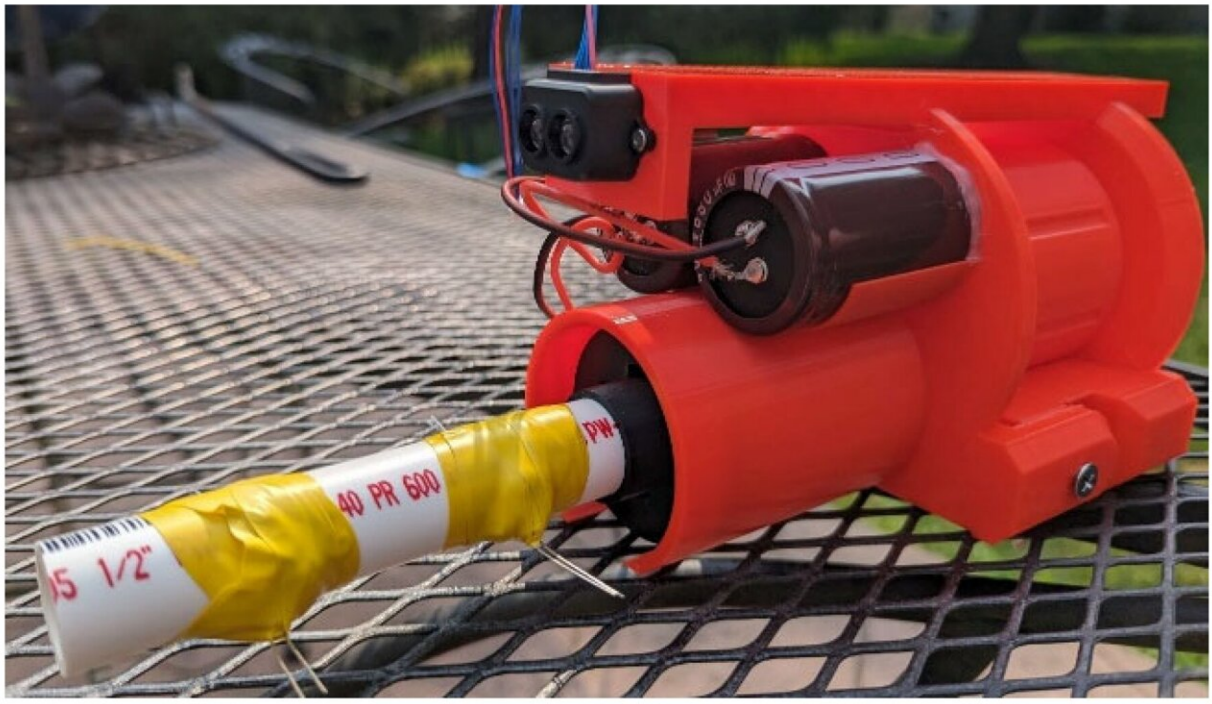
New dart launcher may be a better way to inject animals with drugs

June 13 2024, by Tatyana Woodall



Partial launcher assembly and integrated chronograph in live testing configuration. Credit: *Technologies* (2024). DOI: 10.3390/technologies12050069

A new type of dart launcher has been developed as a safer and more cost-effective alternative to firearms or air guns to inject animals with drugs or tracking chips.

Utilizing electromagnetic coils and lidar technology, the prototype was able to consistently deliver a projectile to a target with enough controlled kinetic energy to suggest that it could deliver drugs successfully without so much force as to injure animals, said John LaRocco, lead author of the study and a research scientist in psychiatry at The Ohio State University College of Medicine.

Normally, if you launch a projectile without any kind of control, its initial velocity drops off because of gravity, wind resistance and other factors," said LaRocco. "We can modulate that velocity at specific distances so it arrives with the correct amount of kinetic energy."

Many types of dart launchers, like ones that use compressed air to operate, are used by biologists and veterinarians to aid in the capture and treatment of pets and wildlife. However, these common machines do carry a measure of risk, as coilgun syringe darts can often fail to inject a target by being too slow or cause injury or death by puncturing an animal too forcefully.

