

A Fifteenth Major Improvement to the Integrated Visual Augmentation System

A military-specific segmentation algorithm for object classification and targeting

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EINPresswire.com/ -- Army Rangers are well suited to perform force-oriented reconnaissance to gather important intelligence on enemy forces such as the types and number of military equipment. Often times during a recon mission a Soldier sees an object, but is uncertain of what exactly it is so expert consultation is needed.

In a 1 August 2023 article, [TPMI](#) introduced its AI-assisted image analysis process, which if integrated into the Army's Integrated Visual Augmentation System ([IVAS](#)) could near instantly bring a Soldier's captured imagery to the most skilled imaging expert. This improvement would result in near real-time, informed decision making for both the Soldier in the field and his or her leadership. Questions like "should further recon be performed?" could often be reliably answered.

However, some situations exist where even the top subject matter expert is unable to classify the image. This can be due to a wide range of causes. For example, the picture can be blurry. Or, the vehicle can be mostly hidden by trees, bushes and other camouflage. So, what can be done?

In US Patent 11,058,390, a novel image segmentation algorithm was developed, which if used with the IVAS will significantly boost the Army's capabilities.

First, a bit of background. Image segmentation is the process of partitioning an image into segments and defining the boundary of those partitioned segments. For example, a 2D image

U.S. Patent

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METHOD OF GENERATING A MODIFIED SEGMENTED STRUCTURE

Loading a three-dimensional imaging dataset
[3200](#)

Performing segmentation of a structure within the imaging dataset
[3201](#)

Determining the coordinates of a set of voxels that correspond to the outer surface of the segmented structure
[3202](#)

Determining at least one layer of voxels external to the outer surface of the segmented structure wherein the one layer of voxels is contiguous with the outer surface of the segmented structure
[3203](#)

Adding the at least one layer of voxels external to the outer surface of the segmented structure to generate a modified segmented structure
[3204](#)

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could be divided into (1) the vehicle, (2) the forest, and (3) the sky. The goal of segmentation is to define, within the image, the precise boundary of the object of interest (e.g., the vehicle).

Rather than defining the visible object's boundary, the '390 patent's novel segmentation algorithm would add layers of pixels in a conformal fashion surrounding an object of interest thereby preventing portions of the actual object (that might be hidden on the 2D image) from being clipped off. Thus, a 2D halo surrounding the object of interest is generated to fully encapsulate the object. An AI algorithm predicts the true shape of the object and modifies the boundary of the 2D halo to account for portions of a vehicle that are hidden.

Consider a first Soldier. With a known GPS coordinate and a known trajectory (e.g., true North) towards a partially camouflaged vehicle (e.g., Russian artillery), the 2D halo generated by the '390 patent based on sensor data from IVAS#1 could be converted to a first elongated 3D shape. Note that the depth of the first elongated 3D shape would be unknown.

Now, consider a second Soldier. With a different GPS coordinate and an orthogonal trajectory (e.g., true East) towards the partially camouflaged vehicle, the 2D halo generated based on sensor data from IVAS#2 could be converted to a second elongated 3D shape. An intersection volume of the first elongated shape and the second elongated shape can be determined to yield an approximate 3D volume and shape of the partially camouflaged vehicle.

More views from a squad of Soldiers could yield a more precise boundary of the camouflaged vehicle. As the boundary becomes more precisely defined, a more confident type classification can be determined (e.g., classified as a 2S23 Nona-SVK). Moreover, precise GPS coordinates can be assigned to unique identifiers on the object (e.g., vulnerable spot in armor) for targeting with precision munitions.

The '390 patent's military-specific segmentation algorithm and intersection volume approach, will yield a precision 3D boundary of a camouflaged vehicle for type classification. The implications for military are huge. A panoramic picture could be presented to the leaders. Battle plans could be better formulated. Attacks can be better timed. Precision munitions could be used.

With TPMI's enhancements, the IVAS system could be improved. TPMI aims to work with [PEO Soldier](#) to integrate this novel technology into the IVAS.

About the author: Dr. Robert Douglas is a West Point graduate who: fought as an Infantryman in Vietnam with US units and a Vietnam recon company; worked in a combat development agency; studied nuclear war in the Joint Chiefs of Staff; patrolled in the desert for the UN in the Middle East with Russian war planners; and developed a system to assist Air Force space exercises. After leaving the service he spent over three decades in the defense industry rising from manager to vice president working programs ranging from sensors and missiles for Air Force aircraft to rubbing shoulders with Army scientists; to Army helicopters and combat vehicles as well as rapid

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