The Integration of Diversity with Robotics Start-Ups

By Chinwe Ekenna and Lydia Tapia

To develop products that resonate with all potential customers, new robotics start-ups are embracing competence and excellence while promoting diversity and inclusiveness. Although sometimes accused of having competing priorities, groundbreaking roboticists have used best practices to emphasize all of these priorities to ensure the market ubiquity of the cutting-edge systems they are developing. We interviewed some of these groundbreakers (see Figure 1), the founders of three robotics venture start-ups, Mayfield Robotics, Root Robotics, and Zyrobotics, for *IEEE Robotics and Automation Magazine* (*RAM*).

Mayfield Robotics is the maker of Kuri, the world's most adorable home robot. Born out of the Bosch Start-Up Platform, the company is a wholly owned subsidiary of Robert Bosch North America Corporation.

Root Robotics is an educational platform that teaches children to program, even as the robot drives on whiteboards with magnet wheels, senses colors, and draws (see Figure 2). Root Robotics provides a fun platform that includes programming challenges to learn logic through art and games.

Zyrobotics produces children's educational products that help change how kids learn, specifically taking into consideration the limitations that children with disabilities could face (see Figure 3). Zyrobotics has recently

Figure 1. The start-up cofounders (clockwise from upper left): Radhika Nagpal (Root Robotics); Ayanna Howard (Zyrobotics); and Stephanie Lee, Kaijen Hsiao, and Sarah Osentoski (Mayfield Robotics).
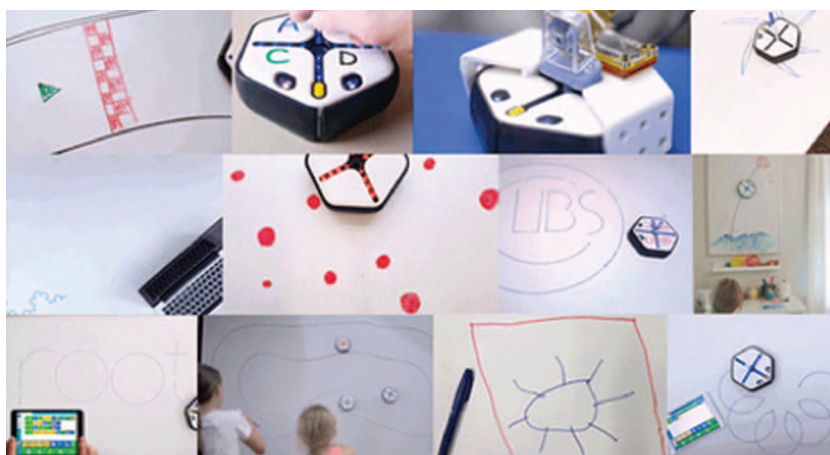
Figure 2. Some of the Root Robotics tools for teaching programming.

released its first suite of mobile therapy and educational products for children with differing needs.

Kaijen Hsiao is the chief technology officer and Sarah Osentoski is the chief operating officer of Mayfield Robotics. Hsiao's focus has been working on the development of Kuri's navigation/mapping and perception capabilities and on features such as cameras, sensors, processors, and mechanisms for expression and movement. Osentoski is the driving force behind Mayfield's development and is extremely dedicated to cultivating an environment where creativity, curiosity, and ingenuity thrive. Together with Stephanie Lee, director of mechanical engineering at Mayfield Robotics, they have worked to develop Kuri's mechanical hardware.

Radhika Nagpal cofounded Root Robotics with Ziv Dubrovsky and Raphael Cherney at Harvard's Wyss Institute for Biologically Inspired Engineering. Nagpal is a professor of computer science at the John A. Paulson School of Engineering and Applied Sciences and is a colead of the biorobotics platform at the Wyss Institute. She was named by the journal *Nature* in 2014 as one of the year's top ten scientists. She is a strong advocate for an inclusive culture in science and is passionate about gender respect, equity, and diversity in academia.

Ayanna Howard is a cofounder of and chief technology officer for Zyrobotics, LLC, which is currently licensing technology derived from her research. Howard is the Linda J. and Mark C. Smith professor and chair of the School of Interactive Computing at the Georgia Institute of Technology. She also holds a faculty appointment in the School of Electrical and Computer Engineering, where she functions as the director of the Human–Automation Systems Lab. In 2015, she founded and now directs the US\$3 million traineeship initiative in health-care robotics and functions as the lead investigator on the National Science Foundation's undergraduate summer research program in robotics. She has been recognized as one of the

Figure 3. Some of the Zyrobotics tools for children with disabilities.

23 most powerful women engineers in the world by *Business Insider*.

RAM: Can you tell me how ensuring the diversity of your team impacts your start-up's product?

Hsiao, Osentoski, and Lee: Kuri is an adorable home robot that brings a spark of life to any home and becomes part of any family. Every family is different, so it was important to us that the team working on her was diverse, bringing ideas, experiences, and backgrounds as wide-ranging as the families Kuri would become a part of.

