

# Night-time imagery in daytime colours

*TNO Human Factors has developed a method to give multi-band night-time imagery the appearance of daylight colour photographs. The method transfers the colour characteristics of a standard colour photograph to the multi-spectral night-time imagery. The only requirement is that the contents of the colour photograph and the night-time scene are similar to some degree. The method can be applied to night-time imagery with at least two bands. The transformation is simple and can therefore be implemented in hardware, or be performed in real time using powerful processors.*

Modern night-vision systems like image intensifiers and thermal cameras enable operations at night and in adverse weather conditions. Night vision cameras that are currently available generally deliver monochrome (grey level or greenish) images. This type of imagery is usually hard to interpret, and may give rise to visual illusions and loss of situational awareness.

### **False colour**

Recently night vision cameras have become available that produce images in multiple spectral bands (e.g. thermal and visual). The different bands provide complementary information since they represent different characteristics of a scene. A combined or fused representation of the individual bands may provide an



**Night-time imagery is better recognisable when given a natural appearance.**

with a complete image of the outside world.

A common approach to visualise multiple spectral bands is to map them to the different channels of a colour monitor. Such a 'false-colour' representation generally has an unnatural appearance, and is therefore hard to interpret.

### **Better performance**

Studies performed by TNO-Human Factors have shown that the performance of observers using false-colour images depends on the fidelity of the colour settings, the degree of correspondence between the false-colour scheme and the colours in the real world. Observer performance in search and detection tasks is better with images that have a familiar appearance, and is worse when the images look 'unnatural'.

**Application**

The (international) armed forces aim to be operational 24 hours a day. To perform their tasks in all operational conditions, they need imaging systems that provide a complete and ergonomic representation of the outside world in a wide range of environmental conditions. The method TNO Human Factors has developed contributes to this by giving multi-band night-time

imagery a more recognisable appearance in daytime colours. The same principle may also be applied to surveillance systems. Because the cameras used with these systems usually register fixed scenes, the colour transformation can be optimised by applying a daytime photograph of the same scene.

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Intensified image



Thermal image



Combination of both images with new method



shortwave band of intensified image



longwave band of intensified image



thermal image



new colour representation