

Robot capable of sorting through and folding piles of rumpled clothes

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Advancements in robotics have enabled humankind to automate a whole range of industrial processes, leading to more efficient and safer production and helping to expand our knowledge through scientific discovery. Why is it, however, that we can send a robot into space to take samples of Martian rocks, but still can't delegate the ironing to a household robot?

The recently completed EU-funded CLOPEMA project may finally have a solution to this problem. A [robot](#) has been developed that in tests has been shown to be capable of organising 'deformed' fabrics (i.e. sorting through a pile of crumpled clothes), and then folding each item neatly. What makes this process so complex is that clothes, unlike objects usually manipulated by robots, do not retain their shape. A new

way of receiving and processing information was required.

One of the novel challenges of this project has been designing the clothes folding [prototype robot](#) from (mainly) off-the-shelf components. A variety of components have been assembled – such as cameras and a range of other complex sensors – and integrated into one operating system. A special built-in camera for example enables the robot to see the fibres up close, and to differentiate light fabrics from dark and starchy materials from more flexible ones.

In tests, various garments were presented in a random pile on an arbitrary background, and random requests made sorting, folding, etc.). With a mechanical arm, the robot chooses a random fabric, which it then folds and places neatly on a surface. Results were measured and analysed within three carefully defined demonstrator projects of increasing difficulty.

In order to provide help the robot perceive and manipulate garments in 3D through an active binocular robotic vision system, a database of 80 colour images with corresponding horizontal and vertical disparity maps was created. This database is based on 16 different off-the-shelve garments. Each garment was imaged in five different pose configurations on the project's binocular robot head.

The end result is a state of the art robot capable of autonomously perceiving and manipulating all kinds of fabrics, textiles and garments. The operating-software is based on ROS (Robot Operating System) and written in C++, Python and Java.

So is this the future of ironing? A commercialised domestic ironing robot may still be some way off. Human hands are highly complex; certain subtle movements such as unbuttoning a shirt are still challenging tasks for robots to perform.

The most likely practical use for this prototype robot might be in sorting through fabrics in an industrial setting, with human assistance. The project team has already made contact with a clothing manufacturing company in Italy to investigate the possibility of commercially exploiting robots in the manufacturing sector.

More information: CloPeMa - Clothes Perception and Manipulation:
cordis.europa.eu/project/rcn/100800_en.html

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