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April 1st: Keeping on Your Toes

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Electronic Design

April 1st has traditionally been a day to celebrate with jokes, spoofs, and other tricks. It's always hard to consider humor when there are so many tragedies in the world, but we seem to have them regardless of the year at hand. Likewise, humor can make bearing up in these tough times a little easier. We don't want you to forget the horrors occurring in Ukraine or having to deal with COVID. However, we do hope our attempt at humor puts a grin on your face.

Our take on this day follows our take on the industry we cover. If you stumble upon our articles, then you better read carefully. We've also collected them together so that you won't miss any.

By BILL SCHWEBER, Contributing Editor

Using Smartphone Texts for Clinical Reflex/Reaction-Time Tests

Testing speed of human response may be as simple as using a smartphone app and text messages, according to a health institute.

Measuring the reaction time of test subjects to random-timed stimuli is a standard clinical procedure in many settings. Modern instrumentation makes this a simple task—far more sophisticated than the "carnival" units of the 1950s *(Fig. 1)*—and can produce highly accurate time-data for further analysis. But setting up the test arrangement takes time while its "institutional" look can affect user comfort and thus skew results.

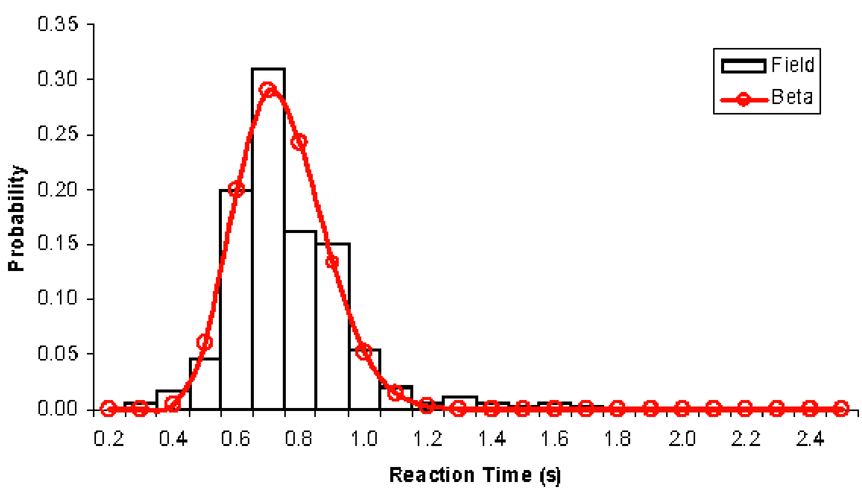
Now, a team at the Nation Institutes of Health (NIH) is investigating use of standard smartphones to perform the same tests. The idea is to send a text message to the test subject's own phone and time how long it takes for them to respond, using the phone as the timer. A simple app downloaded to the phone will measure the responses and report the raw data for additional analysis *(Fig. 2)*.

According to the project leader, people are amazingly speedy when

it comes to responding to text message alerts. They can't resist picking up the phone immediately to check. In fact, he noted that there are documented cases of individuals who were comatose yet woke up upon hearing their phone ping. In some cases, the patients even picked up their phone to answer the text message as they "snapped" out of their comatose state. An NIH spokesperson mused, not entirely in jest, "Who knows, it might even become an Olympic event in a few years?"

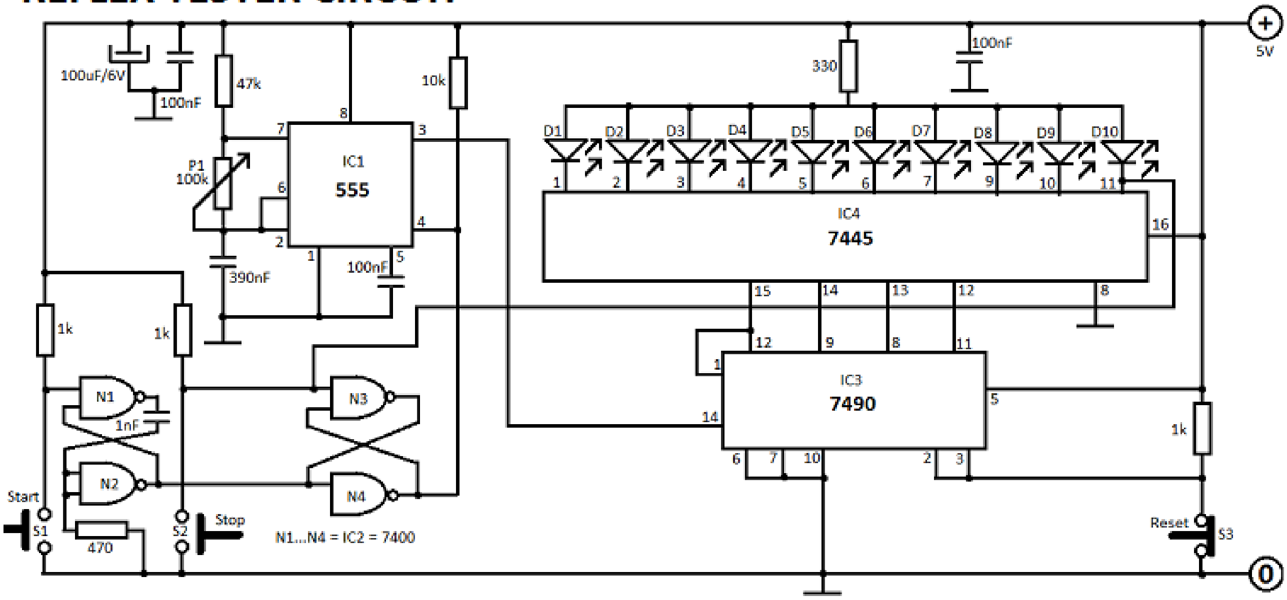
Use of the system based on smartphones may eliminate the need for hobbyist DIY reaction-time test circuits, such as the one built with the classic 555 timer and a few small-scale digital ICs *(Fig. 3 on next page)*.

