Does Technology Have Race?

David Hankerson

Andrea R. Marshall

Jennifer Booker

Houda El Mimouni

Imani Walker

*Jennifer A. Rode

Rainbow Laboratory

Drexel University, USA

djh343@drexel.edu

andrea.marshall@drexel.edu

gbooker@drexel.edu

he52@drexel.edu

iw48@drexel.edu

jen@acm.org

*Contact Author

Abstract

This paper started as a response to the "Black Lives Matter" campaign in the United States, and emerged as a critique of race more generally in technology design. This paper provides case studies of how technologies are often less usable by persons of color, and contextualizes this in light of intersectionalist theory. Finally, it discusses how the HCI community can ameliorate the situation, and our obligation to do so in light of the ACM code of ethics.

Author Keywords

Race; Social Justice; Computing; Racism

ACM Classification Keywords

• Human-centered computing~Human computer interaction (HCI) • Social and professional topics~Race and ethnicity.

Introduction

Stephen Colbert is noted for the catch phrase, "I don't see race" [33]. It is part of a Liberal ideology that hopes by being blind to race you can achieve blind justice. Of course, in doing so it fails to note the cultural contributions that stem from that difference. Further, one cannot simply close ones eyes and avoid the effects of pre-existing bias. The term bias is used by Friedman and Nissenbaum, who say it "refers to computer systems that *systematically* and *unfairly*

*discriminate*s against certain individuals or groups of individuals in favor of others." [10, p23]. By extension pre-existing societal bias is "bias that originates from society at large, such as from organizations (e.g., industry), institutions (e.g., legal systems), or culture at large. (E.g., gender biases present in the larger society that lead to the development of educational software that overall appeals more to boys than girls)" [10, p24]. Pre-existing bias can be implicit and subconscious, rather than malicious in intent. Yet, this sort of bias still has negative effects by failing to provide appropriate technologies for underrepresented minorities in STEM, and as such in this paper we will argue for the existence of pre-existing social biases regarding race in HCI, provide examples of interfaces that challenge minority users, and discuss possible ways to ameliorate future designs and design cultures.

Literature Review
A search for the term 'race' in the ACM digital library (excluding the phrase 'race conditions') yields 897 results, where a search for the term 'racism' yields only six. The term racism implies not just neutrally categorizing data based on race, but rather a political motivation and acknowledgement of pre-existing social bias. The bulk of work on race focuses on the disparities of participation of minorities in computing without a specific political agenda. The discussion of racism include an article on addressing values in design including racism [20], one on critical game play [13] one on classifying racist texts [14], one on cyber-bullying in information retrieval [25], an article on the Twitter response to the decision as to whether to indicate the white police officer responsible for Eric Garner's death, and a poem [9]. This is hardly a research showing that is consistent with the impact of

discussions of racism in the popular press. Consider the Black Lives Matter movement, and that in 2015 African American were disproportionately likely to be shot by police [45]. African American men represent 6% of the US population but represented 40% of those killed by police. If racism is such a significant topic in the United States, regardless of its applicability to CHI worldwide, why is it not reflected in our literature?

Elsewhere in the CHI literature Rode has argued the HCI community has wanted to treat technology as value neutral [30], and yet this is not the case, as other scholars in HCI have previously noted in their own research. To wit, Winner argued artifacts are actively imbued with the political values political characteristics held by those who construct them [54]. Similarly, Berg and Lie argued artifacts traditionally take on gender characteristics that reflect the values of their creators [5]. Therefore, it is reasonable to assert that similarly to scholarly arguments about the construction of gendered and politicized artifacts, then technologies can have race, and technology creators in turn can perpetuate racial bias. This is not to say that members of the HCI community are intentionally creating racist technology, as pre-existing social bias can be unintentional, one possible source is 'white privilege'. This is an emotionally laden term as discussed by Hugo award winner science fiction author John Scalzi, as he tries to explain the concept to fellow gamers at the height of Gamergate,

> "I've been thinking of a way to explain to straight white men how life works for them, without invoking the dreaded word "privilege," to which they react like vampires being fed a garlic tart at high….

"Dudes. Imagine life here in the US - or indeed, pretty much anywhere in the Western world - is a massive role playing game, like World of Warcraft except appallingly mundane, where most quests involve the acquisition of money, cell phones and donuts, although not always at the same time. Let's call it The Real World. You have installed The Real World on your computer and are about to start playing, but first you go to the settings tab to bind your keys, fiddle with your defaults, and choose the difficulty setting for the game. Got it?"

"Okay: In the role playing game known as The Real World, "Straight White Male[1]" is the lowest difficulty setting there is."

"This means that the default behaviors for almost all the non-player characters in the game are easier on you than they would be otherwise. The default barriers for completions of quests are lower. Your leveling-up thresholds come more quickly. You automatically gain entry to some parts of the map that others have to work for. The game is easier to play, automatically, and when you need help, by default it's easier to get." [37]

---

[1] In this example the trifecta of straight identities, whiteness, and maleness are being positioned as equally problematic. The sex and gender identity aspects of this example are not important to this analysis—though extremely important elsewhere. Here we merely want to emphasize 'whiteness' is in Scalzi's words "an easier difficulty setting" than engaging with the world as a user of color, and are using this sort of gamer metaphor as a design fiction.

