

Guiding light: New technology puts a light-painting drone at your fingertips

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Skoltech researchers have designed and developed an interface that allows a user to direct a small drone to light-paint patterns or letters through hand gestures. The new interface, DroneLight, can be used in distant communications, entertainment, and even search and rescue. The paper was published on the preprint server arXiv.org and presented at IEEE International Conference on Robot & Human Interactive Communication.

Drones are becoming ubiquitous both in industrial and consumer applications, and engineers are working on ways to make human-[drone](#) interaction as natural and reliable as possible. Yet, as the paper notes, "up to now, the available technologies have not made it possible to control drones intuitively without special training and additional control equipment."

"Flight control is a challenging task as user has to manipulate with the joystick to stabilize and navigate drones. Only a very skillful operator can maintain smooth trajectory, such as drawing a [letter](#), and for the typical user it is almost not possible," says Professor Dzmitry Tsetserukou, a coauthor of the paper.

Tsetserukou, Roman Ibrahimov, and Nikolay Zherdev with the Skoltech Intelligent Space Robotics Laboratory have developed a system that allows easy interaction with a micro-quadcopter with LEDs that can be used for light-painting. The researchers used a 92x92x29 mm Crazyflie 2.0 quadrotor that weighs just 27 grams, equipped with a light reflector

and an array of controllable RGB LEDs.

The control system consists of a glove equipped with an inertial measurement unit (IMU; an electronic device that tracks the movement of a user's hand), and a base station that runs a machine learning algorithm. This algorithm matches the user's gestures to pre-defined letters or patterns and directs the drone to light-paint them. In their experiment, the engineers defined five different letters (S, K, O, L and J), training a Random Forest Classifier algorithm to connect the [hand gestures](#) for these letters to corresponding drone trajectories.

The team plans to further develop their system by adding more user gestures to the dataset, adding more letters to its 'alphabet', and creating a more precise and faster machine learning algorithm.

"The most fascinating application can be DroneMessenger, when partners can not only exchange messages and emoji over the distance but also enjoy the light art during a starry night. Another application is a show of drones when an operator can generate dynamic light patterns in the sky in real time. You can also imagine another system, SwarmCanvas, where users located in remote places can draw a joint picture on the canvas of the night sky. Currently, drone show systems just reproduce predesigned trajectories and lighting patterns," Tsetserukou notes.

More information: Roman Ibrahimov et al. DroneLight: Drone Draws in the Air using Long Exposure Light Painting and ML. arXiv:2007.15171 [cs.RO] arxiv.org/abs/2007.15171

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