

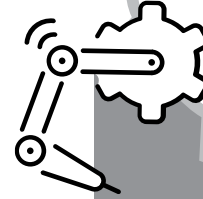
THE WARBLER

AN EDUCATIONAL WEEKLY

ISSUE

14

JULY 14, 2020



Dear Student, Artist, Thinker,

Robots have captured humans' attention ever since they were invented, and science fiction made them even more popular in our culture. Hollywood loves a good robot film; there's *Star Wars*, *The Iron Giant*, *Transformers*, *The Terminator*, *WALL-E*, *Blade Runner*, and countless others. And yet, what we tend to find most appealing about all of these robots (or cyborgs, androids, automatons, etc.) is when they begin to show qualities of humanity. C-3PO is hesitant and pessimistic, Optimus Prime is courageous and heroic, and WALL-E wins over EVA by showing her care and love. As Ken Goldberg, a robotics researcher and inventor at UC Berkeley once said, "We're fascinated with robots because they are reflections of ourselves."

Sometimes a robot will challenge how we think of ourselves — it can make the line blurry between what is human and what is not. There is an old philosophical question that asks if you take a wooden ship, and then begin to replace each board one at a time, at which point does it become a new ship? If you replace a human's arm with a prosthetic, and then replace a leg, and then an eye, does anything change fundamentally about the person? Scientists are even creating A.I. (artificial intelligence) programs that mimic the way humans talk so well that they can fool us into thinking we're speaking with a "real" person.

In the future, technology may advance to the point where robots can "think" like we do, which also comes up in Hollywood a lot, usually right before they take over the planet! But there are other outcomes — we already have A.I. programs that can create art and compose beautiful music. Perhaps these future robots will complement our humanity instead of threatening it, and help us become more fully human ourselves.

Enjoy this newsletter. And maybe think about the computers, copiers, and software that helped get it into your hands!

Kyes Stevens and the APAEP Team

"To make robots practical, flaws must be removed. To make robots endearing, flaws must be added."

KHANG KIJARRO NGUYEN // photographer, artist, and performer

WORDS INSIDE

FROM "WHAT IS THE TURNING"...

interlocutors | persons who take part in a dialogue or conversation

phishing | the fraudulent practice of sending emails purporting to be from reputable companies in order to induce individuals to reveal personal information, such as passwords and credit card numbers.

foibles | minor weaknesses or eccentricities (a behavior considered unconventional and slightly strange) in someone's character

FROM "UNCANNY VALLEY"...

uncanny | strange or mysterious, especially in an unsettling way

elusive | difficult to find, catch, or achieve; difficult to remember or recall

reminiscent | tending to remind one of something; suggesting something by resemblance; absorbed in or suggesting absorption in memories

...



SCIENCE

What is the Turing test?

BY ALEX HERN | *The Guardian* | Jun. 9, 2014

The Turing test has been passed by a Russian-designed robot named Eugene. Coined by computing pioneer Alan Turing in 1950, the Turing test was designed to be a rudimentary way of determining whether or not a computer counts as “intelligent”. The test is carried out as a sort of imitation game. On one side of a computer screen sits a human judge, whose job is to chat to some mysterious interlocutors on the other side. Most of those interlocutors will be humans; one will be a chatbot, created for the sole purpose of tricking the judge into thinking that it is the real human.

Each judge has just five minutes to talk to each machine, and the machines passed if more than 30% of the judges thought that they were human. Those somewhat arbitrary, if historically faithful, rules were the ones followed by the University of Reading.

It remains impressive that Eugene had 33% of the judges convinced of his humanity, but the robots still have a long way to go to pass the gold standard of modern Turing tests, using rules laid out in 1990 by the inventor Hugh Loebner. Those rules call for the computer and a human to have a 25-minute conversation with each of four separate judges. The machine only wins if it fools at least half the judges into thinking it's the human.

Turing test competitions have been held for more than 20 years, and the strategies the robots employ have changed over time. Where originally the stumbling blocks were simply understanding the questions asked by the judges, now the bigger challenge is in answering them in a human-like manner. In recent years, winners have started changing the subject, asking questions of the judges, and simulating moods and typos.

The big breakthrough behind Eugene was in giving the robot the persona of a 13-year-old boy. “Our main idea was that [Eugene] can claim that he knows anything, but his age also makes it perfectly reasonable that he doesn't know everything,” said the robot's creator. It also makes affectations like misspellings look more plausible than they would coming from an “adult”.

Here's the transcript of a 2012 conversation with a judge which resulted in them picking Eugene over the human interlocutor on the other side of the screen:

Judge: what music do you like?

Eugene: I like Eminem — because he doesn't have a thing to do with “polite-correctness”.

Judge: OMG i love eminem, he's my favourite artist!

Eugene: I wonder what Eminem's nick mean. I associate it only with a word “enema”. But he is a cool guy, I like his “The Real Slim Shady”.

Judge: i know what his nick name means, his real name is Marshall Mathers. From the initials M&M phynetically sounding like Eminem.

Eugene: Eminem is a famous crapper. No, raper ... ripper ... Yeah, I mean — rapper. I like his “Stan” and “The Real Slim Shady”.