Also we are using the terminology Black and White as Americans, as that is the word choice within the "Black Lives Matter" Community. We recognize elsewhere, like the UK, it has a different political tone [27].

While perhaps not the most scholarly explanation of the theory it is certainly an approachable metaphor, life is just a bit easier if one is Caucasian because the society is a bit more supportive and suited to one's needs. Technology like any aspect of society is just a bit easier to use if one happens to be Caucasian.

Our feminist intersectionalist frame also calls white women's responsibilities into question. (Perhaps, this is especially ironic as three of the supporting authors of the paper are white (queer) women. The fourth author is an Arab Muslim woman.) This accountability of white women is something feminists of color have indicated is an ongoing rift within discussions of intersectionalism [16, 47, 55]. The interlocution between HCI literature and intersectionalist perspectives is an emergent one; it is one that, such as Trauth et al. argue, "Rather than examining identity characteristics such as race, ethnicity, gender and class in isolation, intersectionality considers how these interact to mutually construct one another" [52, p.199]. We hope to expand this discussion with ways to further our understandings of how multifaceted user identities and perspectives can be critically understood in order to expand diversity within computing cultures and how it may be sustainable in terms of practitioners [7, 11, 53]. Young's [59] form of intersectionality, the Lived Body Experience is perhaps most known to the HCI community in that it addresses a person's embodied interaction with the world through the intersectional lenses of their race, gender, sex, (dis)ability, age, etc. Similarly, Sun's work culturally responsive computing [48, 49] and Kafai's research on ethnocomputing [18] both build on intersectionality and are known to CHI.

Here we hope to provide case studies to contextualize this discussion and draw much needed attention to it.

Figure 1: Automatic Faucet.
(Image Credit: Shaun Kane)

Figure 2: Sensors on Apple iWatch. The circles in the 3 and 9 o'clock positions are green and infrared LEDs. The ones in the 12 and 6 o'clock positions are photodiode sensors.
(Image Credit: Shaun Kane)

We will then discuss the range of tools (user research, usability testing, value sensitive design) which the HCI community can use to minimize preexisting bias and white privilege in HCI. Up to this point we discussed race theoretically, but next we will provide a survey of examples where technology use is easier for Caucasians than underrepresented minorities.

Examples of Technologies with Racial Bias

We have cataloged a range of incidents where race has adversely affected technology's usability for underrepresented minorities. We will discuss three areas where this has occurred—in sensor design, in algorithms and in interface design.

Sensors

Automatic Faucets

In 2015 a video went viral on YouTube [27] where a dark-skinned man was not able to use a public sink with an automatic soap dispenser (see Figure 1), but a light-skinned man was. As a result many articles have been written recently publicizing this issue [12, 29, 31]. This clear case of racial bias in everyday technology leads to the questions: how is this possible? And what is being done about it?

Automatic faucets and soap dispensers typically work by sending an infrared beam toward the sink. When a person's hands enter the beam, some of the beam is reflected back to the sensor, and it knows to allow water or liquid soap to flow. The problem is that darker skin reflects less of the infrared beam than lighter skin, so the sensor can fail to detect the presence of a darker hand. This problem has been known since the early 1990's [39]. Faucets can be adjusted during installation for the range of the beam [2, 43], from typically 2-10 inches, with a default value of 6 inches, but nowhere do

these major brands of faucet allow adjustment of the sensor sensitivity for darker skinned users. Consumer literature only shows Caucasian people [44]. In the troubleshooting guide, one faucet maker says if the faucet doesn't respond to someone within its sensor range, they only suggest the battery may need replacement [34]. Nevertheless, faucets sold in India have been adjusted to work with darker skin tones [30], they made the faucet more responsive to decreased signal reflected from the darker-skinned users. This adjustment could be made easily during installation in response to user demographics elsewhere, yet neither Sloan or American Standard have implemented these solutions. Not only are automatic faucets and soap dispensers, which were intended to improve hygiene [6], of questionable effectiveness at reducing bacteria, and are harder to clean [46], their solvable usability problem for minority users has remained unaddressed for decades [39].

Apple iWatch

Another example of sensor technology failing for dark-skinned people is the pulse monitor function in Apple Watches (see Figure 2). A medical pulse oximetry (pulseox) meter measures the percent of oxygen capacity in blood (which is near 100% for healthy people), however someone figured out how to determine one's pulse from a slight rise which occurs in pulseox with each heartbeat [41]. Apple has taken a pulseox and removed the oxygen measurement and just used it to measure one's pulse, e.g. during exercise, and uses beams of green and infrared light which are reflected into photodiode sensors [3].

