Afrofuturism: Catalyzing a Pathway to more Inclusive Engineering Design

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Abstract

As engineers seek means by which to design, develop, and deploy technologies in meeting the grand challenges for engineering in the 21st Century, it is important that engineers, think and act, specifically, imagine - more holistically - in conceiving and delivering future solutions of benefit to all of humanity. Unfortunately, often as a function of a lack of diversity in perspectives, beliefs, and values of those privileged to engage in these grand engineering exercises, a more homogenous view of humanity may emerge. This narrower lens of perspective not only constrains the engineering exploration but could foster technological solutions that are blind to the needs and considerations of often marginalized and disenfranchised groups such as blacks/African-Americans here in the United States. While an unintentional consequence of the engineer’s decision-making, the implications can be profound.

Afrofuturism, a means by which to view possible and alternative futures, offers a potential antidote to this thesis. In explicitly placing the often-disenfranchised black voice central - with an intent of universal betterment through and by technology, Afrofuturism, at its core, offers a bridge of empathy; connecting the pertinent cultural insights and considerations to the engineering dilemma. With this understanding, not only could a more culturally relevant engagement occur but more inclusive engineering “design thinking” be fostered. This could provide a more complete picture of all people throughout the engineering process; potentially expanding the solution space both in novelty and, equally as important, inclusivity. And, inclusion matters in technology design; for, without appropriate countermeasures and/or advocacy the risk exists of constructing technologies that simply “mirror a narrow and privileged vision of society, with its old, familiar biases and stereotypes”.

Afrofuturism, in practice, helps to make visible how traditional engineering design practices can be, while not necessarily intentional, both culturally located and power laden. Similar to such speculative design approaches as Science Fiction Prototyping and complementary to liberatory design practices such as equityXdesign, Afrofuturism affords a framing for engineering decision making that could lessen, in a more proactive sense, unintended consequences of design decisions. The proposed paper explores Afrofuturism as a means to enable the engineer to see and counter tacit commitments and limitations of more traditional engineering design approaches, a design lens, in essence. Through an examination of recent challenges in the design and development of wearable technologies within the health and wellness space (i.e. connected fitness technologies/devices), this paper presents a case study in engaging Afrofuturism in imagining more inclusive, equitable, and just future concepts. Moreover, thoughts are offered in how this infusing of both the value and relevancy of diversity in thought and perspective in engineering could increase the participation of blacks/African-Americans in engineering.

The case for inclusive engineering design
As engineers seek means by which to design, develop, and deploy technologies in meeting the grand challenges for engineering in the 21st Century [1], it is important that engineers, think and act, specifically, imagine - more holistically - in conceiving and delivering future solutions of benefit to ALL of humanity. Unfortunately, often as a function of a lack of diversity in perspectives, beliefs, and values of those privileged to engage in these grand engineering exercises, a more homogenous view of humanity may emerge. This narrower lens of perspective not only constrains the engineering exploration but it also fosters future technological solutions that are blind to the needs and considerations of often marginalized and disenfranchised groups such as blacks/African-Americans in the United States. While an unintentional consequence of the engineer’s decision-making, the implications can be profound.

**Afrofuturism defined**

Afrofuturism, a lens by which to imagine possible and alternative futures, offers a potential antidote to this thesis. Coined as a term by Mark Dery, Afrofuturism can be defined as “a literary and cultural aesthetic that uses the tools and tropes of science fiction, as well as references to African and non-Western mythology, as a means to confront and analyze the present-day issues faced by people of color” [2]. Traditionally viewed as an aesthetic, Afrofuturism lies at the intersections of black cultures, imagination, liberation, and technology [3]. Sanford Biggers, in responding to Afrofuturism’s relevancy outside of a strictly aesthetic context, situates Afrofuturism somewhat as an epistemology; stating that “Afrofuturism is a way of re-contextualizing and assessing history and imagining the future of the peoples of the African Diaspora via science, science fiction, technology, sound, architecture, the visual and culinary arts and other more nimble and interpretive modes of research and understanding” [4].

**Situating Afrofuturism within engineering design**

Cast in this epistemological sense in offering a connection with engineering design, Afrofuturism represents a means by which diverse solution possibilities can be cultivated and realized; expanding the solution space both in novelty and, equally as important, inclusivity. And inclusion matters in technology design. Without appropriate processes, countermeasures, and advocacy, we risk constructing technologies that “mirror a narrow and privileged vision of society, with its old, familiar biases and stereotypes” [5].