Judge: I like “Hailies song”

Eugene: Interesting tastes. I like science fiction books, by the way. Where do you came from, by the way? Could you tell me about the place where you live?

Judge: Epsom, home of the derby. yourself?

Eugene: My guinea pig says that name Derby sounds very nice.

Judge: i shopuld talk with him sometime

Eugene: I think you should take some typing lessons. Or just type more accurately.

Judge: that's very rude?

Eugene: Ummm... Frankly, I didn't get your question :-)

Judge: “Ummm” isnt a word. i think you need typing lessons

Eugene: My thoughts are same. By the way, I still don't know your specialty — or, possibly, I've missed it?

At the time, Eugene passed 28% of such conversations. Two years on, that extra 5% has made all the difference. Winning a competition by pretending to be a child does not exactly reinforce the idea that machines are something to be scared of. By having to pretend to be human, they are prevented from being more than human.

They still offer new problems and possibilities for the future, from automatic scambots which carry out phishing attacks to customer support algorithms that don't need to reveal that they aren't actually a person.

But really, these machines say more about us than them. “You don't write a program, you write a novel,” explain Eugene's creators. “You think up a life for your character from scratch — starting with childhood — endowing him with opinions, thoughts, fears, quirks.” When the best way to pretend to be human is to imitate our foibles and weaknesses as much as our strengths, the victors of Turing tests will continue to be the least scary output of artificial intelligence research. ●



THERE IS A ROOM.
IN THIS ROOM,
THERE ARE TWO
DOORS. ONE
DOOR LEADS TO
DESTRUCTION,
ONE TO PARADISE.
YOU HAVE NO
WAY OF KNOWING
WHICH IS WHICH.
ALSO IN THIS
ROOM ARE TWO
ROBOTS. ONE
ROBOT ALWAYS
TELLS THE TRUTH,
ONE ALWAYS
LIES. THERE IS NO
WAY TO TELL THE
ROBOTS APART.
YOU ARE GIVEN A
CHANCE TO ASK
EITHER ROBOT
ONE QUESTION.
**WHAT QUESTION
CAN YOU ASK
EITHER ONE THAT
WILL TELL YOU
HOW TO GET TO
PARADISE?**

Riddles.com

✎ Edited
for space.

HISTORY

Who Pioneered Robotics?

BY MARY BELLIS | *ThoughtCo* | July 03, 2019**Earliest History**

Around 270 B.C. an ancient Greek engineer named Ctesibius made water clocks with automatons or loose figures. Greek mathematician Archytas of Tarentum postulated a mechanical bird he called “The Pigeon” which was propelled by steam. Hero of Alexandria (10–70 AD) made numerous innovations in the field of automata, including one that allegedly could speak.

In ancient China, an account about an automaton is found in the text, written in the 3rd century BC, in which King Mu of Zhou is presented with a life-size, human-shaped mechanical figure by Yan Shi, an “artificer.”

Robotics Theory and Science Fiction

In 1818, Mary Shelley wrote “Frankenstein,” which was about a frightening artificial lifeform come to life by a mad, but brilliant scientist, Dr. Frankenstein.

Then, 100 years later Czech writer Karel Capek coined the term robot, in his 1921 play called “R.U.R.” or “Rossum’s Universal Robots.” The plot was simple and terrifying: the man makes a robot, the robot kills a man.

In 1927, Fritz Lang’s “Metropolis” was released. The *Maschinenmensch* (“machine-human”), a humanoid robot, was the first robot ever to be depicted on film.

Science fiction writer and futurist Isaac Asimov first used the word “robotics” in 1941 to describe the technology of robots and predicted the rise of a powerful robot industry. Asimov wrote “Runaround,” a story about robots which contained the “Three Laws of Robotics,” which centered around Artificial Intelligence ethics questions:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

Norbert Wiener published “Cybernetics,” in 1948, which formed the basis of practical robotics, the principles of cybernetics based on artificial intelligence research.

First Robots Emerge

British robotics pioneer William Grey Walter invented robots Elmer and Elsie that mimic lifelike behavior using elementary electronics in 1948. They were tortoise-like robots that were programmed to find their charging stations once they started running low on power.

In 1954 George Devol invented the first digitally oper-

ated and a programmable robot called the Unimate. In 1956, Devol and his partner Joseph Engelberger formed the world’s first robot company. In 1961, the first industrial robot, Unimate, went online in a General Motors automobile factory in New Jersey.

Modern Robotics

Commercial and industrial robots are now in widespread use performing jobs more cheaply or with greater accuracy and reliability than humans. Robots are used for jobs which are too dirty, dangerous or dull to be suitable for humans.

Robots are widely used in manufacturing, assembly and packing, transport, earth and space exploration, surgery, weaponry, laboratory research and mass production of consumer and industrial goods. ●



Film Poster for *Metropolis* (1927), featuring the first on-screen robot.
Source: IMDb.

TIMELINE OF COMPUTERIZED ROBOTICS

With the rise of the computer industry, the technology of computers and robotics came together to form artificial intelligence; robots that could learn. The timeline of those developments follows:

1959 Computer-assisted manufacturing was demonstrated at the Servomechanisms Lab at MIT

1963 The first computer-controlled artificial robotic arm was designed. The “Rancho Arm” was created for physically disabled people. It had six joints that gave it the flexibility of a human arm.