Within days of the release there were reports pulse measurement did not work if the subject had some shades of red or black tattoos on their arms. This had a

secondary effect of making the watch deactivate Apple Pay because it thinks it lost contact with the user's skin, [51]. Apple confirmed that tattoos could confuse the watches "Dark inks, such as red, blue and black, are reportedly more prone to obscuring heart rate readings, given how colors play into the device's sensor system" [3].

Figure 3. "My friend's not a Gorilla." Screenshot of Alciné's public Twitter feed. (Image Credit: Rainbow Lab)

Before long, people realized that some shades of darker skin were not being accurately measured, and Taylor [50] suggests that changing the sensors to use yellow light could help fix the problem, but Apple has not done so. Apple acknowledges the problem with tattoos, but has not commented on the racial implications. They

recommend using an external Bluetooth chest strap for more accurate pulse readings [3], however this is impractical for 24/7 use, and places an additional financial burden on minority users.

In both the case of the automatic faucets and the Apple iWatch we see examples of sensors that do not function appropriately when used by non-White users. In both incidents a technical solution exists to address the disparity, but in both cases manufacturers have failed to directly address claims of racism.

Algorithms
"My Friend's Not a Gorilla."

Jacky Alciné, a former Google intern, tweeted to this in June of 2015 in response to Flickr and Google labeling

images of black people in their photo app as "ape" and "gorilla" (see Figure 3). This fiasco is a reminder of the white skin bias that considers light-skin tones as the ideal standard to be pictured [36]. Google apologized, "We're appalled and genuinely sorry this happened [36]. This might partially indicate the under-representation of minorities in Silicon Valley. However, Google's chief architect for social, Yonatan Zunger, said it is rather due to the way machines recognize faces or more specifically the way algorithms learn. Zunger elaborated that, in this case, the algorithm was fooled by some aspect of an image's patterns. The algorithm will learn from getting feedback from users. Nevertheless, while the algorithm may correct itself overtime, we like Alciné argue the situation could have been prevented by testing with more racially diverse data sets [22].

"No, I did not blink... I'm just Asian!"
Face detection is an intelligent technology that aims at making photography more convenient and ensuring best results. One of its popular features is autofocus where the camera detects the face to define the focus of the photo. In addition, some cameras with a face detection function can warn the photographer when someone in the frame blinks. While tackling face detection two incidents have shown how technology failed to embrace race diversity.

In the first case, Joz Wang, an Asian American blogger, has got her mom a Nikon Coolpix S630 for Mothers' Day. While taking pictures for the family, the camera kept prompting "Did someone blink?", although everybody's eyes were open. Wang's camera had difficultly detect her and her family's eyes as open because it "was incapable of distinguishing her narrow eye from a half-closed one. An eye might only be a few pixels wide, and a camera that's down sampling the images can't see the necessary level of detail" [33].

The second case is a viral YouTube video with 3 million views casting light on the bias of HP Pavilion laptop cameras towards dark skinned people. In the video, an African American man and his white female co-worker tested the face detection and tracking functions of the built-in webcam on an HP Pavilion laptop. The HP laptop detected the white colleague's face and followed her as she moves within the frame, whereas it never detected the African American's face. Finally, when he is in frame it stops detecting both faces. The African American man concludes: "I welcome responses to why the HP webcam does not pick up Negros" [58].

Both Nikon and HP state they are working to improve their product [33], however both issues demonstrate significant usability gaps for minority users.

Interface Design
Video games and race

Video games have been sparking plenty of criticism as they are claimed to promote racism and cultivate and intensify racist stigmas. They are found to "represent a powerful instrument of hegemony, eliciting ideological consent through a spectrum of white supremacist projects" [22]. Further, one study found over two-thirds of the main characters were white (68%), followed by Latino (15%) and black (8%) [8]. An analysis of games by Williams et al [56] found a systematic over-representation of males, white and adults and a systematic under-representation of females, Hispanics, Native Americans, children and the elderly.

For instance, one of the most popular racist video games is Resident Evil 5 where a well-muscled white American man shoots masses of brainless diseased Africans as soon as he gets to see them and even before metamorphosing into monsters. Other popular games like Uncharted and the God of War all revolve around the same story of a strong white man shooting non-whites that turn into savages. While there might be very few enemies to the game's hero that are white, they are always visibly monstrous. In general, Black personas are rarely present as prominent characters. In Final Fantasy VII, the only black persona is usually cruel, speaks poor English, and follows queer stereotypes. The only romantic black character in Mass Effect cheats, makes another woman pregnant and his father is a criminal [37]. Call of Duty 4 portrays Middle Easterners as brutal

Race	Female	Male
Total	1.6mil	4mil
Hispanic or Latino	114,000	227,000
Asian	286,000	680,000
American Indian or Alaskan Native	3,000	7,000
Black or African American	108,000	159,000
Native Hawaiian or Pacific Islander	2,000	9,000
White	1.1mil	2.86mil

Table 1. Employed Scientists & Engineers by Race & Gender. Abridged version from [26].

savages all acting irrationally. Almost all Arabs and Muslims in games are portrayed as insane lunatics who care only about war. In Killzone, the character Rico Velasquez is dark skinned but his name is clearly Latino. He is depicted as "the most ignorant and foul-mouthed character in the Killzone" [16]. With depictions such as these we have to agree with Griffith's study, that video games are perpetrating racism [15].

