Imagining and Building Robots (in Capes!)

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As part of the 21st Century Robot project, a team from Intel collaborated with three middle-school students, helping them design and build their own unique robots.

In the Science Fiction Prototyping department, we've had a good amount of fun chronicling the 21st Century Robot project and the adventures of Jimmy, a robot developed through science fiction prototyping. This month I'm pleased to report that Jimmy has friends! Here's the story of how some Intel colleagues and I made three unique robots in collaboration with some extraordinary young minds.

In September 2014 Intel released the 21st Century Robot kit at the World Maker Faire in New York City. Regular readers will remember the profile of our launch last year in "Jimmy Takes Manhattan" (*Computer*, vol. 46, no. 11, pp. 95–98). To celebrate this release and show how everyone should be able to imagine, design, build, and program their own robot, we teamed up with a group of young designers to create three new robots.

Ron Bergmann, Vice President and CIO at Lehman College—City University of New York, introduced us to middle school students from the Laboratory School of Finance and Technology (MS 233) located in the South Bronx. The school has been designated an Intel School of Distinction, and the students we worked with were participating in a summer program. Yaritza Montiel (age 12), Melvin Estudillo (age 11), and Anjeliqe Martinez (age 12) worked with the 21st Century Robot team to design and develop application specifications for their own robots.

STEP 1: IMAGINING

The process started with Skype calls where I introduced the students to Jimmy the Robot and explained the project's goals. First, I asked them to imagine their robot, since this is the initial step for any great invention. To help them get started, I asked them to name their robot; the 21st Century Robot project's motto is "every robot has a name," based on our belief that each robot is an individual because it's imagined and built by an individual person.
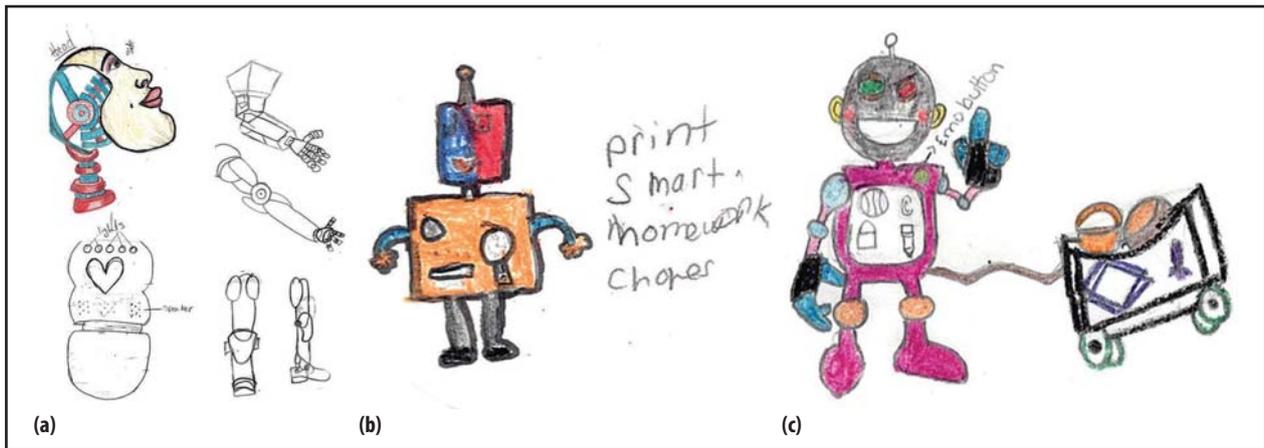
Figure 1. Student designers first named and then drew their robots. (a) Yaritza's drawing of Ritz Bitz, (b) Melvin's drawing of Callim, and (c) Anjeliqe's drawing of Jason.
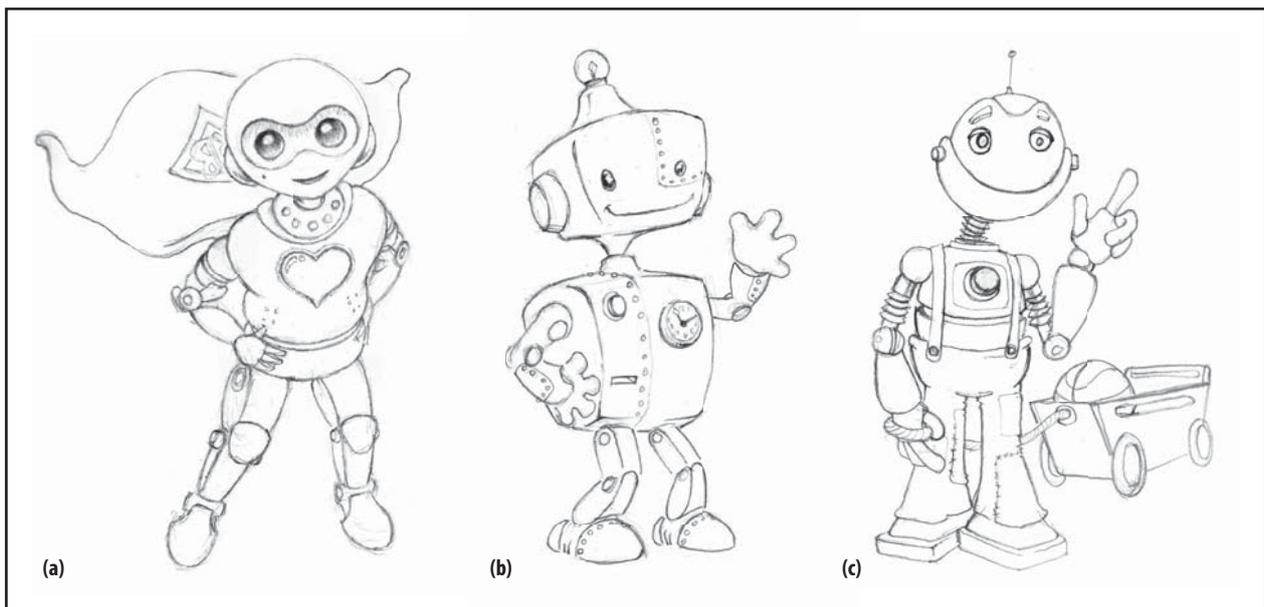

