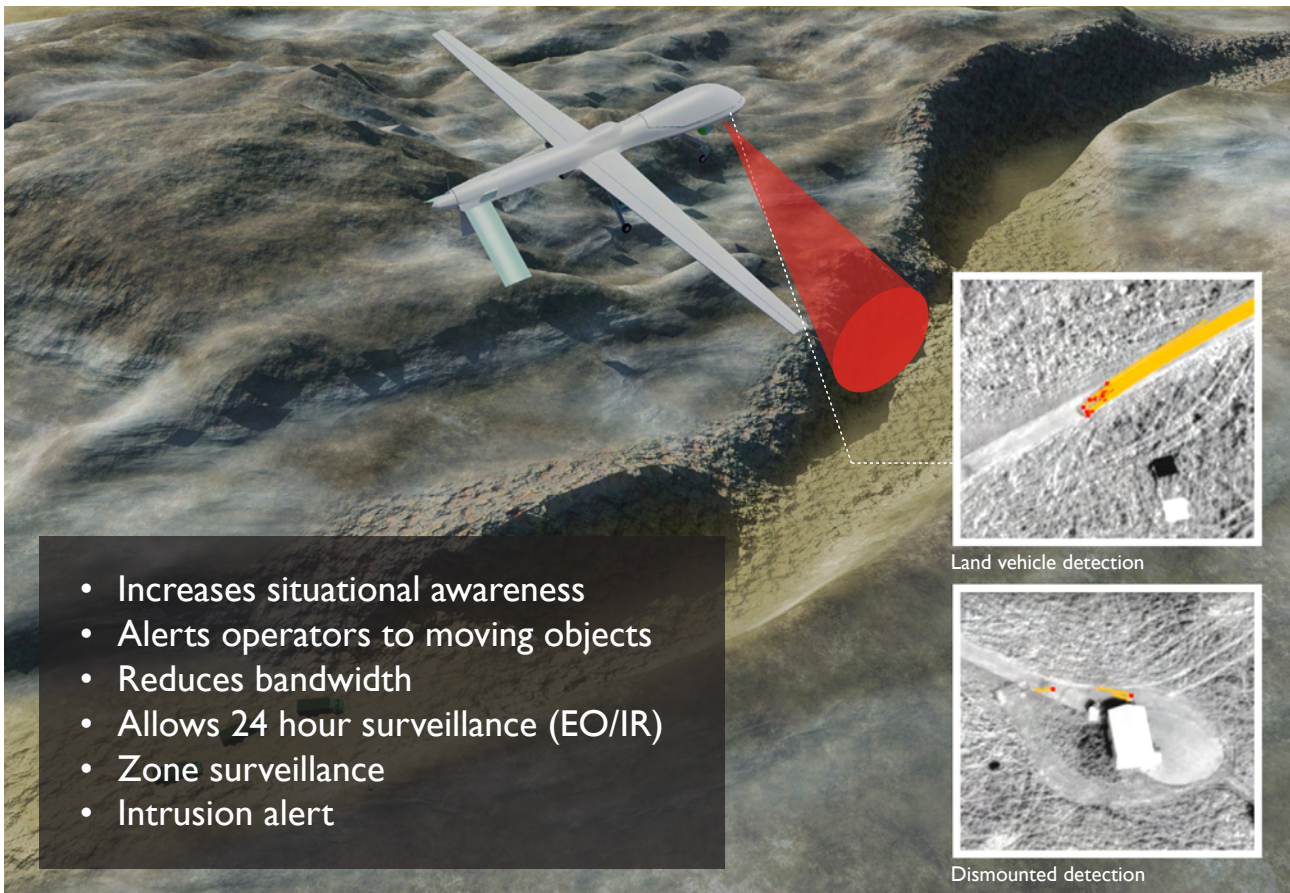


Visual Moving Target Indication

Detects and tracks moving objects



- Increases situational awareness
- Alerts operators to moving objects
- Reduces bandwidth
- Allows 24 hour surveillance (EO/IR)
- Zone surveillance
- Intrusion alert

Description

Unmanned Aerial Vehicles (UAVs) are increasingly used in military and civil applications. Currently, the assessment of UAV video is overwhelmingly performed by human operators. This requires that the video is first transmitted to a ground station over a high bandwidth link, and then carefully examined by the operator. The rapid and unceasing movement of the video footprint over the ground makes this an exceedingly expert and demanding task.