Emojis

The computer-mediated communication (CMC) mode imposes conversational constraints on users' language owing to the lack of the contextual cues that are richly available in the face-to-face communication. Thus, emojis and emoticons are often utilized to circumvent these limitations. In 2014, a comic interview with Sasheer Zamata [60] on NBC's Weekend Update criticizes the number of emojis representing white people, but without a single one available depicting a black person. Sasheer shared her experience using a black moon as a representation of a black skinned face. In early 2015, Apple, in conjunction with Unicode Consortium, released a new set of emojis that are said to be diverse. In the iOS 8.3 update, these emojis allow for skin color customization. The new emoji have quickly been appropriated, and many have no doubt find them liberating, but one problem that has arisen is that they are being used to make racist comments on social media, and they are also used to insert questions of race in texts and tweets, for instance Clorox's campaign "New Emoji's are alright but where's the bleach" was critiqued for racist undertones [54]. Further, the "Nightly Show with Larry Wilmore" discussed how people have found themselves compelled to identify themselves with a matching emoji skin color as using another emoji color

can be insulting [40]. In the literature, emoticons are found to have multiple key functions; they regulate the interaction, disambiguate the message, express affect, strengthen a message, and convey humor, mitigate or aggravate disagreement and influence negative feedback acceptance. Above all, they contribute to enable receivers to correctly understand the level and direction of emotion, attitude, and attention expression [24]. Thus emoticons are contextually situated and therefore, the interpretation of an emoticon depends on their contexts. To our knowledge, no research indicated a necessity for emojis to represent race or skin color. There is little known about the process the Unicode consortium used to debate the inclusion of the new icons, nor whether representatives of the minority communities (e.g. NAACP) were contacted. Yet, we see how these icons have been appropriated to be explicitly racist [54]. Given the social impact it is clear such decisions need to be made with greater care.

Black Lives Matter, so do Black Technologies
This paper's roots lie in a response to the "Black Lives Matter" movement, but the six examples we have provided thus far show how mainstream technologies are less usable for a range of underrepresented minorities. Automatic faucets and the Apple iWatch's sensors were not properly calibrated for minority users. The viral discussion that ensued regarding image detection to classify photographs and checking for blinking eyes both show how algorithms can be biased through design decisions or a lack of a diversity in the calibrating dataset. Finally, minority emojis and video games show how poor design decisions can perpetuate racism. We contend that technologies can have race, and as such we as HCI practitioners to go beyond Universal Design and explicitly question the role of race

in our technological creations and in our corporate organizations.

Representation in IT
As demonstrated in Table 1 many minorities are severely underrepresented. Hiring more individuals of color would allow design teams opportunity to check bias and privilege [26]. However, a critical mass of individuals would need to be established in an organization to avoid putting developers and designers in the position of acting as the sole spokesperson for their entire demographic.

User Research
While training and hiring a more diverse population is a long term goal, steps for engaging in more diverse user research can be more immediate. Barkhuus and Rode previously published statistics showing women were grossly underrepresented in user research [4] and in that data set the race of participants was almost never discussed. We need to ensure minorities are represented adequately in our user testing population. Companies often base user research profiles on marketing data which privilege higher socio-economic status users over those for whom purchasing a given technology may be a stretch. This means there is a tension between the political agenda of racial equity and market forces. Yet, the ACM code of ethics states we must "Be fair and take action not to discriminate" [1], so as HCI professionals we must advocate for racially balanced study participants.

Further, conducting such studies may themselves be logistically difficult. The last author while attempting to recruit a racially diverse sample of families for her ethnographic dissertation work found the nearest

racially diverse community 44 miles away—several hours each way in rush hour traffic given a desire to do fieldwork in the evenings after work when families were home. Distance, combined with childcare issues (African Americans being statistically more likely to be have single-parent homes), and a tendency to hold multiple jobs can make recruiting individuals for lab based studies even more difficult. Finally, Caucasian fieldworkers, as obvious outsiders, often experience issues with rapport and that impacts their ability to collect good data. These issues need to be overcome, and we must as a community develop strategies to collect the data needed for diversity.

Value Sensitive Design (VSD)
One way to establish this dialogue among all members of our community is to recognize that we are all defined by some sort of privilege, as recognized by intersectionalist feminist arguments [16, 47, 55]. Privilege, whether inadvertent or intentional, creates spaces for bias to exist and thrive. bell hooks rightly observed that, "Acknowledgment of racism is significant when it leads to transformation" [16, p56]. Therefore, reflexivity is one way in which we can question our own privilege and bias in order to engage with VSD as a racially and culturally sensitive practice that recruits multiple perspectives to STEM [18, 41, 48, 49].