1. This carnival reaction-time tester was the forerunner of more sophisticated electronic units. (Image credit: Worthpoint)



2. The smartphone-based reaction-time app provides raw data that can then be analyzed and graphed in various formats, including the basic histogram. (Image credit: Semantic Scholar)

REFLEX TESTER CIRCUIT



3. A basic reaction-time circuit with a readout of 10 LEDs is analogous to the carnival version and doesn't even require a microcontroller. (Image credit: Electroschematics)

LEE GOLDBERG, Contributing Editor

The First Odor-Enhanced VR Headset Goes on Sale in Time for the Holidays

Can digitally synthesized odors add realism to VR gaming or bring a bit of the real-world office environment to remote workers?

Digitally synthesized odors (DSOs) promise to bring a new dimension of realism to virtual reality, allowing virtual travelers to breathe in the heady aromas of downtown Mumbai, and make it possible for gamers to smell an enemy lurking behind them. At least one manufacturer is aiming to bring a first-generation olfactory-enhanced (OE) headset to market in time for the 2022 holiday season, despite setbacks caused by two competing DSO technologies competing to dominate this emerging market *(Fig. 1)*.

Born in Battle

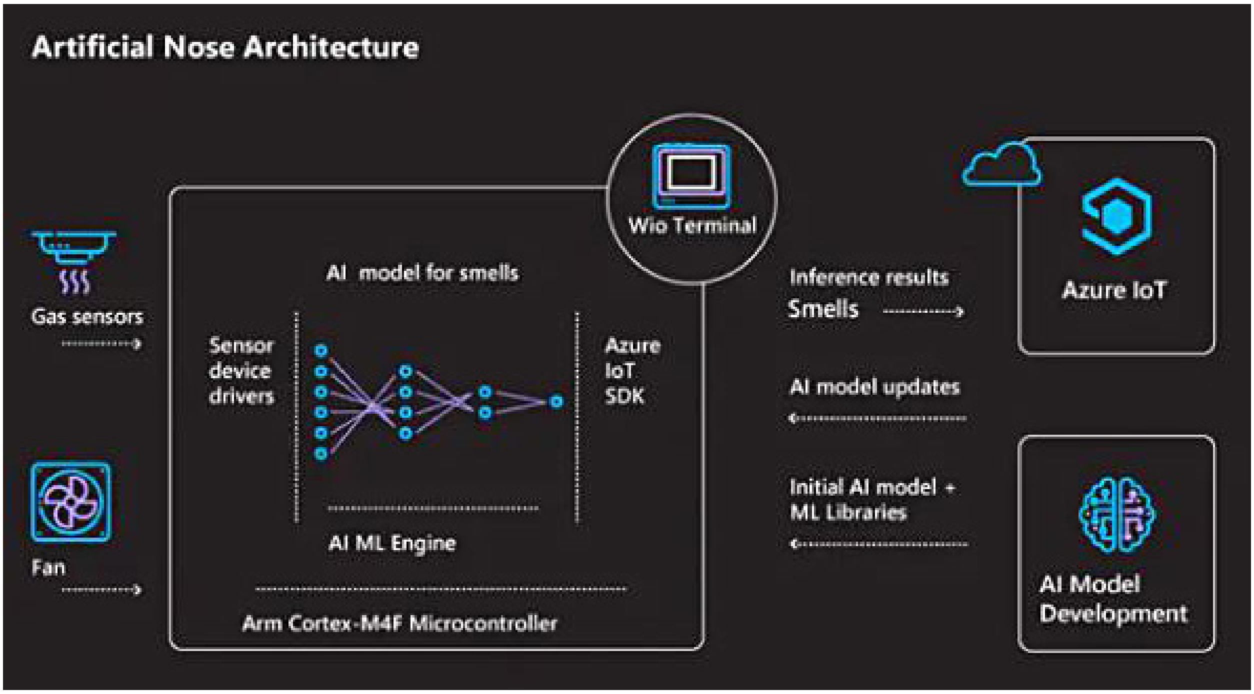
Digital odor synthesis was invented in the mid-1990s as part of a DARPA research program and has proven its value in several generations of the U.S. Army's battle training simulators. As reported in the April 1, 1995 issue of *Electronic Design*, the original DSO system, developed by Dr. Apri L'Fuhl, was based on a recently discovered class of organic compounds, known as "Primary Odorants (POs)."