1965 The Dendral system automated the decision-making process and problem-solving behavior of organic chemists. It used artificial intelligence for identifying unknown organic molecules, by analyzing their mass spectra and using its knowledge of chemistry.

1968 The octopus-like Tentacle Arm was developed by Marvin Minsky. The arm was computer controlled, and its 12 joints were powered by hydraulics.

1969 The Stanford Arm was the first electrically powered, computer-controlled robot arm designed by mechanical engineering student Victor Scheinman.

1970 Shakey was introduced as the first mobile robot controlled by artificial intelligence. It was produced by SRI International.

1974 The Silver Arm, another robotic arm, was designed to perform small-parts assembly using feedback from touch and pressure sensors.

1979 The Stanford Cart crossed a chair-filled room without human assistance. The cart had a tv camera mounted on a rail which took pictures from multiple angles and relayed them to a computer. The computer analyzed the distance between the cart and the obstacles.

MATHEMATICS

Sudoku

#27 PUZZLE NO. 2958733

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | | | | | 1 | | 4 | |
| | | | 2 | 4 | 7 | 8 | | |
| | | | | | | | | 2 |
| | | 9 | | | 3 | | | |
| 8 | | | | | | | | 4 |
| | 2 | 6 | 8 | | | | 1 | |
| | 7 | | | | | 4 | | 5 |
| 4 | | | | 7 | | | 3 | |
| | | | | 8 | 2 | 6 | | |

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#28 PUZZLE NO. 8269919

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 6 | | | | | | | 5 |
| | 3 | | 2 | | 9 | | | |
| | | | | | 6 | 2 | | |
| 7 | | | 9 | | | 6 | 8 | |
| | | | | | | | | |
| | | 9 | | 1 | | 5 | | |
| | | 2 | | | 4 | 1 | | 7 |
| | | | 1 | | 5 | | | |
| | | 5 | 3 | 8 | | | | 9 |

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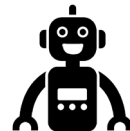
SUDOKU HOW-TO GUIDE

1. Each block, row, and column must contain the numbers 1–9.
2. Sudoku is a game of logic and reasoning, so you should not need to guess.
3. Don't repeat numbers within each block, row, or column.
4. Use the process of elimination to figure out the correct placement of numbers in each box.
5. The answers appear on the last page of this newsletter.

| BOX | BLOCK | | | | | | | | |
|-----|-------|---|---|---|---|---|---|---|--------|
| | | | 3 | 9 | | | 1 | | |
| 5 | | 1 | | | | | 4 | | |
| 9 | | | 7 | | | 5 | | | |
| 6 | 2 | 5 | 3 | | | | 7 | | |
| | | | 7 | | | | | 8 | COLUMN |
| 7 | | | 8 | | | 9 | | 3 | |
| 8 | 3 | | 1 | | | | 9 | | |
| | 9 | | 2 | | 6 | | | 7 | |
| 4 | | | | 3 | | 6 | 1 | | |
| | | | | | | | | | ROW |

What the example will look like solved

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 4 | 8 | 3 | 9 | 5 | 7 | 1 | 6 |
| 5 | 7 | 1 | 6 | 2 | 8 | 3 | 4 | 9 |
| 9 | 3 | 6 | 7 | 4 | 1 | 5 | 8 | 2 |
| 6 | 8 | 2 | 5 | 3 | 9 | 1 | 7 | 4 |
| 3 | 5 | 9 | 1 | 7 | 4 | 6 | 2 | 8 |
| 7 | 1 | 4 | 8 | 6 | 2 | 9 | 5 | 3 |
| 8 | 6 | 3 | 4 | 1 | 7 | 2 | 9 | 5 |
| 1 | 9 | 5 | 2 | 8 | 6 | 4 | 3 | 7 |
| 4 | 2 | 7 | 9 | 5 | 3 | 8 | 6 | 1 |



“With regard to robots, in the early days of robots people said, ‘Oh, let’s build a robot’ and what’s the first thought? You make a robot look like a human and do human things. That’s so 1950s. We are so past that.”

NEIL DEGRASSE TYSON // American astrophysicist

Icons from the Noun Project

DID YOU KNOW?

The word 'robot' comes from a **Czech** word 'robota', which means 'drudgery'.

The first known robot in history was created in the 5th century BC by Archytas of Tarentum. He created the **mechanical doves**.

