New Army Technology Guides Soldiers in Complete Darkness

ARL PUBLIC AFFAIRS OFFICE

Researchers at the U.S. Army Research Laboratory (ARL) developed a new type of thermal imaging camera that allows Soldiers to see hidden objects that were previously undetectable.

Dr. Kristan Gurton, an experimental physicist in the Computational and Information Sciences Directorate, and Dr. Sean Hu, an electronics engineer in the Sensors and Electron Devices Directorate, are leading the ARL's effort.

According to Gurton, all objects that have a non-zero temperature emit thermal radiation in the infrared portion of the spectrum, and the "intensity" of that radiation is proportional to its temperature.

The researchers said thermal radiation is always present in the environment regardless of whether it's day or night, which is why the Army uses thermal cameras to "see" objects that are often hidden in the dark. However, in addition to the "intensity" of the infrared light, there is another characteristic of light that is often ignored when it comes to imaging: polarization state.

"At ARL, we have been developing, with the help of the private sector, a special type of thermal camera that can record imagery that is based solely on the polarization state of the light rather than the intensity," Gurton said. "This additional polarimetric information will allow Soldiers to see hidden objects that were previously not visible when using conventional thermal cameras."

Gurton is pursuing the development of the camera hardware, while Hu is working on software designed to best exploit the additional information thermal polarimetric imaging provides.

"Soldier-specific applications that we have been investigating include the detection of hidden tripwires and booby traps, enhanced ability to see camouflaged targets, identification of buried line-mines and improvised explosive devices, and enhanced targeting and tracking of missiles, mortars, unmanned aerial vehicles, and other airborne threats," Gurton said.

The team's most recent and exciting discovery involves the ability to detect and identify specific human subjects during complete darkness.

"Prior to our research at ARL, the only way to view humans at night was to use thermal imaging," Gurton said. "Unfortunately, such imagery is plagued by a 'ghosting' effect in which detailed facial features required for human identification are lost. However, when polarization information is included in the thermal image, i.e., a thermal polarimetric image, fine facial details emerge, which allows facial recognition algorithms to be applied."

Read the complete article at: https://www.army.mil/article/211492/new_army_technology_guides_soldiers_in_complete_darkness.

The images above are examples of human identification using conventional and polarimetric thermal cameras. The thermal polarimetric image allows for finer facial details to emerge. (U.S. Army images)