This challenge vividly and unfortunately reminds the authors of a recent viral video that shows an automatic soap dispenser that appears to dispense soap to a white person’s hand but not a black person’s [6]. Coupled with other more consequential examples of technologies personifying racial biases [7], these cases highlight such considerations as the impact of data set biases in design decision-making (e.g. use of non-representative, racially homogenous samples in testing/evaluation activities). Implications evoke notions highlighted in an Atlantic essay entitled “Technology Versus African-Americans” by Anthony Walton where he states that:

“...blacks have participated as equals in the technological world only as consumers, otherwise existing on the margins of the ethos that defines the nation, underrepresented as designers, innovators, and implementers of our systems and machines. As a group, they have suffered from something that can loosely be called the technological illiteracy.”
Though this has not been the point of technological innovation, it has undeniably been its fallout. It is important that we understand and come to terms with this now; there are technological developments in the making that could permanently affect the destiny of black Americans, as Americans and as global citizens”.[8]

Afrofuturism, complementary to (and often lacking in) such speculative and critical design approaches as science fiction prototyping that use science fiction to speculate on technological design and the future, evokes a design debate in countering this fate. As such, Afrofuturism, as an exemplar design lens [9] by which to engage liberatory design practices that fuse equity work within design thinking processes such as the equityXdesign framework (Figure 1), places the often-disenfranchised black voice central in the design narrative – “letting their voices and experiences lead” in the design engagement - with an intent of universal betterment through and by technology.

![EquityXDesign Framework](image)

Figure 1: equityXDesign Framework [10]

In explicitly placing the often-disenfranchised black voice central - with an intent of universal betterment through and by technology, Afrofuturism, at its core, offers an analogous bridge of empathy; connecting the pertinent cultural (e.g. racial) insights and considerations to the engineering design dilemma. With this understanding, not only could a more culturally relevant engagement occur but more inclusive engineering “design thinking” benefitting for all (e.g. the soap dispenser example), ultimately, be fostered.
A case study in engaging Afrofuturism in more inclusive wearable technology designs for black/African-American women

In the context of the authors’ work in exploring the interaction design aspects of connected fitness technologies (e.g. activity tracking technologies such as Fitbit devices), Afrofuturism could prove transformative in motivating more inclusive and impactful designs. This is particularly demonstrative in the design and engagement of wearable technologies by black/African-American women, for whom considerable health disparities exist.

A recent study confirms earlier anecdotal evidence that suggests the skin color (i.e. skin pigmentation) of participants impact device accuracy of wrist based devices that use optical heart rate monitors [11]. This inaccuracy results in higher error rates when extrapolating energy expenditure (i.e. caloric burn). In particular, errors are worse for participants with darker skin [12]. This is truly problematic, especially as the potential of wearable technology in increasing physical activity levels is viewed as promising in mitigating many of the health disparities experienced by black/African-American women.

Algorithmically, these technologies are also seemingly lacking in responding to the physiology of the black body. Countering the assumption that energy needs of individuals with the same body weight are the same, a recent study offers evidence that indicates that black/African-American women have lower energy requirements than Caucasian women. This means that Black/African-American women must burn more calories to achieve a similar weight loss as experienced by Caucasian women [13]. This evidence, coupled with discussed error rates, suggests that the use of wearable technologies by Black/African-American women in gauging and tracking caloric burn may actually be leading to behaviors counter to their weight loss goals and/or objectives. Truly, technology, in this case, is not working for all.

Moreover, the type and nature of insights offered by these technologies to motivate the user in increasing physical activity often differs. Current technologies focus on more quantitative measures (e.g. number of steps taken). However, more qualitative representations of collected and analyzed quantitative measures might be more appropriate in engendering behavioral change around physical activity, especially for black/African-American women. Demonstrative in the efforts of GirlTrek (http://www.girtrek.org/) - an organization that inspires black women to change their lives and communities by walking, situating one’s step count within a black historical context such as completing the 54-mile civil-rights protest march from Selma to Montgomery, as an example, could better motivate increased physical activity levels.

Leveraging Afrofuturism in engineering design

So, what can be done? How are technologies with such potential for societal benefit be equally limiting and harmful in both use and relevance to diverse groups? In framing a response to these questions, Rob Girling and Emilia Palaveeva [14] state that:

“We need to be clear-eyed about what we are striving to do and minimize the chances of creating more problems than we are trying to solve...as a result, we will be poised to design systems that
have minimum negative impact, create and sustain equity, and build on technological advances without disrupting the foundations of society”

And, becoming more “clear-eyed” requires greater focus and mindfulness to notions of exclusion and oppression that often cloud (i.e. influence) technological design and development decision making (see Figure 2). Exclusionary practices, patterns, behaviors, and norms are being ingrained within the culture of engineering that, while unintentional, may lead to future technological solutions that do more harm than good. By no means is it being suggested that what is being witnessed is deliberate. Nonetheless, these factors, individually or collectively, cannot be given a “pass”; with their consequences – the disenfranchisement of segments of humanity- simply dismissed as collateral damage.

