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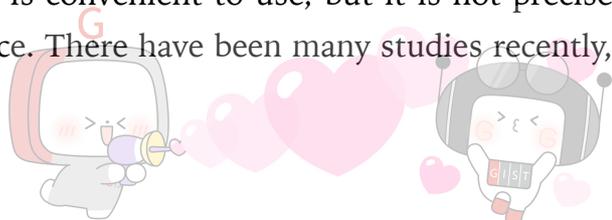
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Professor Jongho Lee's research team develops drone technology that automatically lands on moving vehicles

- GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) School of Mechanical Engineering Professor Jongho Lee's research team developed a drone technology that can autonomously land while following a moving vehicle that has been installed with a hemispherical infrared* marker.

* infrared (IR): light with longer wavelengths than the red visible light region and used by the military for target detection and tracking

- The results of this study are expected to be used in the unmanned vehicle industry in the future, including drone delivery through cooperation between drones and vehicles.
- Cooperation between drones flying in the sky and vehicles traveling on the ground can greatly expand the scope of their previous missions. In particular, it is difficult to create a large landing space on a vehicle, so it is important to accurately detect the narrow landing point of the moving vehicle and land the drone reliably.
- The Global Positioning System (GPS) is convenient to use, but it is not precise enough to land a drone in a small space. There have been many studies recently,



such as marking the landing point on the vehicle with a marker, locating the marker with a sensor, and landing the drone on the marker. However, the more the drone looks at the marker, the lower the recognition rate. Furthermore, if the marker is obscured by something, locating the marker becomes more difficult.

- The research team produced a hemispherical LED marker that widened the detection range by arranging infrared LEDs in a three-dimensional hemisphere shape. When an infrared camera mounted on a rotating 2-axis gimbal detects infrared rays emitted from the marker, the drone is guided to the landing point while tracking the marker and lands automatically. The developed hemispherical infrared marker has the advantage of lowering the manufacturing cost by using commercial LED devices.
- The LED used for the hemispherical infrared marker emits light in the infrared (wavelength: 940nm) region with relatively high transmittance, so even when the marker is covered with foreign substances such as leaves or vinyl in a realistic environment, the infrared camera attached to the drone can be used to detect the marker and land stably. In addition, by using heat sinks and cooling fans made of metals with high thermal conductivity, it can effectively dissipate the heat generated when multiple LEDs are used, enabling long-term use.
- Professor Jongho Lee said, "As a result of this study, the hemispherical infrared marker allows automatic landing of unmanned aerial vehicles such as drones on ground vehicles, so it can be used for unmanned aircraft industries such as drone delivery through collaboration between unmanned aircraft and ground vehicles."
- The research was conducted by GIST Professor Jongho Lee's research team and published online on March 17, 2021, in *IEEE/ASME Transactions on Mechanics*, a top 5% journal for engineering and machinery.

