

SYSTEM ALERT!

Tomorrow is almost here.

Robots to the rescue?

Every day, heroic rescue workers risk their lives to save others. They answer the call of duty during fires, bomb threats, collapsed buildings, disasters at sea, and more. Rescue workers are highly trained, but entering a disaster area is always dangerous.

Can robots offer safer search and rescue operations? Yes! In fact, they are already doing so, though human rescue workers will still be needed for a long while. After all, robots are still far from having human capabilities. But thanks to the determination of engineers, they are gaining new abilities all the time.

Take a peek at the state of search and rescue robotics.

Radiation-proof robot helps at disaster site

In 2011, the world watched in horror as a disaster unfolded at the Fukushima Daiichi Nuclear Power Plant in Japan. When an earthquake and tsunami dealt a double blow to the plant, safety measures failed. This resulted in explosions and a massive release of radiation. Uranium fuel rods from three nuclear reactors literally melted, burning through their containers and through the concrete floor.

For years, the exact location of the melted fuel from one of the reactors remained a mystery. Teams could not get near enough to search. Radiation levels are high enough to kill humans within seconds! Not only that, but the whole reactor is submerged in seawater and filled with debris.

But in 2017, a remote-controlled robot called Mini Manbo entered the chamber and found melted uranium. Mini Manbo's features were designed for this task. These include:

- Components that can survive radiation that would kill humans and damage most robots.
- Propellers for swimming.
- A compact size (about the size of a shoe box) to navigate tight spaces.

The cleanup itself is still expected to take years. No doubt robots will have an important role to play. ⚠



Image credit: Toshiba

ROBOTICS CAREERS

- Mechanical engineer
- Software developer
- Electrical engineer



Myth and human combine to save lives

Sometimes, robots have highly specialized abilities humans lack. But when it comes to interacting with the environment in diverse ways, humans have the edge. Our human bodies let us walk, crouch, clamber, move objects, and use various tools.

The Centauro system is a step toward a search and rescue robot with the same general abilities. Named after the centaur, a mythological creature with a human torso and the body of a horse, Centauro has two arms and four wheeled legs.

What makes Centauro special is its flexibility. Thanks to numerous actuators (or components that allow movement), Centauro can stand tall, duck low, climb stairs, move rubble, and operate tools. It also did pretty well in a karate chop demonstration, breaking a piece of plywood in two.

As for future upgrades, the creators envision operators using “a full-body telepresence suit” to control Centauro. Operators will be in an augmented-reality environment based on data collected from the robot’s sensors. ⚠️



Image credit: Centauro Project



Image credit: Yufeng Chen, Neel Doshi, and Benjamin Goldberg/ Harvard University

The ultimate search swarm

When searching in a time-sensitive scenario, rescuers want to cover a lot of ground quickly. This is what engineers envision for HAMR, a minirobot about the size of a cockroach. Still at least 10 years off from real-world use, the idea is pretty cool: this swarm of insect-like robots can fly into nooks and crannies and cooperate to cover an area more quickly. In fact, HAMR can even go under water!

A couple technical issues must be solved before HAMR is ready for the field. A major one is power. A solar-powered version has been created that can keep the robot operating for up to five minutes. However, this is short of what might be needed for a real rescue operation. ⚠️



Snake-inspired robot helps rescuers in Mexico

Presenting the 2017 Ground Rescue Robot of the Year: Snakebot!

Engineers often take inspiration from the animal kingdom. Just like a real snake, Snakebot has an incredible range of motion. This is thanks to actuated joints that bend and twist in combination to move the robot. It can slither, roll, and even climb. Watching it coil its body to climb up the inside of a drain pipe, you’ll get an idea of this robot’s amazing capabilities.