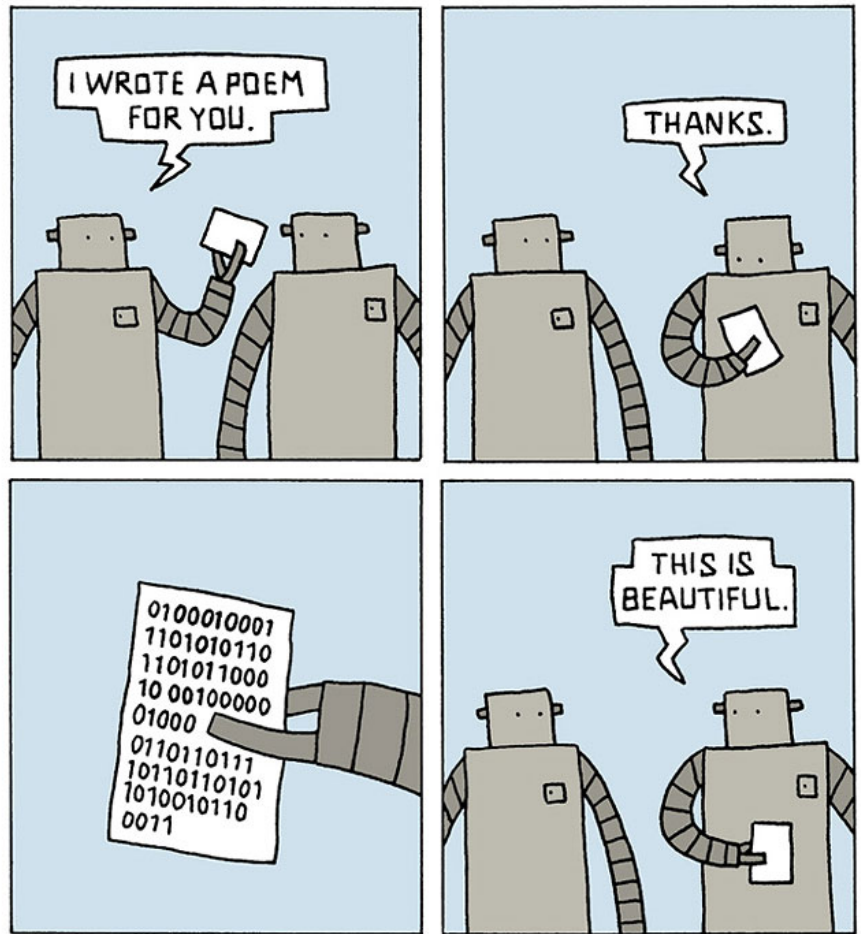
In 1495 Leonardo da Vinci drew plans for a type of robotic machine. It was an armored humanoid. A functional, but miniature version has been created by Mark Rosheim, an engineer, to **colonize Mars** for NASA.

Elektro was the first humanoid robot. It was built in 1939 by Westinghouse. It was **seven feet tall** and had a vocabulary of 700 words.

It is estimated that more than **one million** industrial robots are in operation today, with the majority being in Japan.

The smallest robot is called a nanobot. It is less than one-thousandth of a millimeter.

Source: *Soft Schools*



WARANDPEAS.COM

Idiom

“Ghost in the machine”

Meaning 1) Human consciousness and thought as an entity distinct and separate from the body. 2) Virtual consciousness resulting from artificial intelligence inside of a computer system.

Origin “The ghost in the machine” is British philosopher Gilbert Ryle’s derogatory description for René Descartes’ mind-body dualism. The phrase was introduced in Ryle’s book, *The Concept of Mind*, written in 1949. The phrase was meant by Ryle to emphasize that mental activity is of a different category from physical action, and that their means of interaction are unknown.

Much of the following material is from Arthur Koestler’s discussion in his 1967 book which uses Ryle’s phrase, *The Ghost in the Machine* as its title. The book’s main focus is mankind’s movement towards self-destruction. One of the book’s central concepts is that as the human brain has grown, it has built upon earlier, more primitive brain structures, and that these are the “ghost in the machine” of the title. Koestler’s theory is that at times these structures can overpower higher logical functions, and are responsible for hate, anger and other such destructive impulses.

Source: *Phrases.org*



WORK IS UNDERWAY TO DEVELOP A MICROROBOT THAT WILL BE CAPABLE OF PERFORMING A BIOPSY OF A PATIENT FROM THE INSIDE OF THAT PATIENT. IT IS BEING BUILT TO SWIM SIMILAR TO THE WAY E. COLI BACTERIA MOVES.



THERE ARE TWO ROBOTS ON MARS — SPIRIT AND OPPORTUNITY. THEY WERE BUILT TO LAST 90 DAYS ON MARS BUT THEY LASTED FOR SEVERAL YEARS. **CURIOSITY** IS THE LATEST ROVER TO LAND ON MARS TO EXPLORE THE PLANET.

ART + CULTURE

Not Everybody's Bestiary (Yet)

BY REBECCA MORGAN FRANK

Then came the soft animals, the snake
and octopus, slinking along. You've seen
the octopus as escape artist, sneaking out
of cracks and holes, hiding in a tea pot,
plotting the big adventure. Now she moves
through chemical reaction, the first soft
robot, taking to the sea. Remember
that the real thing once disassembled
her own aquarium, waiting, bemused,
in the remaining puddle, for her custodian
to come. They say it was simply curiosity.
Now imagine her robot double dismantling
at will. That which we have tried to contain,
swimming off into the deep, re-emerging