Roke's Visual Moving Target Indicator (Visual MTI) automatically detects and tracks moving objects on the ground from aerial full motion video (FMV). The system is able to track all moving objects, including people and cars, and operates on both visible band and infrared imagery allowing 24 hour surveillance. Visual MTI can be used in first-phase analysis to alert operators, in real-time, to any movement occurring on the ground. When combined with Visual Mosaic¹, this movement can be plotted on an aerial map of the area to increase the operator's situational awareness. All movement is automatically tracked to allow users to review the data in further phases of analysis and piece together a coherent picture of events.

¹ Mosaicing stitches images recorded by camera to form a composite map which can be geo-located. This provides a wider visual context as the camera pans and tilts freely and aligns the mosaic to existing maps.

Key benefits

- **Alerts operators to moving objects** – Visual MTI detects, tracks and highlights moving objects to operators in real-time with low latency, enabling them to be alerted to events as they occur.
- **Increases Situational Awareness** – When combined with Visual Mosaic, the moving objects can be overlaid onto a map and their geographic positions determined.
- **Reduces Bandwidth** – Visual MTI can be used to reduce bandwidth by producing cropped snippets of video of the tracked objects to send on to users with limited bandwidth.
- **Allows 24 Hour Surveillance** – Visual MTI is able to operate on both visible band and infrared imagery enabling day and night surveillance.

Detection highlights

- **Alerting operators to moving objects** – Visual MTI detects, tracks and highlights moving objects. Visual MTI can detect objects of different speeds and sizes, including cars, people and bikes. Visual MTI is also able to resolve the 3D nature of the environment to reduce false alarms on high rise 3D structures in the scene, such as tall buildings, which create perspective effects in the imagery.
- **Real-time, Low Latency Processing** – Visual MTI operates in real-time and with low latency, enabling operators to be alerted to events as they unfold.
- **Image Stabilisation** – Visual MTI performs image stabilisation (in real-time) to enable operation on shaky imagery.
- **24 Hour Surveillance** – Visual MTI is able to operate on both visible band and infrared imagery enabling day and night surveillance.
- **Reduced Bandwidth** – Visual MTI can be of assistance in bandwidth constrained situations. For example, Visual MTI processing can be performed on-board the aircraft so only the tracked object data and highly compressed imagery need to be sent to ground. Visual MTI can also be used to create cropped snippets of video of the detected movement and these snippets sent on to limited bandwidth users.
- **Standardised outputs for Simple Integration** – The results of Visual MTI processing can be output in a standardised format according to STANAG 4609 to enable integration into existing video analysis systems. Visual MTI libraries and associated web services are available to allow third parties to interrogate and display the data.
- **Increased Situational Awareness** – When combined with Visual Mosaic, the object tracks can be presented to the users by overlaying them onto a geographic map. Users can then select the tracks, view the video clip of the object, and tag the track with further information. This tag information can be input into a database and updated on any additional users' displays. This 'whiteboard' approach helps to ensure that all users have an up-to-date picture of the status of the area under surveillance.
- **High-level Analysis of Ground Motion** – When combined with Visual Mosaic, the tracks can be overlaid onto a mosaic map. Tracks can be colour coded according to speed, direction or time of detection. This is a useful tool to enable patterns of activity to be assessed to determine coherent patterns of movement or changes in patterns of movement.
- **Automatic Detection of Events** – Visual MTI track information generated by a UAV loitering over an area, or returning to an area regularly, could be input into high level analysis algorithms. These could be algorithms that build up a statistical picture of what is normal movement and, when they detect behaviour which is out of the ordinary, alert this to an operator. Rule-based anomaly detection methods could also be used to detect trigger events pre-specified by the operator. These techniques could allow suspicious behaviour to be identified and investigated promptly.

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