Figure 2. Illustrator Sandy Winkelman's character sketches for (a) Ritz Bitz, (b) Callim, and (c) Jason.

The students came up with Ritz Bitz (Yaritza), Callim (Melvin), and Jason (Anjeliqe).

Then I asked them to draw pictures of their robot. Figure 1 shows the results. I also posed some questions: What would make their robot an individual? What would their robot do that no one else's robot would do? What apps would they have on their robot? What would it be like to live with the robot? What would their robot do when he or she grew up? By answering these questions, the students essentially gave the 21st Century Robot team a document explaining how the robots needed to function and which applications we needed to write. The requirements varied from robot to robot, but all three students wanted both a singing app and friend app. They saw their robots not as servants but as equals.

STEP 2: BUILDING

The next step in the process was to get the drawings to Sandy Winkelman, my creative partner and illustrator of the 21st Century Robot stories. Aside from being a whiz at character design, Sandy also has a deep knowledge about what's possible when it comes to actually building robots. Sandy took the students' work and turned them into the characters shown in Figure 2.

Working with Sandy's sketches and collaborating with the entire team, our 3D designer Ron Boyle prepared the robots to be 3D printed. Each robot's exoskeleton is
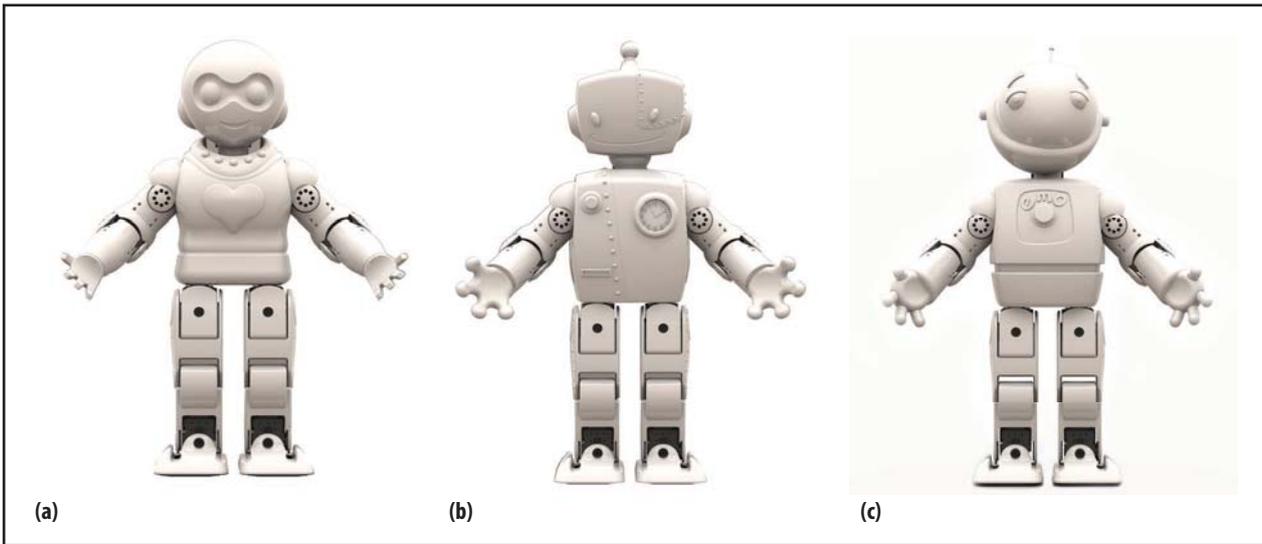
Figure 3. The 3D printed robots. (a) Ritz Bitz, (b) Callim, and (c) Jason.

made up of a series of distinct parts or shells that attach onto the endoskeleton. The endoskeleton is made up of the motors, battery, support frame, and computational intelligence that drive the robot. Using this standard endoskeleton, each of the students' designs could be attached, which resulted in the unique robots shown in Figure 3.

With our 3D printed robots ready to make their debut, we headed to New York City and the World Maker Faire. Yaritza, Melvin, and Anjeliqe shared their stories with other young minds (and some not-so-young minds) in a crowd of nearly 80,000 makers, builders, and engineers.

My favorite moment from the show was when we booted up Ritz Bitz, Yaritza's superhero robot who sings robot-themed songs. I found it an especially great achievement to have been part of a creative engineering process that developed a robot who wears a cape. When we brought Ritz out onto her platform and she began to sing "I am your robot, your only robot" to the tune of "You Are My Sunshine," a swarm of youngsters appeared from nowhere and flocked the little robot. As she gestured and continued to sing, the kids touched her fingers and cape. I hope we opened their minds to what the future of robots could look like—and maybe even turned a few of them into tomorrow's engineers.

For more information, visit www.21stcenturyrobot.com. **C**

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