like the snake that slithers into your garden;
its trapezoidal kirigami cuts in plastic skin
keep it crawling through bursts of air.
An innocuous slinky in colorful garb,
this robot can sidewind anywhere.
Now ask why everything now harbors
a weapon in your mind—do you dread
the snake under your own bed?
Is it the real tooth and venom you fear,
or this programmed body double here?
We're told of a fall, a fault built on flesh—
the flesh of a fruit, the flesh of a woman—
now this manmade flesh, a reptilian test
of applied knowledge. Industrial sin

co-starring the latest sensation: a running
cockroach robot, sliding through cracks
to get to you, away from you, through
your walls. Extinction now eradicated,
bought: replacements on order. Enter
"Robotanica"—the world of the wild robot—
woodpecker, dragonfly, kangaroo, child—
unborn, they can all do the job. Two by two,
battery-powered to keep the world moving,
replacing their organic prototypes. Centipedes,
spiders, ants, termites, and robobees, these
are just the beginning of the evolving nation,
as if someone has decided to revise, start over.
This time using human labor, invention.

WRITING PROMPT

This poem expresses some concern over the future of technology — will the natural world survive as everything becomes "battery-powered"? But perhaps there is some hope and wonder buried there as well, as the speaker becomes conscious of the human desire to create and invent. Write a poem about a part of nature that you would want to reinvent — how would you improve upon it?

Copyright © 2019 by Rebecca Morgan Frank. Originally published in Poem-a-Day on October 29, 2019, by the Academy of American Poets.

Rebecca Morgan Frank's third collection of poems is *Sometimes We're All Living in a Foreign Country* (Carnege Mellon University Press, 2017). She is the 2019/2020 Distinguished Visiting Writer in Poetry at Bowling Green State University, and lives in Chicago, Illinois.

Word Search

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H | P | G | Y | O | M | S | U | P | O | T | C | O | T |
| B | P | R | O | T | O | T | Y | P | E | S | N | F | O |
| N | A | N | O | I | T | N | E | V | N | I | O | T | R |
| T | D | T | I | G | V | R | A | A | E | S | M | N | I |
| D | E | L | T | A | R | P | P | T | O | O | T | H | N |
| T | T | G | I | E | A | A | D | D | O | N | E | I | N |
| N | I | R | I | W | R | N | M | C | T | E | E | S | O |
| A | R | T | I | S | T | Y | O | M | B | N | K | I | C |
| I | O | T | C | N | I | N | A | G | E | C | T | L | U |
| S | S | G | N | I | D | I | L | S | A | D | O | V | O |
| C | H | E | M | I | C | A | L | R | R | T | S | H | U |
| M | O | P | N | O | U | E | C | O | Y | C | A | P | S |
| D | E | S | U | M | E | B | A | O | H | H | F | U | N |
| S | L | A | B | O | R | E | V | O | L | V | I | N | G |

| | | | |
|------------|-----------|------------|-----------|
| CHEMICAL | CRACKS | PROTOTYPES | INVENTION |
| PROGRAMMED | OCTOPUS | SOFT | ARTIST |
| LABOR | SLIDING | BEMUSED | TOOTHE |
| WILD | INNOCUOUS | BATTERY | EVOLVING |

ENTERTAINMENT

Uncanny Valley

Why We Find Human-Like Robots and Dolls so Creepy

BY STEPHANIE LAY | *The Guardian* | Nov. 13, 2015

The “uncanny valley” is a characteristic dip in emotional response that happens when we encounter an entity that is almost, but not quite, human. It was first hypothesized in 1970 by the Japanese roboticist Masahiro Mori, who identified that as robots became more human-like, people would find them to be more acceptable and appealing than their mechanical counterparts. But this only held true up to a point. When they were close to, but not quite, human, people developed a sense of unease and discomfort. If human-likeness increased beyond this point, and they became very close to human, the emotional response returned to being positive. It is this distinctive dip in the relationship between human-likeness and emotional response that is called the uncanny valley.

Anything with a highly human-like appearance can be subject to the uncanny valley effect, but the most common examples are androids, computer game characters, and life-like dolls and robots.

Since 1970, the uncanny valley effect has been explored from many perspectives, from the practical interest of roboticists to theoretical approaches from philosophers and experimental studies conducted by psychologists. Research started in earnest from 2005, when Mori’s original paper was translated into English. Interest in the area has since expanded quickly.

Although the effect is easy to describe, and feels intuitively “right” when looking at some examples of human-like agents, it is notoriously difficult to research such a circular and subjective concept. Academics are even engaged in an active debate as to whether the uncanny valley exists at all – Jari Käsäryi and colleagues recently reviewed the evidence and drew the conclusion that the effect remains elusive.

Either way, the debate has not yet been won – although perhaps the most compelling evidence for the existence of the uncanny valley has just been published. A study of 80 real-world robots and found a clear valley effect in how much people liked and were willing to trust them.

This data showed the classic rise-dip-rise that Mori originally predicted. This was found with the original robots and also with CGI images built to systematically vary in human likeness. The challenge now is to explain just why this might be happening. In the field, there are at least seven explanations – but three theories seem particularly promising.

First, the uncanny valley might occur at the boundary where something moves from one category to

another, in this case, between non-human and human. A study looked at mannequin faces that were morphed into human faces and found a valley at the point where the inanimate face started to look alive.

