TEO the robot shows off ironing skills

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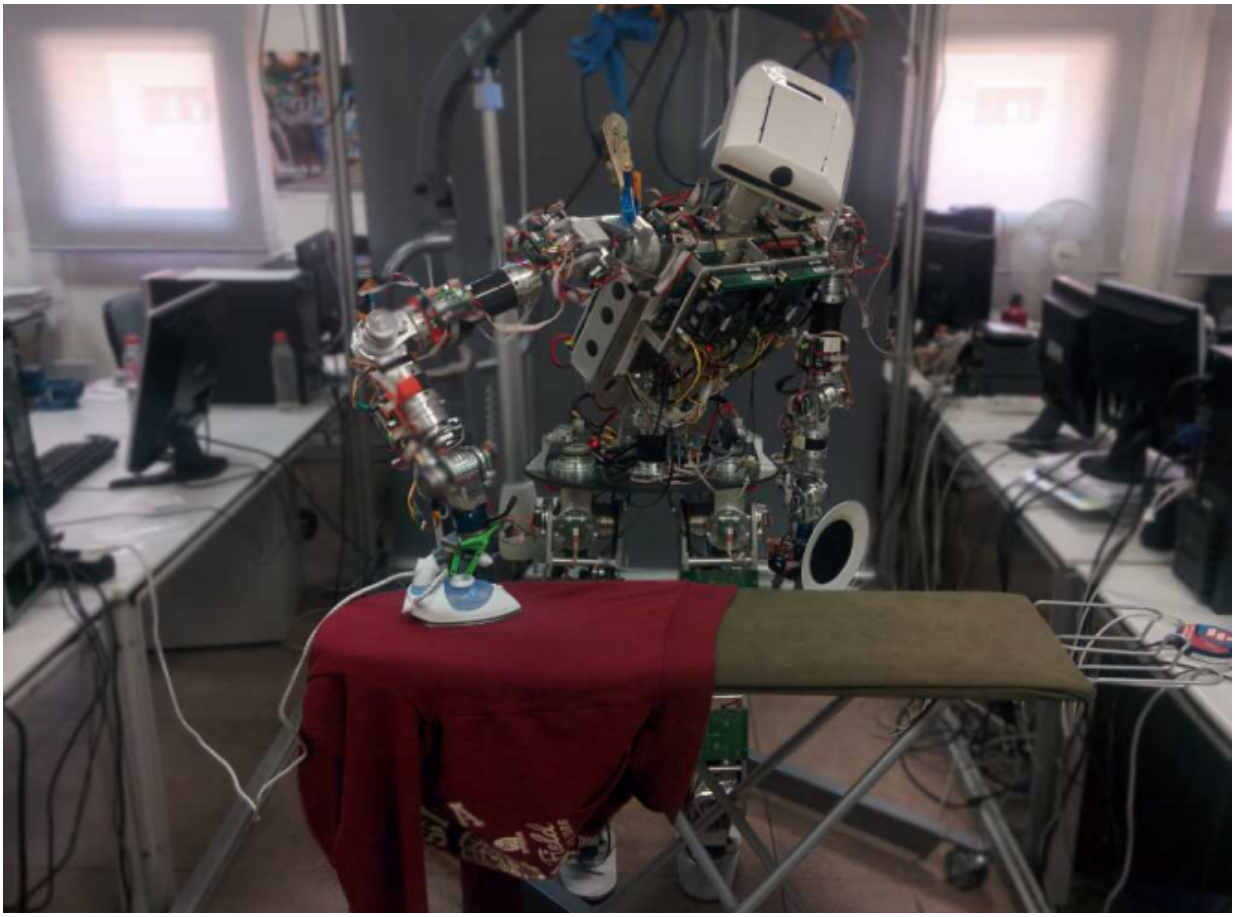

Experimental setup for full-sized humanoid robotic ironing with 3D perception and force/torque feedback. Credit: arXiv:1706.05340 [cs.RO]

(Tech Xplore)—You can see an ironing robot in a video.

Never mind that you do not even own an iron or that the last time you ironed was so long ago you cannot recall. A video showing TEO, a robot ironing, has attracted lots of attention, as it is a robot's feat and that in and of itself has merit.

Luke Dormehl in *Digital Trends* knows it: "Ironing might not be the most strenuous household chore from a human perspective, but clothes aren't an easy thing for robots to manipulate. Challenges arise from the deformability inherent in garments. Unlike rigid objects, clothes get wrinkled and entangled, so garment manipulation requires careful planning of the moving trajectory, and a constant tracking of garments' current shape on a moment-to-moment basis."

What the video shows: First, a human assistant places a clothing item—-on the ironing board. TEO, the robot, uses a camera built into its head to create a 3D representation of the item.

The robot computes a "Wrinkleness Local Descriptor"—a value of between 0 and 1 is computed for each point on the garment; 0 represents a sharp edge and 1 represents a flat spot.

TEO works out where the creases are. TEO moves the iron through the optimum trajectory to smooth out the creases. It completes this cycle until the garment is completely crease-free.

The robot first came into being at the Carlos III University of Madrid, Spain, in 2012, said Timothy Revell in *New Scientist*."

He said the team wants TEO to be able to tackle other domestic tasks, like helping out in the kitchen. "Their ultimate goal is for TEO to be able to learn how to do a task just by watching people with no technical expertise carry it out."

A paper describing their work is up on arXiv. "Robotic Ironing with 3D Perception and Force/Torque Feedback in Household Environments" is by David Estevez, Juan G. Victores, Raul Fernandez-Fernandez and Carlos Balaguer.

The paper noted that all of the authors are members of the Robotics Lab research group in the Department of Systems Engineering and Automation, Universidad Carlos III de Madrid.

As their abstract states, their approach involves joining 3D perception with force/torque sensing, with an emphasis on finding a practical solution, with a feasible implementation, in a domestic setting.

They wrote in the Conclusions and Future Work section of the paper that "Results show that this system is capable of performing successfully ironing operations over simple garments."

Note the word simple.

The authors recognized that this was a first approach to a practical robot ironing process, and it was focused on the ironing of simple garments.

Moving forward, though, they propose as future work "to extend the proposed algorithm with detection of different elements present in garments, such as buttons, zippers or other decorative elements."

More information: Robotic Ironing with 3D Perception and Force/Torque Feedback in Household Environments, arXiv:1706.05340 [cs.RO] arxiv.org/abs/1706.05340

Abstract
As robotic systems become more popular in household environments, the complexity of required tasks also increases. In this work we focus on

a domestic chore deemed dull by a majority of the population, the task of ironing. The presented algorithm improves on the limited number of previous works by joining 3D perception with force/torque sensing, with emphasis on finding a practical solution with a feasible implementation in a domestic setting. Our algorithm obtains a point cloud representation of the working environment. From this point cloud, the garment is segmented and a custom Wrinkleness Local Descriptor (WiLD) is computed to determine the location of the present wrinkles. Using this descriptor, the most suitable ironing path is computed and, based on it, the manipulation algorithm performs the force-controlled ironing operation. Experiments have been performed with a humanoid robot platform, proving that our algorithm is able to detect successfully wrinkles present in garments and iteratively reduce the wrinkleness using an unmodified iron.

Project page: roboticslab.uc3m.es/roboticslab/robot/teo-humanoid