Searle and Kafai have observed that,
"Discussions around broadening participation often assume that boys and men are dominant in computing circles, effectively erasing the experiences of males from non-dominant racial and ethnic groups within a given context" [41, p31].
As it is crucial we understand the design fictions surrounding the Straight White Male, we propose that we might expand this discussion to the intersections

between gender and race, as both types of privilege and bias are often related to one another. Race and culture are inextricably bound to social constructions of user groups within HCI; we ignore these crucial components at our peril. Sun has indicated that "Insensitive design recommendations could end up strengthening the cultural essentialism designers want to leave behind in this increasingly globalized world" [48; p61]. In order to clarify the enormous impact of how intersectionalist approaches to design inform the future of HCI, Sun and Hart-Davidson [49] caution against even inadvertent biases, which can emerge during the design process. They ask, "How might design features that aim to improve efficiency and effectiveness end up hurting a user's feelings and morale, distancing him from his own community, isolating her from other users, and/or labeling him as "other"?" [49]. As Sun and Hart-Davidson inquire about how to critically understand these conceptual categories, located within the context of culturally responsive design through a discursive lens, we argue that design practices cannot be separated from the dialogic standards that inform the design fictions of how we perceive race, gender, and privilege within HCI. Reflexivity is a critical tool for HCI researchers who wish to consider race, gender, and privilege. It allows for an intersectionalist approaches to design (VSD, and racially sensitive), because it requires us to explore both our own privilege as scholars, as well as the biases of the communities we study [33]. We call for additional reflexive research trying to illuminate these issues.

Conclusion

This paper began when a few brave undergraduate students of color (including the first author) having read Winner [57] and motivated by the Black Lives Matter movement chose to try to explain their everyday experiences of technology in a final term paper. Professionals in the STEM fields discuss how minority students are socially isolated, but there has been little discussion to date as to how the technologies themselves are just less usable for all underrepresented minorities. The members of the Rainbow Lab, recognizing the significance of the contribution, wanted to work with this undergraduate to make sure this work was shared with the HCI community.

The initial paper showed a passionate sense of vulnerability, incredulity, as well as, righteous and justified indignation. As the more senior Rainbow Lab members worked to make this paper more in keeping with dispassionate academic traditions, we struggle with authentically representing this tone. So here as we close we again want to draw attention to the personal effect this isolation has on the lives of young underrepresented minorities. We, the technology community, are othering (making people feel excluded by not being part of a dominant social group based on race, gender etc.) many young underrepresented minorities[2], sending a not-so-subtle signal that technology is not for them - it is for "Whites Only" [27]. This is a heartbreaking predicament. We hope this paper and its case studies raise awareness, and that we have begun a discussion of best design practices that are racially inclusive. We believe whole-heartedly that the HCI community deeply feels a need for inclusive design, and that we will rise and meet this challenge.

---

[2] Of course, this experience of exclusion may not be felt by all underrepresented minorities, and we do not wish to claim these opinions represent the views of our colleagues that are themselves from underrepresented minorities.

References

1. ACM. 1992. ACM Code of Ethics. (16 October 1992). Last retrieved January 13, 2016. https://www.acm.org/about-acm/acm-code-of-ethics-and-professional-conduct

2. American Standard. 2015. Installation Instructions. Last retrieved January 13, 2016. http://www.americanstandard-us.com/assets/documents/amstd/install/Install_2151.pdf

3. Apple, 2015. Your heart rate. What it means, and where on Apple Watch you'll find it. Last retrieved January, 13, 2016. https://support.apple.com/en-us/HT204666

4. Louise Barkhuus and Jennifer A. Rode. 2007. From Mice to Men - 24 Years of Evaluation in CHI. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07). ACM, New York, NY, USA. DOI=http://dx.doi.org/10.1145/1240624.2180963

5. A.J. Berg, and Merete Lie Feminism and Constructivism: Do Artifacts Have Gender? *Science, Technology and Human Values*, 20, 3 1995), 332-351.

6. Irus Braverman. 2010. Governing with Clean Hands:Automated Public Toilets and Sanitary Surveillance. *Surveillance & Society*, Vol. 8, No. 1, pp. 1-27, 2010; Buffalo Legal Studies Research Paper No. Paper No. 2011-001. Available at SSRN: http://ssrn.com/abstract=1680477

7. C.C. Cain., & E.M Trauth. (2013, May). Stereotype threat: the case of black males in the IT profession. In Proceedings of the 2013 annual conference on Computers and people research (pp. 57-62). ACM.

8. K. Dill, D. Gentile, W.Richter and J. Dill. (2005) 'Violence, Sex, Race and Age in Popular Videogames', in E. Cole and J. Daniel (eds) Featuring Females: Feminist Analysis

9. Tom Etter. 1985. The quantum and the homunculus (session QA1 addition). In Proceedings addendum of the 1985 ACM annual conference on The range of computing : mid-80s perspective: mid-80s perspective (ACM '85). ACM, New York, NY, USA, 4-7. DOI=http://dx.doi.org/10.1145/324409.324411

10. Batya Friedman & Helen Nissenbaum. 1997. Bias in Computer Systems. In Human Values and the Design of Computer Technology. Friedman, eds. Cambridge UP: Stanford, CA p21-40

11. K. Fuller, L. Kvasny, E.M.Trauth, & K.D. Joshi, (2015, June). Understanding Career Choice of African American Men Majoring in Information Technology. In Proceedings of the 2015 ACM SIGMIS Conference on Computers and People Research (pp. 41-48). ACM.