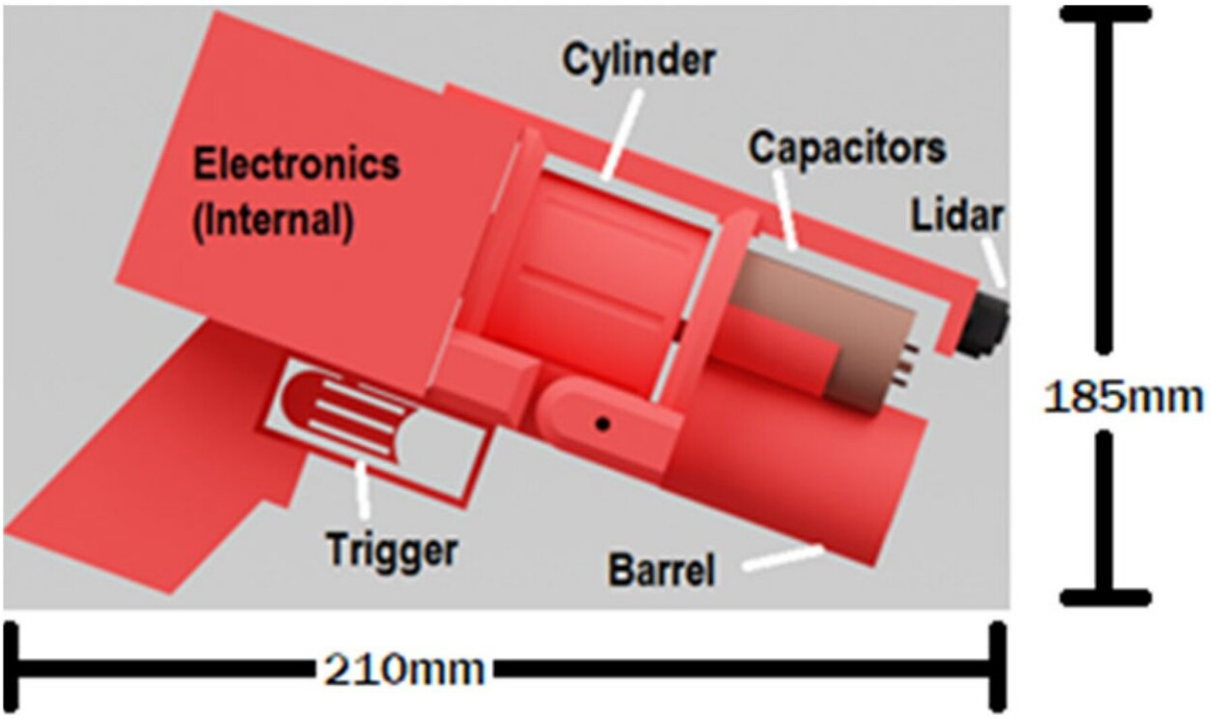
But in experiments where they tested their launcher by firing at a wooden target at distances of 1 to 8 meters, the team was surprised to find that their launcher could control a dart's velocity so well that it only had a very narrow deviation from what the researchers intended, said LaRocco.

The total energy of the dart is comparable to a Nerf dart, instead of a firearm or air gun.

"This is a novel control system capable of delivering consistent mechanical control outcomes," he said. "It's not something we were expecting to see with the materials we used, so it's far beyond our expectations."

The study was recently published in the journal *Technologies*.

The prototype consisted of a single-stage coilgun with a soft dart. The lidar calculated the distance to the target and a voltage controller then determined the proper dart velocity.



Labeled diagram of the dart launcher, with the placement of primary components. Credit: *Technologies* (2024). DOI: 10.3390/technologies12050069

John Simonis, co-author of the study and an undergraduate student in electrical and computer engineering, noted that what will likely be the most valuable of the system's future applications will be its ability to enhance existing manufacturing technologies and machine controls.

"We've created a far more accessible type of mechanical and electronic control scheme that can be delivered with high consistency at low cost," he said. "The benefit is if you have more precise control systems in your machines that are much cheaper, that's going to directly result in more precise parts for the consumer at a lower price."

And because a great deal of the prototype's parts were either 3D printed or made with commercial components, their device is something that could easily be reproduced by other researchers, said Qudsia Tahmina, another co-author of the study and an associate professor in electrical and computer engineering.

"By aiming to mitigate the risks associated with the availability of the materials and providing a low cost option for people interested in doing research in this area, this work addresses real-world supply chain issues in a practical way," she said.

Though the precision of the current design is remarkable, with iterative modifications like improving the system's sensors and making their darts follow more complex trajectories, the team expects that its continued improvement combined with its widespread commercial availability could usher in a new era of industrial mechanical engineering.

"Feedback from the research community who would utilize this mechanism can allow us to adapt the project into something that's a little more targeted," said Simonis. One future step would be to test the prototype on live animals, the researchers said.

More information: John LaRocco et al, Evaluating a Controlled Electromagnetic Launcher for Safe Remote Drug Delivery, *Technologies* (2024). DOI: 10.3390/technologies12050069

Provided by The Ohio State University

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