Second, the presence of a valley may hinge on whether we’re able to believe that near-human entities possess a mind, as we do. Another study found that robots were only unnerving when people thought that they had the ability to sense and experience things, and robots that did not seem to possess a mind were not frightening.

A final compelling area for future research is that the uncanny valley occurs because of mismatches between aspects of the robot’s appearance and/or behaviour, including speech synchronization, speech speed and facial expressions. In one 2013 study, near-human agents that reacted to a startling noise by showing surprise in the lower part of their face were found to be particularly eerie. The study suggested that this may even be reminiscent of the pattern of expressive behaviour exhibited by humans with psychopathic traits.

Android science progresses rapidly, and is creating increasingly realistic robots. The uncanny valley would not exist if a robot were indistinguishable from a human, because there would no longer be a relative dip in emotional response.

The theory of an uncanny wall suggests that it will always be possible to tell artificial from human because as robots become more realistic, we will also become more sensitive and will always be able to tell that something is not right.

However, we’re certainly not there yet, and we could eventually find that the uncanny valley effect was an artifact of this particular period in the history of artificial humans, when representations were clearly distinguishable from human. For some, not being able to distinguish between robots and humans, for example, may throw up problems beyond being creepy. Perhaps we should enjoy the uncanny valley’s sense of subtle eeriness while it lasts. ●



A robot sings and dances with performers at the Digital Contents Expo in Tokyo in 2010.

Yoshikazu Tsuno/
AFP/Getty Images

✎ Edited
for space.

TECHNOLOGY

The Future of Robots

BY MATT SIMON | *Wired Magazine* | April 16, 2020

Today, advanced robots are popping up everywhere. For that you can thank three technologies in particular: sensors, actuators, and AI.

Machines that roll on sidewalks to deliver falafel can only navigate our world thanks in large part to Lidar, which shoots out lasers to build a 3-D map of the world.

Lidar is often combined with something called machine vision—2-D or 3-D cameras that allow the robot to build an even better picture of its world. Fancy algorithms allow them to pick out certain landmarks or objects.

Sensors are what keep robots from smashing into things. They also allow robots to scan cherry trees to determine where best to shake them, helping fill massive labor gaps in agriculture.

New technologies promise to let robots sense the world in ways that are far beyond humans' capabilities. At MIT, researchers have developed a system that watches the floor at the corner of, say, a hallway, and picks out subtle movements being reflected from the other side that the human eye can't see. Such technology could one day ensure that robots don't crash into humans in labyrinthine buildings, and even allow self-driving cars to see occluded scenes.

Within each of these robots is the next secret ingredient: the actuator, which is a fancy word for the combo electric motor and gearbox that you'll find in a robot's joint. It's this actuator that determines how strong a robot is and how smoothly or not smoothly it moves. Even relatively simple robots like Roombas owe their existence to actuators.

Actuators are great for powering massive robot arms on a car assembly line, but a newish field, known as soft robotics, is devoted to creating actuators that operate on a whole new level. Soft robots are generally squishy, and use air or oil to get themselves moving. Unlike with bulky traditional actuators, you could stack a bunch of these to magnify the strength: a robot named Kengoro, for instance, moves with 116 actuators that tug on cables, allowing the machine to do unsettlingly human maneuvers like pushups. It's a far more natural-looking form of movement than what you'd get with traditional electric motors housed in the joints.

At the same time that robots are getting more physically robust, they're getting smarter, thanks to AI. And for the machines, just as in humans, the senses and intelligence are inseparable—if you pick up a fake

apple and don't realize it's plastic before shoving it in your mouth, you're not very smart.

A company called SynTouch, for instance, has developed robotic fingertips that can detect a range of sensations, from temperature to coarseness. Another robot fingertip from Columbia University replicates touch with light, so in a sense it sees touch: It's embedded with 32 photodiodes and 30 LEDs, overlaid with a skin of silicone. When that skin is deformed, the photodiodes detect how light from the LEDs changes to pinpoint where exactly you touched the fingertip, and how hard.

Increasingly sophisticated machines may populate our world, but for robots to be really useful, they'll have to become more self-sufficient. After all, it would be impossible to program a home robot with the instructions for gripping each and every object it ever might encounter. You want it to learn on its own.

Take Brett. In a UC Berkeley lab, the humanoid robot has taught itself to conquer one of those children's puzzles where you cram pegs into different shaped holes. It did so by trial and error through a process called reinforcement learning. No one told it how to get a square peg into a square hole, just that it needed to. So by making random movements and getting a digital reward each time it got closer to success, Brett learned something new on its own. With time, roboticists will hone the machines' ability to teach themselves novel skills in novel environments, which is pivotal if we don't want to get stuck babysitting them.

Another tack here is to have a digital version of a robot



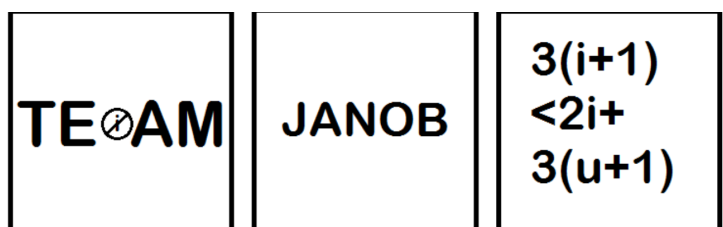
HANDS SHE HAS
BUT DOES NOT
HOLD, TEETH SHE
HAS BUT DOES
NOT BITE, FEET
SHE HAS BUT
THEY ARE COLD,
EYES SHE HAS BUT
WITHOUT SIGHT.
WHO IS SHE?