While each PO has its own distinctive smell, they can be combined in precise ratios with one or more other POs to create a wide range of completely different scents. Modern DSO systems typically use a small cartridge, containing an array of capsules each containing a different PO compound. Each capsule is equipped with a small heating element and a MEMS-based valve that can precisely meter the compound into a vortex mixing plenum where the desired scent is created.

Thanks to the POs' unique properties, it takes only takes 32 different compounds to produce tens of thousands of unique odors. When Dr. L'Fuhl's team sought to commercialize the technology in the early 2000s, they introduced a new collection of 64 POs that could produce what they referred to as high-definition digitally synthesized odors (HD-DSOs).

The team also developed the technology for an "artificial nose" that would enable two-way transmission of odors over the internet, a technology commonly referred to as "tele-olfaction." Unfortunately, the deployment of tele-olfaction

1. Inspired by alien technology, YoYo Dyne's Overthruster Full Impact OE-VR headset will enhance the user's VR experience with realistic smells. (Credit: Jeff Bellio)



2. Microsoft's artificial nose uses AI to enhance the relatively simple capabilities of the technology developed back in the 1990s. (Credit: Microsoft)

became stalled when the IETF found itself in conflict with Microsoft over the development of a standard for communication of odors.

Eventually, the IETF abandoned its efforts and Microsoft's WinSmell 95 drivers became the de facto standard, just before the software giant scuttled the entire project. It was only recently that Microsoft revived its research on the technology and introduced a greatly improved version of the artificial nose *(Fig. 2)*.

An Overnight Success—After 20 Years

The war over transmission standards was one of several reasons that the technology struggled to gain traction in commercial applications for over two decades. Things began to look up during the internet boom of the early 2000s. Several venture capitalists dabbled briefly with tele-olfaction, most notably as an enhancement to the early tele-dildonics systems that were hitting the market. While systems won awards at CES and its companion show, the AVN Expo, a combination of technical and marketing issues kept the technology from achieving critical mass.

In an odd twist of fate, the COVID pandemic has given DSO technology a second life, thanks to a surge in the adoption of virtual reality by tens of millions of homebound workers and consumers. The high volume of VR headsets being sold provided the justification for investing in the R&D needed to commercialize the technology.

YoYo Dyne Entertainment, based in Grover's Mill N.J., was the first company to license the technology. The company created a much smaller, lighter DSO system that could be integrated into a gaming product. The company recently announced that, after successful beta testing of the prototype, its OE-VR headset will be entering production early this summer in a repurposed automotive accessory plant, located just outside Flint, Mich.

"We decided to onshore even before the Ukraine kerfuffle" said John Fish, YoYo Dyne's CBO. "In addition to giving us a shorter, more reliable supply chain, we also have access to a huge community of highly skilled manufacturing monkey-boys—oops, I meant workers. And besides, YoYo Dyne feels it is both our privilege and our duty to give back to the planet, ah, I mean country that has given us so many opportunities."

Branded as the Overthruster-Full Impact, the OE-VR headset will take its place as the flagship product in YoYo Dyne's 2023 collection of its iconic Overthruster series of gaming gear. With a retail price of $799.42, it will come with a basic 32-odorant cartridge, suitable for general-purpose use. The company also will be introducing a series of specialized cartridges that can be used to further enhance specific applications.

"We'd anticipated that there would be a big demand for a high-def cartridge that could create exotic odors to complement the alien landscapes that players encounter in many science-fiction-based VR games" said John Bigbooty, YoYo Dyne's VP of marketing. "We also expect our 'Smell the World' cartridge to be very popular, especially, if Heaven forbid, another nasty COVID variant forces us back into lockdown."

The VP hefted one of the first production units in his hand and grinned. "The funny thing about this launch is that we were completely surprised when our focus groups identified a large percentage of former office workers who now work remotely who expressed a deep nostalgia for the smells of their old workplace," said Bigbooty. "To meet this demand, we developed the Daily Grind odor cartridge. When combined with a small software app, it can take a remote worker through a full week of the routine and random smells they miss."