When Mexico City was struck by an earthquake, the Snakebot team was called to the scene of a collapsed apartment building to help search for survivors. The machine can enter areas that are too confined or too dangerous for humans or rescue dogs. Though Snakebot didn’t find anyone, it proved its potential by performing well. ⚠️



Image credit: Carnegie Mellon University

TETRIX®: Urban Search & Rescue

As a student, you might think that you have nothing to contribute to the field of search and rescue robotics, but this is just not true. Middle school and high school students across the country are using the TETRIX® building system from Pitsco Education to compete in Urban Search & Rescue competitions through SkillsUSA®. Teams design robots that search through disaster areas to find dangerous explosives that must be disposed of. The disaster scenarios are simulated, of course, but the robots are functional.

In fact, one TETRIX robot designed by three high school students was purchased by an emergency response team in DeSoto, Texas! The robot might have been more modest than a professional model, which can cost hundreds of thousands of dollars. But the robot passed field tests with flying colors – surveying an area and transmitting video to its operator 100 feet away. The robot even overcame turns, angles, and other obstacles.

The Army National Guard in several states has also taken notice of TETRIX robots. Search and rescue is a critical function of the Guard, so they understand well the risks to humans and the potential of robotics. Though the Guard doesn't use TETRIX robots in their rescues, they do bring TETRIX to schools and head up Urban Search & Rescue competitions. ⚠️

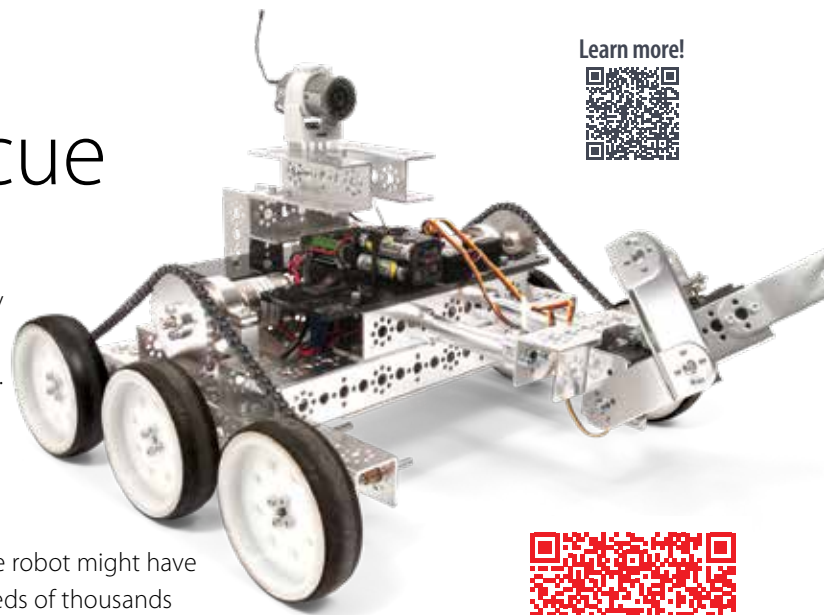
Foldable drones: More than meets the eye

Robots are real, but Transformers are just fiction . . . right? Researchers at the University of Zurich recently developed a drone that can change its shape mid-flight.

Why is this important? In disaster situations such as earthquakes, fires, and cave-ins, rubble and collapsed structures can create tight spaces. But a drone searching the area might be able to make it through those spots by compressing its shape. The drone has four arms with a propeller on each. The arms can fold in close to the body in different configurations.

Right now, the drone relies on a human operator, but eventually the creators hope to program more autonomy into their drone. According to researcher David Falanga, "The final goal is to give the drone a high-level instruction such as 'enter that building, inspect every room, and come back' and let it figure out by itself how to do it." ⚠️

Learn more!



SEE IN ACTION!

SEARCH AND RESCUE CAREERS

- Firefighter
- Coast Guard
- National Guard
- Explosive ordnance disposal technician



Image credit:
University of Zurich



Social media: A tale of cause and effect

If nobody is talking about it on the Internet, does it truly exist? Social media platforms like Facebook, Snapchat, and Instagram give many users a rush and a feeling of being connected. But skeptics caution that too much social media might have downsides for our emotional health.