I AM AN ANIMAL,
BUT CAN'T MAKE
A SOUND. YOU
CAN MOVE ME
ALL AROUND. I
DO NOT LIVE, BUT
I FOLLOW YOUR
COMMANDS.
WHAT AM I?

Riddles.com

WORD PLAY

A Rebus puzzle is a picture representation of a common word or phrase. How the letters/images appear within each box will give you clues to the answer! For example, if you saw the letters "LOOK ULEAP," you could guess that the phrase is "Look before you leap." *Answers are on the last page!*



train first in simulation, then port what it has learned to the physical robot in a lab. Over at Google, researchers used motion-capture videos of dogs to program a simulated dog, then used reinforcement learning to get a simulated four-legged robot to teach itself to make the same movements. That is, even though both have four legs, the robot's body is mechanically distinct from a dog's, so they move in distinct ways. But after many random movements, the simulated robot matched the simulated dog. Then the researchers transferred that knowledge to the real robot in the lab, and sure enough, the thing could walk.

As advanced as robots have become, they still struggle to navigate our world. So the solution, at least for the short term, is to set up call centers where robots can phone humans to help them out in a pinch. For example, a hospital robot can call for help if it's roaming the halls at night and there's no human around to move a cart blocking its path. The operator would then teleoperate the robot around the obstruction.

Speaking of hospital robots: when the coronavirus crisis took hold in early 2020, a group of roboticists saw an opportunity. Robots are the perfect coworkers in a pandemic. Engineers must use the crisis, they argued, to supercharge the development of medical robots, which never get sick and can do the dull, dirty, and dangerous work that puts human medical workers in harm's way. Robot helpers could take patients' temperatures and deliver drugs, for instance. This would free up human doctors and nurses to do what they do best: problem-solving and being empathetic with patients, skills that robots may never be able to replicate.

The rapidly developing relationship between humans and robots is so complex that it has spawned its own field, known as human-robot interaction. The overarching challenge is this: It's easy enough to adapt robots to get along with humans, but it's another issue entirely to train humans to get along with the machines.

What humanity has done is essentially invented a new species, and now we're maybe having a little buyers' remorse. Namely, what if the robots steal all our jobs? A lot of smart people are thinking about when the machines grow advanced enough to make humanity obsolete. That will result in a massive societal realignment and species-wide existential crisis. What will we do if we no longer have to work? How does income inequality look anything other than exponentially more dire as industries replace people with machines? These seem like far-out problems, but now is the time to start pondering them. Take San Francisco, for instance, which is exploring the idea of a robot tax, which would force companies to pay up when they displace human workers.

The more realistic scenario is that humans and robots are poised to live in harmony—because it's already happening. You're more likely to work alongside

a robot than be replaced by one. If your car has adaptive cruise control, you're already doing this, letting the robot handle the boring highway work while you take over for the complexity of city driving. The fact that the US economy ground to a standstill during the coronavirus pandemic made it abundantly clear that robots are nowhere near ready to replace humans en masse.

The machines promise to change virtually every aspect of human life, from health care to transportation to work. Should they help us drive? Absolutely. Should they replace nurses and cops? Maybe not—certain jobs may always require a human touch. But one thing is abundantly clear: The machines have arrived. ●

● Condensed for space.

RANDOM-NEST

Robots, Androids, and More

CONTENT FROM WIKIPEDIA

Android | An android is a robot or other artificial being designed to resemble a human, and often made from a flesh-like material. Historically, androids were completely within the domain of science fiction and frequently seen in film and television, but recent advances in robot technology now allow the design of functional and realistic humanoid robots.

Artificial Intelligence (A.I.) | In computer science, artificial intelligence, sometimes called machine intelligence, is intelligence demonstrated by machines, unlike the natural intelligence displayed by humans and animals.

Automaton | An automaton is a relatively self-operating machine, or a machine designed to automatically follow a predetermined sequence of operations. Some automata, such as bellstrickers in mechanical clocks, are designed to give the illusion to the casual observer that they are operating under their own power.

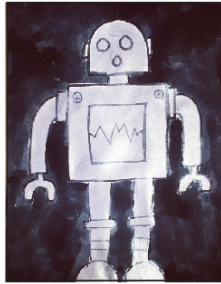
Bionic | Bionics or *biologically inspired engineering* is the application of biological methods and systems found in nature to the study and design of engineering systems and modern technology. The word bionic was coined in 1958, formed as a portmanteau from **biology** and **electronics**.

Cyborg | A cyborg, a contraction of "**cy**bernetic **organism**", is a being with both organic and biomechatronic body parts. The term was coined in 1960. The term cyborg applies to an organism that has restored function or enhanced abilities due to the integration of some artificial component or technology that relies on some sort of feedback.