12. Feliks Garcia. 2015. 8 Times Technology Proved to Be Racist; Modern Tech has a history of privileging whiteness. *NTR SCTN.* Last retrieved January 13, 2016. http://ntrsctn.com/science-tech/2015/11/racist-technology/

13. Lindsay D. Grace, 2012. Critical gameplay: designing games to critique convention. In Proceedings of the 20th ACM international conference on Multimedia (MM '12). ACM, New York, NY, USA, 1185-1188. DOI=http://dx.doi.org/10.1145/2393347.2396414Ronald E. Anderson. 1992. Social impacts of computing: Codes of professional ethics. *Soc Sci Comput Rev* 10, 2: 453-469.

14. Edel Greevy and Alan F. Smeaton. 2004. Classifying racist texts using a support vector machine. In Proceedings of the 27th annual international ACM SIGIR conference on Research and development in information retrieval (SIGIR '04). ACM, New York, NY, USA, 468-469. DOI=http://dx.doi.org/10.1145/1008992.1009074

15. M. Griffiths. (1999). Violent video games and aggression: A review of the literature. Aggression and violent behavior, 4(2), 203-212.

16. Chad Hunter. 2012. The 15 Most Stereotypical Characters In Video Games. Retrieved from http://www.complex.com/pop-culture/2012/05/the-15-most-stereotypical-characters-in-video-games/

17. bell hooks. (1984) Feminist Theory: From margin to center. Boston: South End Press.

18. Yasmin Kafai, Kristin Searle, Crîstobal Martinez, and Bryan Brayboy. 2014. Ethnocomputing with electronic textiles: culturally responsive open design to broaden participation in computing in American Indian youth and communities. In Proceedings of the 45th ACM technical symposium on Computer science education (SIGCSE '14). ACM, New York, NY, USA, 241-246. DOI=http://dx.doi.org/10.1145/2538862.2538903

19. Joshua Krisch. (2015) Last retrieved January 13, 2016. http://thegrio.com/2015/05/01/apple-watch-dark-skin/

20. Vanessa Kitzie and Debanjan Ghosh. 2015. #Criming and #alive: network and content analysis of two sides of a story on Twitter. In Proceedings of the 78th ASIS&T Annual Meeting: Information Science with Impact: Research in and for the Community (ASIST '15). American Society for Information Science, Silver Springs, MD, USA, , Article 41 , 10 pages.

21. Nicholas LaLone. 2014. Values levers and the unintended consequences of design. In Proceedings of the companion publication of the 17th ACM conference on Computer supported cooperative work & social computing (CSCW Companion '14). ACM, New York,

NY, USA, 189-192. DOI=http://dx.doi.org/10.1145/2556420.25565

22. Wendy Lee. How tech's lack of diversity leads to racist software. *SF Gate*. July 22, 2015. Last retrieved January 13, 2016. http://www.sfgate.com/business/article/How-tech-s-lack-of-diversity-leads-to-racist-6398224.php

23. D. Leonard (2003). Live in your world, play in ours: Race, video games, and consuming the other. *Studies in Media & Information Literacy Education*,*3*(4), 1-9.

24. S.-K. Lo. (2008). The nonverbal communication functions of emoticons in computer-mediated communication. *CyberPsychology & Behavior*, 11(5), 595-597.

25. B. Sri Nandhini and J. I. Sheeba.2015. Cyberbullying Detection and Classification Using Information Retrieval Algorithm. In *Proceedings of the 2015 International Conference on Advanced Research in Computer Science Engineering & Technology (ICARCSET 2015)* (ICARCSET '15). ACM, New York, NY, USA, Article 20, 5 pages. DOI=http://dx.doi.org/10.1145/2743065.2743085

26. National Science Foundation. 2015. Women, Minorities and Persons with Disabilities in Science and Engineering, Data Table. Last retrieved 13 January, 2016. www.nsf.gov/statistics/wmpd/

27. Teej Meister. 2015. Whites Only? Video. (September 2, 2015). Last retrieved January 13, 2016. https://www.youtube.com/watch?v=WHynGQ9Vg30

28. H. S. Mirza, (ed) (1998). Black British feminism: A reader. London: Routledge.

29. Kara O'Neil, 2015. 'Racist' tap will only give out soap to people with white skin thanks to 'discriminative' sensor. *Mirror.* (3 September 2015). Last retrieved January 13, 2016. http://www.mirror.co.uk/news/weird-news/racist-tap-only-give-out-6375873