"We worked hard to faithfully reproduce the environment that office workers call their comfort zone" continued Bigbooty. "When you log in to work, your Full Impact VR headset will greet you with the smell of fresh-brewed coffee that will become increasingly stale as the day goes on. Your day will also be punctuated by occasional bursts of ozone and toner from a virtual copying machine as well as random whiffs of body odors from your virtual co-workers.

"At lunchtime, Daily Grind's virtual break room will fill the air with the scents of various lunches being microwaved. And, if you happen to work late, you'll be treated to the muffled sound of trash cans being emptied and whiffs of various janitorial products," he concluded.

By BILL SCHWEBER, Contributing Editor

Game Show to Focus on STEM Constants with "Number, Please" Week

The popular game show will use science and engineering constants as the answers, and contestants must provide the associated name.

Top-rated TV game show *Jeopardy* will host a special week of shows focusing on key numbers in science, math, and engineering as a unique challenge to the contestants. Details are still being worked out, but the plan is to group the numbers into logical categories such as "physical constants" and "geometry." These numbers will range from relatively easy ones such as 3.1415 (π) and 2.718 (Euler's number e) to somewhat harder (3×10^8—speed of light) to fairly hard (1.38×10^{-23}—Boltzmann's constant).

A spokesperson for the show said, "there's no shortage of good numbers; hey, we've all had to deal with Avogadro's number, 6×10^{23}, in high-school chemistry." The show's producers haven't yet decided if the displayed numbers also will have their units shown (where applicable) to make the challenge somewhat easier, or if the numbers will be shown dimensionless. However, they're leaning toward the former to give the clues more "personality."

If the ratings are good enough, the show may add a special week called "Effect and Cause," whereby contestants will be given a scientific effect and answer with its name. They provided two examples: For "the tendency of a fluid jet to stay attached to a convex surface," the response would be "what is the Coanda effect?" and for "the tendency of alternating high-frequency currents to crowd toward the surface of a conducting material," it would be "what is the skin effect?"

ALIX PAULTRE, Editor at Large

Novel Material Challenges Legacy Audio Amplification

A breakthrough in materials science defies traditional electronics by doing away with them altogether in a range of audio apps.

One of the issues faced by the electronic product development community is the need for advanced power-amplification solutions, especially in the area of audio. Audio amplification is a major part of our personal electronics landscape, as aside from vision, audible information is arguably the next most important information input mode.

Amplification solutions based on legacy electronics confront multiple issues, among them power consumption, thermal waste, and physical mass. These factors, and others, contribute to the bulk, heat, and battery life of audio power-amplification systems. Furthermore, the extra circuitry needed for amplification adds to the bill of materials and product package ergonomics.

The EKAF

Recently German-based Narrin Enterprises unveiled a novel and revolutionary product called the Emetic Kinetic Amplitude Focuser, or EKAF. Presented as a scalable and flexible solution that eliminates the need for electronics in the audio-amplification stage of any product, the EKAF is a linear component that's available in a variety of gauges and lengths.

According to the Founder and CEO of Narrin, Eno Lirpa, the cable-like solution is based on a materials breakthrough he had in his garage workshop. "The EKAF 'cable' uses strings of solidified phlogiston dielectric woven together like microscopic bundles of camper's lanyards. Stretching, bending, and coiling the cable changes the flow of electrons through it by squeezing them really, really hard in various ways."

Mr Lirpa continued, "When you tie the cable in knots, you change resistance; when you braid it, you increase capacitance; and when you coil it in loops, you get amplification! You can also stretch it for attenuation, but then you need a clamp to hold it in its extended position. It doesn't consume any power to operate because it taps into the universal well of zero-point energy.

"You see, we couldn't find Phlogiston in the past because it evaporates so readily that no previous technology could detect it. As tenuous as Phlogiston is, it's actually a more condensed version of the even more ethereal medium that carries RF signals and light.

"My discovery captures and compresses the Luminiferous Ether into microscopic chains of solidified Phlogiston, which we then feed to genetically modified spiders to weave into threads large enough for me to wind into EKAF cable. I then clad it in my proprietary Interocitor Packaging, or IP, and it's ready to use."

Current Status

Narrin Enterprises didn't have any samples to show at the time of this report, but we've been assured that we will be the first to get the finished prototypes.

The company also claims that its working on a version for military and aerospace radar applications. However, it can't yet solve the issue of standing in front of a high-power microwave emitter to bend the cable into the desired shape. We've also been promised a list of development partners to contact, too, but it hasn't yet arrived. Nonetheless, if this novel technology can be commercialized, it could potentially disrupt the entire electronics industry.