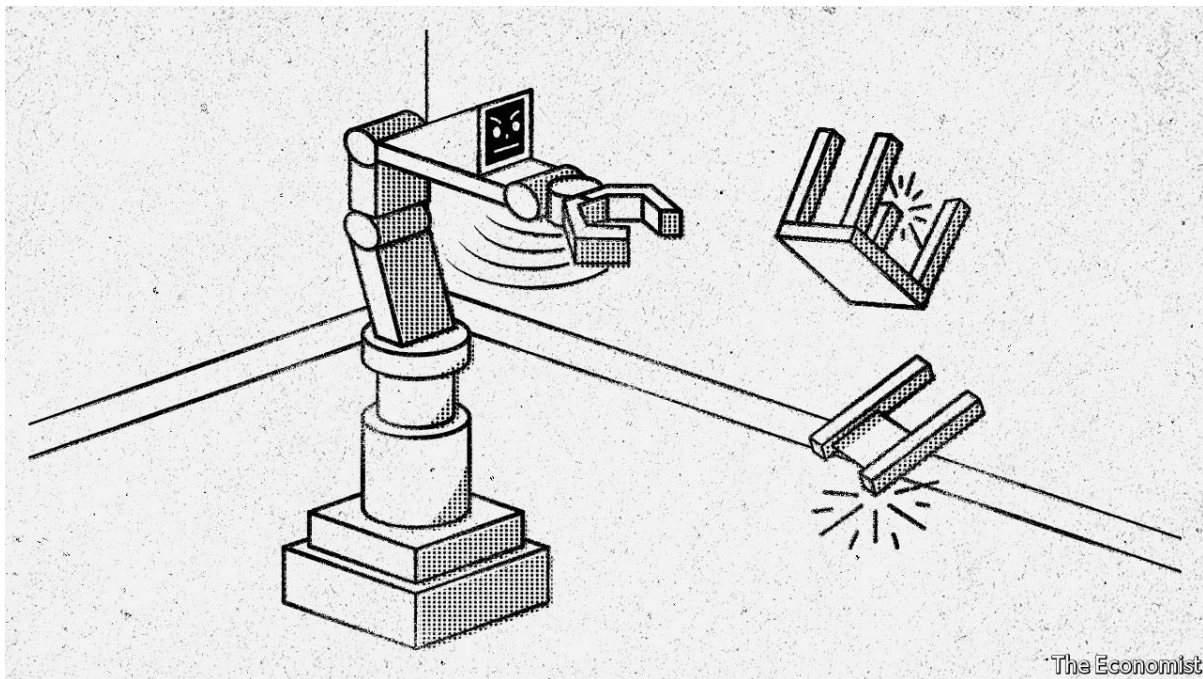


Artificial intelligence

Robots can assemble IKEA furniture

Cower before your silicon overlords, puny humans



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IN 1997 it was chess. In 2016 it was the ancient game of Go. Now it seems computers have mastered a task that stretches the human brain to its limit. In a paper just published in *Science Robotics*, a group of researchers at Nanyang Technological University, in Singapore, report having managed to get a pair of ordinary industrial robots to assemble most of a piece of flat-pack IKEA furniture.

The chair in question was a model called STEFAN. The robots' job was to assemble the frame. This requires several pieces of dowelling to be inserted into pre-drilled holes before the parts are pressed together. In

total, says Pham Quang Cuong, one of the paper's authors, 19 components are involved.

The robots were off-the-shelf arm-shaped machines of the sort found in factories around the world, combined with a stereoscopic camera that can produce three-dimensional images. A pair of videos released by the researchers show the robot arms making various mistakes, dropping dowelling on the floor or misaligning components, before succeeding at their task after almost nine minutes of slow, careful work.

Even with that abundance of caution, though, the robots needed quite a bit of hand-holding. They were given precise instructions before they started (along the lines of, "Arm 1: take the side piece. Arm 2: grab a dowel. Arm 1: rotate side piece so that hole is pointing up. Arm 2: insert dowel into top-left hole." And so on.). Before the nine minutes of assembly began, the robots spent a further 11 minutes scanning their environments and planning the movements needed to carry out these instructions, before they tried to execute them. Moreover, though the larger components of the chair were scattered around at random, meaning the robots had to use the camera to identify them by comparing them with electronic representations loaded into a database, the dowels were gathered together and placed upright in a container.

The result is, nevertheless, sufficiently impressive, says Dr Pham, for his research group to have received considerable interest from industry. In future he and his colleagues hope, gradually, to remove the robots' training wheels. One idea is to get the machines to learn what to do for themselves by watching a human being assemble the chair. Given the difficulties that many people apparently have with IKEA's products, that may, however, also teach them how to toss the whole thing aside in frustration.

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