### Abstract

TNO has completed the construction of the TRICLOBS 3-band nightvision system. This newly developed system consists of two digital image intensifiers (Photonis ICUs) and an uncooled longwave infrared microbolometer (Xenics Gobi 384). This night vision sensor suite registers the visual (400-700 nm), the near-infrared (700-1000 nm) and the longwave infrared bands of the electromagnetic spectrum. The optical axes of the three cameras are aligned, using two dichroic beam splitters (an ITO filter to reflect the LWIR part of the incoming radiation into the thermal camera, and a B43-958 hot mirror to split the transmitted radiation into a visual and NIR part). The field-of-view of the cameras is nearly the same, and any rotations between camera images has been minimized. The registration of the individual images therefore requires only a minimal amount of computational effort. Software has been developed to register the signals from all 3 cameras simultaneously, display the images, and write them to a hard disk.

The system was tested and multiband video was registered during a preliminary pilot field trial in a Dutch MOUT village. The imagery was used to make final adjustments to the camera system before registering imagery in the last phase of this project. The raw imagery has now been registered and fused into a false-color representation, suitable for input to sensor fusion algorithms.
MEMORANDUM FOR AFRL/HEH (Wright Site Institutional Review Board)

FROM: TNO Defense, Security and Safety, location Soesterberg

SUBJECT: Final report for Grant FA8655-09-1-3095 “Request for Extension of Grant FA8655-06-1-3017-P00001 Registration of a Dynamic Multimodal Target Image Test Set for the Evaluation of Image Fusion Techniques”

1. Status of Study:

TNO has completed the construction of the TRICLOBS 3-band nightvision system. This newly developed system consists of two digital image intensifiers (Photonis ICU’s) and an uncooled longwave infrared microbolometer (XenICS Gobi 384). This night vision sensor suite registers the visual (400-700 nm), the near-infrared (700-1000 nm) and the longwave infrared (8-14 µm) bands of the electromagnetic spectrum. The optical axes of the three cameras are aligned, using two dichroic beam splitters (an ITO filter to reflect the LWIR part of the incoming radiation into the thermal camera, and a B43-958 hot mirror to split the transmitted radiation into a visual and NIR part). The field-of-view of the cameras is nearly the same, and any rotations between camera images has been be minimized. The registration of the individual images therefore requires only a minimal amount of computational effort.

Software has been developed to register the signals from all 3 cameras simultaneously, display the images, and write them to a hard disk.

The system was tested and multiband video was registered during a preliminary pilot field trial in a Dutch MOUT village. The imagery was used to make final adjustments to the camera system before registering imagery in the last phase of this project.

Scenarios were designed to record dynamic multispectral imagery during a field trial in the Netherlands in June 2010. The scenarios included targets with a range of different sizes, thermal and visual contrasts. A multimodal test target, especially designed for this purpose, and kindly provided to TNO by Dr. Alan Pinkus (WPAFB, Dayton, Ohio) was also included in the images. The resulting set of multimodal images can be used for the evaluation of objective image quality metrics.

The imagery was collected at a Dutch military base in Amersfoort (The Netherlands), according to the newly developed scenarios. The scenarios involved the TRICLOBS camera system approaching the targets, which were placed against a rural background (rugged countryside with heather and trees), which provided a significant level of clutter.
The position of the camera system relative to the location of the targets was accurately registered.

The raw imagery was handed over to Dr. Alan Pinkus (WPAFB, Dayton, Ohio).

The raw imagery has now been registered and fused into a false-color representation, suitable for input to sensor fusion algorithms. This data will be handed over to Dr. Alan Pinkus during a WoS visit of two TNO employees to WPAFB in September 2010.

2. Summary of Subjects: This study did not involve any experiments with human subjects.

3. Summary of Resources: From the start of the project until August 1, 2010, 185 man-hours have been made, and Euro 969 has been spent on expendable supplies and materials.

4. Objective: The objective of this project was to acquire and register a multimodal target image test set that can be used to assess the operational effectiveness of image fusion techniques for a range of relevant military tasks. This goal has been fully achieved.

5. Publications or Presentations:


6. Adverse events: No adverse events occurred in this period.

7. Amendments to Protocol: N.A.

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