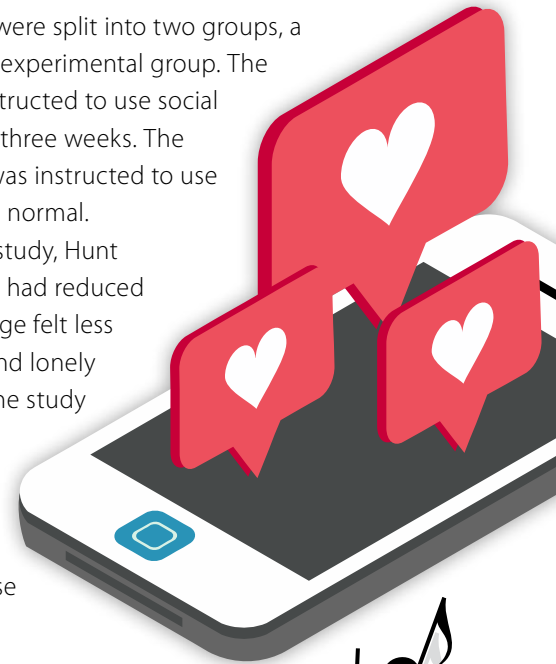
But is this true? Does anybody really know? Studies have tried to link social media use and unhappiness. Just because a study finds a link, it doesn't mean social media causes unhappiness.

There is an old saying among mathematicians and scientists: "Correlation is not causation." For example, as more coats are purchased, more hot cocoa is purchased as well. So, these two things are correlated. But does purchasing a coat cause shoppers to purchase cocoa? No! Both share the same common cause: cold weather.

Researcher Melissa Hunt set out to learn whether social media use really did cause unhappiness. Her team began by surveying 143 volunteers. They asked about their mood and the amount of social media they used. This established a baseline.

Then, the volunteers were split into two groups, a control group and an experimental group. The control group was instructed to use social media like normal for three weeks. The experimental group was instructed to use less social media than normal.

At the end of the study, Hunt found that those who had reduced their social media usage felt less depressed, anxious, and lonely than they did when the study began. In short, this information goes a way toward proving that excessive social media usage can cause unhappiness. ⚠️



A computer that can mimic the masters

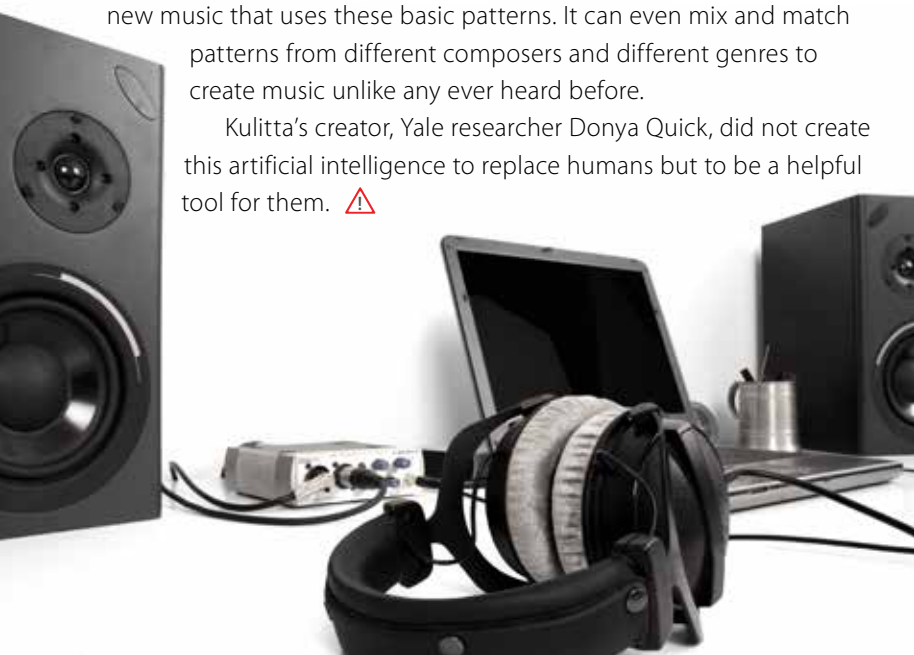
Many fans believe the musical compositions written by 18th-century composer Johann Sebastian Bach are among the most beautiful ever written. His music can be complex, playful, and emotional. And he has a style that music lovers can recognize as his own, even if they aren't familiar with the specific composition they are hearing.

