to write code?

Currently, Harrell is working under a five-year NSF CAREER grant — their “most prestigious award” for early career faculty — for more than half of a million dollars. His project, “Computing for Advanced Identity Representation,” investigates how inventing more expressive technologies for representing ourselves using computers, including more advanced game characters, avatars, social networking profiles and more. He believes that currently these systems can be used to empower, yet often they stigmatize users. He builds systems to do better. He hopes to use computers to capture social identities and psychological meanings (phantasms) that help us make sense of the world and ourselves.

In the early 20th century, W.E.B. DuBois introduced the notion of “double consciousness” in his book, *The Souls of Black Folk*, and in 1929, Nella Larsen’s novel, *Passing*, explored that social phenomenon. Harrell wonders, what would happen if you implement strategies, both painful and triumphant, of social navigation such as “passing” or “double consciousness” and model them in a social networking environment?

His other current project is the book that he is writing for the MIT Press: *Phantasmal Media: An Approach to Imagination, Computation, and Expression*.

Heady stuff. And fun!

Anne Khaminwa is a writer at the Robert R. Taylor Network at MIT. Her articles have appeared in *Transition*, the *Journal of African Travel Writing*, *Abafazi*, *Konch Online* and *Farafina*.

AI Meets Improv

The following are two sample excerpts of poetic narrative text generated while running the Living Liberia Fabric. Along with this generating this text, Harrell’s GRIOT system uses AI to guide the side-scrolling fabric narrative in displaying patterns containing digital video clips of testimony, documentary interviews, and stories of citizens and archival photographic images. Addressing issues of post-conflict, post-colonial “survance” (a term from cultural studies), as the experience unfolds, each line is displayed after users select which themes and stakeholder groups the narrative will focus on by clicking video or photographic assets (in this case the first is focused on youth and the second on women).

Youth-focused poetic narrative:

...what can we do in the future?
we are uplifted
rising like a baobab
the post-colonial often recaps the venom of the colony
victim forgetting, child of the nation
the government has a role to play,
the people are the true answer
we are moving to new horizons
survance is our nobility

Woman-focused poetic narrative:

...what can we do in the future?
regal, everyday women lead the way
it is a process driven by the people
the post-colonial often recaps the venom of the colony
woman forgetting, we can be one
we can love again
look toward ourselves
possibility