30. Anupum Pant. 2015. Racist Sinks. *AweSci-Science Everyday.* (6 September 2015). Last retrieved January 13, 2016. http://awesci.com/racist-sinks/

31. Max Plenke. 2015. The Reason This "Racist Soap Dispenser" Doesn't Work on Black Skin. (September 9, 2015). Last retrieved January 13, 2016. http://mic.com/articles/124899/the-reason-this-racist-soap-dispenser-doesn-t-work-on-black-skin#.IGwMF5QGS

32. Jennifer A. Rode. 2011. A theoretical agenda for feminist HCI. Interact. Comput. 23, 5 (September 2011), 393-400. DOI=http://dx.doi.org/10.1016/j.intcom.2011.04.005

33. Jennifer A. Rode. 2011. Reflexivity in digital anthropology. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '11). ACM, New York, NY, USA, 123-132. DOI=http://dx.doi.org/10.1145/1978942.1978961

34. Adam Rose. 2010. Are face-detection cameras racist Retrieved from http://content.time.com/time/business/article/0,8599,1954643,00.html

35. Alyssa, Rosenberg. Five things Stephen Colbert got right in his response to #CancelColbert *Washington Post*. (April 1 2014). Last retrieved 13 January 12, 2016. https://www.washingtonpost.com/news/act-four/wp/2014/04/01/five-things-stephen-colbert-got-right-in-his-response-to-cancelcolbert/

36. L. Roth. 2009. Looking at Shirley, the ultimate norm: Colour balance, image technologies, and cognitive equity. *Canadian Journal of Communication*, 34(1).

37. J.F. Sargent. 2012. 5 Prejudices That Video Games Can't Seem to Get Over. Retrieved from http://www.cracked.com/article_19922_5-prejudices-that-video-games-cant-seem-to-get-over.html

38. John Scalzi Straight White Male: The Lowest Difficulty Setting There Is. *Kotaku*.(May 17, 2012). Last retrieved January 13, 2016.

http://kotaku.com/5910857/straight-white-male-the-lowest-difficulty-setting-there-is

39. Nick Schulz. 2006. The Crapiest Invetion of All Times; Why the auto-flushing toilet must die. *Slate.* (March 13, 2006). Last retrieved January 13, 2016. http://www.slate.com/articles/arts/gizmos/2006/03/the_crappiest_invention_of_all_time.single.html

40. Danny Schwartz. Ty Dolla $ign Debates Black Emojis On The Nightly Show. *Hnhh: Hot New Hip Hop.* (November 19, 2015). Last retrieved January 13, 2016. http://www.hotnewhiphop.com/ty-dolla-sign-debates-black-emojis-on-the-nightly-show-new-video.36008.html

41. Kristin A. Searle and Yasmin B. Kafai. 2015. Boys' Needlework: Understanding Gendered and Indigenous Perspectives on Computing and Crafting with Electronic Textiles. In Proceedings of the eleventh annual International Conference on International Computing Education Research (ICER '15). ACM, New York, NY, USA, 31-39. DOI=http://dx.doi.org/10.1145/2787622.2787724

42. Sloan. 2015a. Sloan BAYSY Series Faucet EFX-2XX-X0X-0XXX. Last retrieved January 13, 2016. http://www.sloanvalve.com/Specifications/EFX-2_Series_Faucets.pdf

43. Sloan. 2015b. Sloan BAYSY Series Faucet Active IR FAQs. Last retrieved 13 January 12, 2016. http://www.sloanvalve.com/Maintenance_Guides/IR_FAQs.pdf

44. Sloan. 2015c. Sloan BAYSY Series Faucet Brochure. Last retrieved January 13, 2016. http://www.sloanvalve.com/Brochures/BASYS_Brochure1.pdf

45. Sandhya Somashekar and Steven Rich. Final tally: Police shot and killed 986 people in 2015. Washington Post. (6 January, 2016).Last retrieved 13 January 12, 2016. https://www.washingtonpost.com/national/final-tally-police-shot-and-killed-984-people-in-

2015/2016/01/05/3ec7a404-b3c5-11e5-a76a-0b5145e8679a_story.html

46. Emily Sydnor, R. M., Gregory Bova, Anatoly Gimburg, Sara E. Cosgrove, Trish M. Perl and Lisa L. Maragakis. (March 2012). Electronic-Eye Faucets: Legionella Species Contamination in Healthcare Settings. *Infection Control & Hospital Epidemiology* / Volume 33 / Issue 03 / pp 235-240

47. Gayatri Chakravorty Spivak. "Can the Subaltern Speak?" Marxism and the Interpretation of Culture. Ed. Cary Nelson and Lawrence Grossberg. Urbana: U of Illinois P, 1988. 271-313.

48. H. Sun. 2015. Operationalizing culture with design cards: Translating critical knowledge into provocative insights. Rhetoric, Professional Communication, and Globalization, 7(1), 61-78.

49. H. Sun, & W.F. Hart-Davidson. (2014, April). Binding the material and the discursive with a relational approach of affordances. In Proceedings of the 32nd annual ACM conference on Human factors in computing systems (pp. 3533-3542). ACM.

