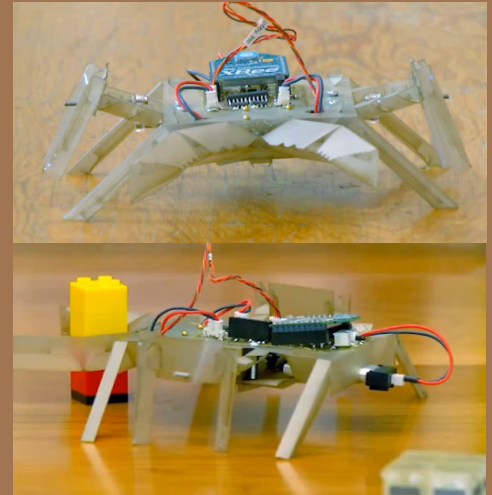
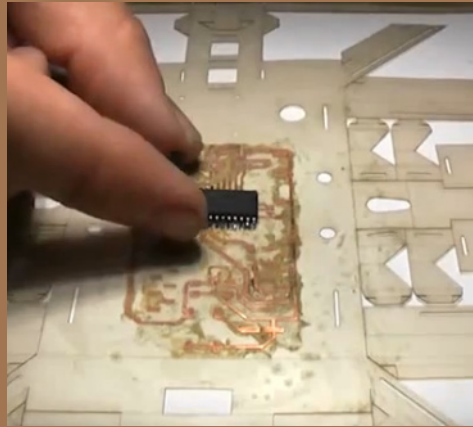




HIGHLIGHTING INNOVATIVE COMPUTER SCIENCE RESEARCH

Printing your own robot at home

Printable robots is like origami for techies with sensors and motors attached



ABOVE IMAGES

Video stills from Science Nation at http://www.nsf.gov/news/special_reports/science_nation/printablerobots.jsp.

“My goal is to make robots more capable, more autonomous. In other words to bring machines into everyday life in such a way that our lives will be improved and enhanced by these machines.”

DANIELA RUS
MIT

You’ve seen robots engaged in activities from manufacturing cars to playing soccer. What would you do if you could make your own robot? Now there are ways to make robots using plastic film sheets and an ink jet printer! **That’s right, you can make a 3-D robot from a 2-D printer!**

A robotic system is generally composed of a **chassis** that forms the structure or body of the robot, a **processor** to handle onboard programming and systems processing, **motor controllers** that take signals from the processor and direct motors to respond appropriately, as well as **input systems** such as **sensors** that provide information about the environment back to the processor.

Producing a functional robot can be expensive and take years. It involves many areas of expertise including the design of the robot itself, design of the hardware and the software, programming, and testing. How robots interact with people is also a significant part of the design process.

A new method developed by researchers funded by the National Science Foundation enable an inkjet printer to print the basic design of a robot onto plastic sheets. A copper sheet is added to the plastic one, and the circuit to control the device is printed by the ink jet printer. The circuit is embedded into the plastic, and these sheets are then cut and folded into the shape of the robot. Processors, motors, and sensors are attached, and the robot is ready to perform its tasks. This is like origami for techies—with sensors and motors attached.

In the future, this technology could make it possible for the average person to design, customize, and print a specialized robot in a matter of hours in their own home. These robots could provide assistance to those in need, help with home care, be used for education, and revolutionize manufacturing by changing how we obtain robotic systems.

Who does this stuff ?

Daniela Rus is Director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) at the Massachusetts Institute of Technology (MIT), where her research interests include distributed robotics, mobile computing, and programmable matter.

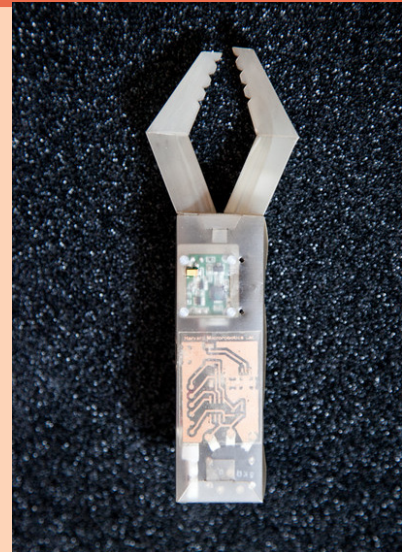
She is a 2002 MacArthur Fellow and an Alfred P. Sloan Foundation Fellow. When Dr. Rus was in high school her favorite activities were math, spending time with friends, watching *Lost in Space*, playing tennis, and spelunking.



→ | DANIELA RUS

Here are a few activities:

- 1** Try your hand at some origami models. Designs for a variety of paper models are available from professors in the Department of Computer Science at the University of Colorado, Boulder:
 - > <http://l3d.cs.colorado.edu/~ctg/projects/hypermami/JavaGami.html>
- 2** See the printable robots at <http://video.mit.edu/watch/printable-robots-12059/> and identify the components: chassis, circuits, and motor.
- 3** Discuss the following questions:
 - A** How can a satellite the size of two tennis courts be sent into space? Then take a look at how origami is being used to deploy the James Webb space telescope at <https://www.youtube.com/watch?v=vpVz3UrSsE4>.
 - B** What activities could you see a "personal" robot performing? Place the ideas into categories (e.g., health care, energy, entertainment, transportation).



ABOVE IMAGE

A robotic gripper printed and designed through the new process that aims to revolutionize the way robots are created. The gripper could be used by people with limited mobility.

Credit: Jason Dorfman, CSAIL/MIT

Learn More

Watch a video about Dr. Rus and printable robots

> http://www.nsf.gov/news/special_reports/science_nation/printablerobots.jsp

Read about this research project

> <http://ppm.csail.mit.edu/>

Additional foldable, printable robots

> <http://ppm.csail.mit.edu/projects>

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