Nagpal: Our goal as a company is to reach all kids, and that's a diverse demographic—to understand the different motivations, economic and family experiences, and school experiences is not a simple thing. What I enjoy the most about Root as a company is that everyone is bringing ideas to the table on how to reach our mission, and we often brainstorm as a group. Having diversity in the team means that we can construct better concrete ideas, because different team members notice different aspects and have different experiences. Diversity for us includes gender and ethnicity, but also where you grew up and what your family construct was. All these things affect how kids learn and how kids imagine what they will be in the future. If we want computer science to reach more broadly, then we have to broaden our thinking.

Howard: With the rapid movement to a touch-based world, people with a disability could be at a disadvantage,

and, with Zyrobotics, we develop assistive technologies to empower children with disabilities. Zyrobotics produces a lot of children-friendly products, which helps foster inclusiveness irrespective of ability, race, or gender.

RAM: What kinds of things should a start-up do to recruit and retain a talented and diverse team?

Hsiao, Osentoski, and Lee: When thinking about the culture we wanted to have at Mayfield, we placed a high importance on creating an inclusive environment where people could do their best work. When a team works in an environment where members feel supported and empowered while also being challenged, diversity proliferates. Leading by example works. Having a diverse team makes a huge difference, both in terms of our products and in terms of our culture. Bringing in diverse perspectives allows us to create a product that appeals to a wide range of people from all walks of life. In terms of company culture, we promote work–life balance and family friendliness. This keeps team members excited about the work they're doing and gives them the freedom to recharge, while preventing burnout. As a result, we've been able to attract employees with diverse backgrounds and family lives who challenge one another while simultaneously maintaining a mutual respect.

Nagpal: Start-ups are volatile because everyone who joins is risk taking, and many talented people may not be in a personal situation to take financial risk. Because of the history on race and gender in the United States, this directly affects diversity in a company. Many populations that we want to bring to the table have been excluded for centuries and are vulnerable and less able to take that risk. For that reason, I also think that those of us founding start-ups need to think bigger and take action at the public policy level; things like publicly guaranteed, affordable health care; basic income; paid maternity leave; etc. are

Figure 3. The Industrial Activities Executive Committee: (from left) Tamas Haidegger, Craig Schlenoff, Dominik Bösl, and Sebastian Bedacht.

Kwon, and Satoshi Todokoro. To learn more about our initiative, please refer to the Global Delphi Study and support us by contributing to further workshops and filling in the questionnaire circulated at a later point in time.

In a nutshell, I am looking forward to an exciting two years serving you and our Society as vice president of IAB. I encourage you to contribute to our efforts or even to the IAB itself—our meetings are always open, and we welcome any contribution! If you want to learn more or provide input, feedback, or criticism, feel free to reach out to Sebastian, Tamas, Craig, Edson, and myself (Figure 3) at any time via ras-iab@ieee.org.

the basis of the feedback from our first two workshops at ICRA and IROS 2018, we have instantiated a Senior Advisory Committee, currently involving Oussama Khatib, Henrik Christensen, Wolfram Burgard, Raja Chatila, Dong-Soo

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ways in which we create security for all people (not just the privileged class), and then, suddenly, a much more diverse population can take risks. My husband, who went to MIT [Massachusetts Institute of Technology] with me for graduate school in computer science, is now an elected public official in the city of Cambridge, and I hope that together we will be able to create an overall better environment for diversity to prosper.

Howard: People need to believe in the mission first and then advertise broadly. Be open to training, and hire based on talent versus a traditional path of experiences. Any working/start-up environment should feel inclusive and welcoming of ideas from individuals of all experiences. This involves active mentoring, providing positive reinforcement, recruiting for talent (whether raw or experienced), and being open to communication. This also means being adamant and stepping in if others don't share these same values.

RAM: What kinds of activities have helped enhance teamwork and collaboration?

Hsiao, Osentoski, and Lee: At Mayfield, we get together as an entire team twice a week to have lunch and talk about what we are working on. During our Thursday team lunch, we have a show-and-tell where members of the team share an update on what they are working on. Bringing everyone together on a regular basis promotes team building and encourages people to talk to other members of the team they may not work with on a day-to-day basis. With a team of incredibly bright people, there are endless opportunities for us to learn from each other. We believe our diverse team brings out the best in everything we do.

RAM: How important is diversity in robotics?

Nagpal: Robotics takes a different flavor in different places. For example, most of the work on swarm robotics

happened in Europe, and it was the place to be to do cutting-edge bio-inspired algorithms; I have been so inspired by many, many colleagues in Switzerland, Belgium, the United Kingdom, and so on. Then you go to Japan, and there's a very different flavor, with robots viewed in a caring way as caregivers and companions and not necessarily as competitors. In the United States, robotics takes on a flavor of industrial progress and efficiency, and also capitalism. The truth is that all these views are true and important. Without diversity, we get stuck in just one way of thinking. And I am hopeful that we can get even more participation in robotics worldwide through education and early exposure with educational robots like Root. Robots naturally appeal to kids, and each kid can put his or her own image of what he or she thinks robots should do in the future.