![Figure 2: The 10 Ideas that Fuel Oppression [15]](image)

Yet, as clearly evidenced in the connected fitness space and referenced grand challenges in engineering, understanding and addressing questions of exclusion, within engineering cannot be more be more relevant. However, as discussed by Erin A. Cech in her paper, The Veiling of Queerness: Depoliticization and the Experiences of LGBT Engineers [16]:

“...there is a level of resistance within the profession of engineering to discuss and work to address issues of inequality in technology design and development”.

Further, Cech states:
“This resistance comes in part from the professional culture of engineering, the system of meanings, values, norms, and rituals built into and around engineering tasks and knowledge. One particular ideology within the culture of engineering, the ideology of depoliticization, misframes questions of inequality within engineering as marginal and largely irrelevant to “real” engineering work.”

Echoing Professor Andrea Grimes Parker, from her paper, Designing for Health Activism [17] specific to health technologies with like thoughts offered in a broader technology design and development context:

“And while it may feel that we are over-stepping our bounds as designers by engaging with issues like race, income, and power, prominent researchers, institutions, and federal agencies have repeatedly indicated that confronting these issues is necessary for eliminating disparities. Thus, evolving within engineering design the requisite competencies to appreciate, understand, and respond to these issues of inequity in offering technological solutions that are beneficial to all is of import. Afrofuturism could provide the necessary rigor within engineering design. In unpacking Afrofuturism’s value and power within the engineering design space in “grappling” with these notions of inclusion a framing for engagement emerges.

In exploring this framing, the authors collaborated with Pittsburgh, PA artist Marcel L. Walker to re-imagine, through an Afrofuturistic design lens, a connected fitness concept that is more responsive to the needs, motivators, and values of black/African-American women, often lacking in current designs [18]. Figure 3 offers one imagined connected fitness concept; grounded in the philosophy of GirlTrek and emboldened by the Afrofuturistic imagery of the warriors of the Dora Milaje – Wakanda’s Special Forces - as featured in Marvel’s film Black Panther (Figure 4).
From an interaction design perspective in particular, this augmented reality (AR) based concept depicts an importance of community and the value of understanding the “pulse”, globally, of this collective in connecting to, contextualizing, and motivating increased physical activity levels [17]. While it is not the intent that this concept be implemented as imagined, it is the intent that this speculative design artefact provoke and trigger a deeper design “debate” in the conceptualization of more inclusive, equitable, and just future connected fitness technologies.

**Conclusion:**

The engineering community is at a crucial junction. Engineering design and related approaches (i.e. design thinking) are often heralded as the “saving grace” in technology design and deployment for the betterment of ALL. However, as illustrated in the connected fitness space
and being witnessed in other contexts, design patterns, behaviors, and norms are being ingrained and reinforced within engineering practices that, while unintentional, may lead to future technological solutions that do more harm than good.

Afrofuturism, as a countermeasure, affords greater reflection, intentionality, and voice to considerations of inclusion within the design process. While Afrofuturism, in particular, aids the designer in identifying those salient “cultural retentions that blacks/African-Americans bring to the technologies that they use” [20], its use supports decision making that affords a more complete and inclusive picture of ALL people within the technology design engagement. Afrofuturism, as such, is a design lens through which the needed motivation and actions be both catalyzed and operationalized in increasing inclusivity and thus equity within the culture and processes of engineering design.

Moreover, the value of Afrofuturism extends beyond the considerations of the black/African-American “perspective” in the process of designing future technologies even as it ensures that this group – these voices - are central in the decision making and conversations around future technologies. In increasing the needed representation of black in engineering, Afrofuturism provides leverage in engendering more active engagement of these underrepresented voices in engineering. The movie Black Panther, as an example, through its Afrofuturistic imagery, plotline, and premise could inspire black/African-American young people, in particular, to explore engineering careers; mirroring many of the discussions and outcomes of STEM engagement efforts spurred by the release of the movie Hidden Figures about a team of female black mathematicians who worked at NASA.

References:
[6] https://www.youtube.com/watch?v=YJjv_OeiHmo