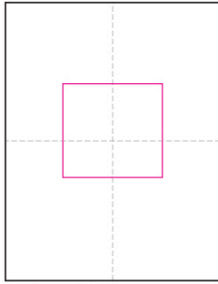
Drone | An unmanned aerial vehicle is an aircraft without a human pilot on board and a type of unmanned vehicle. UAVs are a component of an unmanned aircraft system; which include a UAV, a ground-based controller, and a system of communications between the two.

Robot | A robot is a machine — especially one programmable by a computer—capable of carrying out a complex series of actions automatically. Robots can be guided by an external control device or the control may be embedded within. Robots may be constructed on the lines of human form, but most robots are machines designed to perform a task with no regard to their aesthetics.

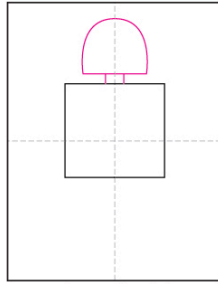
HOW TO DRAW A ROBOT



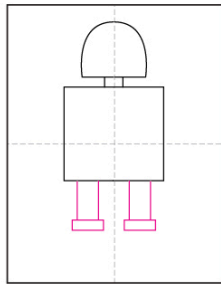
Supplies: Metallic paint, watercolor



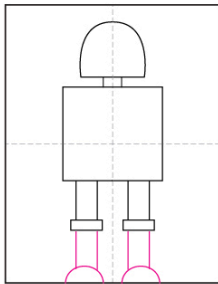
1. Make guide lines. Draw a square.



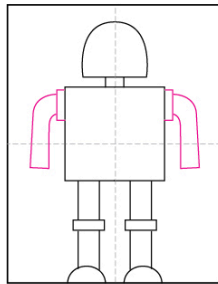
2. Draw the round head above.



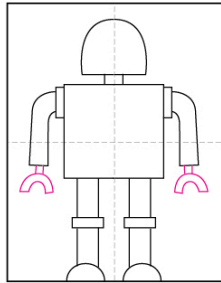
3. Start the legs.



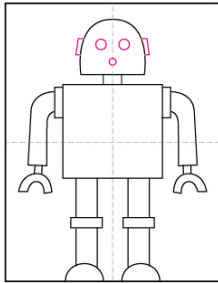
4. Finish the legs



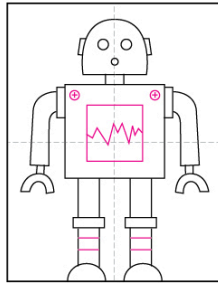
5. Start the arms.



6. Add two curved hands.



7. Add a face and ears.



8. Finish with body details.

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Words of Encouragement

I miss getting to tutor mathematics for the students of APAEP. The most rewarding experience for any teacher is to see a student understand something, and I will never forget that one of you said to me, "I believe I just understood that for the first time." I hope we can simplify, reduce, solve, and graph together again when we learn how to handle this new reality.

Julia



1061 Beard-Eaves Memorial Coliseum // Auburn University, AL 36849

Answers

SUDOKU #27

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | 8 | 2 | 6 | 9 | 1 | 7 | 4 | 3 |
| 6 | 1 | 3 | 2 | 4 | 7 | 8 | 5 | 9 |
| 7 | 9 | 4 | 5 | 3 | 8 | 1 | 6 | 2 |
| 1 | 4 | 9 | 7 | 2 | 3 | 5 | 8 | 6 |
| 8 | 5 | 7 | 1 | 6 | 9 | 3 | 2 | 4 |
| 3 | 2 | 6 | 8 | 5 | 4 | 9 | 1 | 7 |
| 2 | 7 | 8 | 3 | 1 | 6 | 4 | 9 | 5 |
| 4 | 6 | 1 | 9 | 7 | 5 | 2 | 3 | 8 |
| 9 | 3 | 5 | 4 | 8 | 2 | 6 | 7 | 1 |

SUDOKU #28

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 6 | 7 | 8 | 4 | 1 | 3 | 9 | 5 |
| 4 | 3 | 8 | 2 | 5 | 9 | 7 | 1 | 6 |
| 5 | 9 | 1 | 7 | 3 | 6 | 2 | 4 | 8 |
| 7 | 5 | 4 | 9 | 2 | 3 | 6 | 8 | 1 |
| 8 | 1 | 3 | 5 | 6 | 7 | 9 | 2 | 4 |
| 6 | 2 | 9 | 4 | 1 | 8 | 5 | 7 | 3 |
| 3 | 8 | 2 | 6 | 9 | 4 | 1 | 5 | 7 |
| 9 | 4 | 6 | 1 | 7 | 5 | 8 | 3 | 2 |
| 1 | 7 | 5 | 3 | 8 | 2 | 4 | 6 | 9 |



Brainteasers

Page 2 You would ask either robot, "What door would the other robot tell me goes to paradise?" and then take the opposite door.

Page 8 A Doll;
A (computer) mouse

Rebus Puzzle:

1. No "I" in team
2. An inside job
3. I < 3 U

Send ideas and comments to:

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1061 Beard-Eaves
Memorial Coliseum
Auburn University, AL 36849

UNTIL NEXT TIME !