Or they could until Kulitta, that is. Kulitta is an artificial intelligence system that has created original pieces of music in the style of Bach that have fooled even expert listeners. And it doesn't stop with Bach. Various styles of music have been mimicked by Kulitta.

Music is emotional, but it is also mathematical. Musical tones are defined by their frequency. And groups of notes take on beauty because of their mathematical relationship to one another. Random notes will most likely not please the ear, but when they are organized into patterns that respect the rules of harmony, beauty will emerge.

Computers excel at analyzing structures for patterns. Kulitta (with a little bit of help from humans) analyzes pieces of music, finding these patterns and learning from them. The program is then able to create new music that uses these basic patterns. It can even mix and match patterns from different composers and different genres to create music unlike any ever heard before.

Kulitta's creator, Yale researcher Donya Quick, did not create this artificial intelligence to replace humans but to be a helpful tool for them. ⚠️



Volume 7, No. 3

SYSTEM ALERT!
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System Alert! is published by Pitsco, Inc. Information and articles are geared to middle-level students.

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Student name: _____ Class/Hour: _____

***SySTEM Alert!* Quiz (Volume 7, Number 3)**

1. Which two natural disasters dealt a double blow to the Fukushima Daiichi Nuclear Power Plant?
 - A. landslide, forest fire
 - B. tornado, earthquake
 - C. volcano, tsunami
 - D. earthquake, tsunami

2. In a robot, what is an actuator?
 - A. a sensor that detects motion
 - B. a component that allows movement
 - C. the ON switch
 - D. a system that allows the robot to keep its balance

3. How large are the swarm robots called HAMR?
 - A. the size of a ladybug
 - B. the size of a cockroach
 - C. the size of a hummingbird
 - D. the size of an owl

4. A search and rescue drone developed at the University of Zurich can change its shape mid-flight. What advantage does this provide?
 - A. It saves power.
 - B. It can disguise itself.
 - C. It can fit through tighter spaces.
 - D. It can be used in a Michael Bay movie.

5. According to an old saying, "Correlation is not _____."
 - A. everything
 - B. causation
 - C. enough
 - D. coincidence



6. What artificial intelligence system created pieces of music in the style of composer Johann Sebastian Bach?
 - A. Kulitta
 - B. Watson
 - C. Deep Blue
 - D. HAL 9000

7. According to a recent study, how did reducing use of social media affect mood?
 - A. It increased depression, anxiety, and loneliness.
 - B. It decreased depression and anxiety but increased loneliness.
 - C. It decreased depression, anxiety, and loneliness.
 - D. It increased anxiety but decreased depression and loneliness.

8. What robot won the 2017 Ground Rescue Robot of the Year award?
 - A. Centauro
 - B. TETRIX®
 - C. Snakebot
 - D. Mini Manbo

9. In a demonstration, Centauro showed its strength by _____.
 - A. karate chopping a piece of wood in two
 - B. carrying a person
 - C. lifting up the front end of a car
 - D. breaking down a door

10. In the most dangerous regions of the Fukushima Daiichi Nuclear Power Plant, radiation levels are high enough to kill humans within _____.
 - A. seconds
 - B. minutes
 - C. hours
 - D. days

Bonus:

Can you think of five jobs you believe will never be automated by robots or computers? If so, list them. If not, explain why in a short paragraph.