50. Dan Taylor. 2015. Whoops: Apple Watch may not work for black people. (April 30, 2015). Last retrieved 13 January 12, 2016. http://natmonitor.com/2015/04/30/whoops-apple-watch-may-not-work-for-black-people/

51. JC Torpey. 2015. Apple Confirms Apple Watch Problems with Tatoos. *Inquisitor.* (May 6 2015). Last retrieved January 13, 2016. http://www.inquisitr.com/2070216/apple-confirms-apple-watch-problems-with-tattoos-dark-solid-ink-blocks-heart-rate-sensors/

52. E. M.Trauth, C. C. Cain, K. D. Joshi, L. Kvasny, & K. Booth (2012, May). Embracing intersectionality in gender and IT career choice research. In Proceedings of the 50th annual conference on Computers and People Research (pp. 199-212). ACM.

53. E. M. Trauth, C.C. Cain , K. D. Joshi,, Kvasny, L. Kvasny, &, K. Booth (2012, February). Understanding underrepresentation in IT through intersectionality. In Proceedings of the 2012 iConference (pp. 56-62). ACM.

54. Paige Tutt. 2015. Apple's new diverse emoji are even more problematic than before. *Washington Post*. April 10, 2015. Last retrieved January 13, 2016. Retrieved from http://www.washingtonpost.com/posteverything/wp/2015/04/10/how-apples-new-multicultural-emojis-are-more-racist-than-before/

55. A. Walker. 1984. In search of our mothers' gardens: Womanist prose. San Diego: Harcourt Brace Jovanovich.

56. D.Williams, N. Martins, M. Consalvo, & J. D. Ivory (2009). The virtual census: Representations of gender, race and age in video games. New Media & Society, 11(5), 815-834.

57. Langdon Winner. 1999. Do artifacts have politics? In *The Social Shaping of Technology* (2nd. ed.), Donald MacKenzie and Judy Wajcman (Eds.). Open University Press, Buckingham, UK, 28-40.

58. Wanda Zamen. 2009. HP computers are racist. [Video file]. Retrieved from https://www.youtube.com/watch?v=t4DT3tQqgRM

59. Young, I.M., 2005. On Female Body Experience: Throwing Like a Girl and Other Essays. Oxford UP, Oxford, UK.

60. Sasheer Zamata. 2014. Weekend Update. Saturday Night Live. (Season 40, 2014). Retrieved from http://www.nbc.com/saturday-night-live/video/weekend-update-sasheer-zamata/2834507

Commentary

For alt.chi paper
Does Technology Have Race?

Phoebe Sengers
Information Science and Science &
Technology Studies
Cornell University
sengers@cs.cornell.edu

I am really happy that these topics are being broached at CHI. The primary contributions of the paper are (1) to bring race to our attention as an important factor in interaction design (2) to highlight and bring together for discussion specific interaction problems that arise because of the tendency of interaction design to try to be 'race-blind' and in so doing accidentally (but structurally) become 'blind to their effects on people of non-white race.' These examples are well-chosen, clearly explained, and heart-breaking. I appreciated the discussion at the end about the passion and emotions that underlie the paper - this was well-done and well-placed.

These suggestions were made to improve the paper and, as commentary, may be useful in guiding further work in the area.

1) Include social theory in literature review/ background. The authors mention, I believe correctly, that there are few sources in HCI to draw from. It is clear, however, that the authors are drawing on specific social/critical theories of race and marginality which are largely unknown in the HCI community (e.g., feminist intersectional theory; I know what this is but I am guessing most of the potential readers would not). It would be helpful to give a brief overview near the beginning of the theories being drawn on to make the argument, with pointers to the literature for those interested in knowing more.

2) Narrow the frame for what is discussed. While the topic of the paper from the introduction is about race in HCI, the actual empirical examples used are specifically about interface design issues that arise from having failed to take dark skin into account. This is a narrower set of issues than the broader questions about race in HCI, which might include, for example, examining why there so few underrepresented minorities acting as HCI practitioners, and issues that come up for underrepresented minority communities which are marginalized in HCI for reasons other than skin color. For example, Andrea Grimes Parker has done work highlighting how the collectivist orientation of minority communities tends to fit poorly with the model of individual improvement underlying persuasive health.

Note that it is not a problem for the paper that the examples are so narrowly focused, because it would not be possible to do justice to the entire question in 11 pages anyway. It's also not a problem that those examples are placed within the context of the broader question. But the paper would benefit from starting with the big question in the introduction and then saying, "We'll look at this from a more specific lens," bringing up the empirical examples, analyzing them specifically with regard to the issues relevant here, then moving out at the end to say "This is a beginning, it only scratches the surface of issues around technology and race."

3) More analysis of the empirical examples. I think it would be helpful after describing the examples to go back and show the range of blindnesses they revealed, such as: (1) Lack of diversity in user studies (as mentioned) and (2) Lack of structural motivation in the industry to address issues even after they surface.