Workshop 2024
ePicture This
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ABSTRACT PRESENTATION

Title: Real-world performance of small Object Detection
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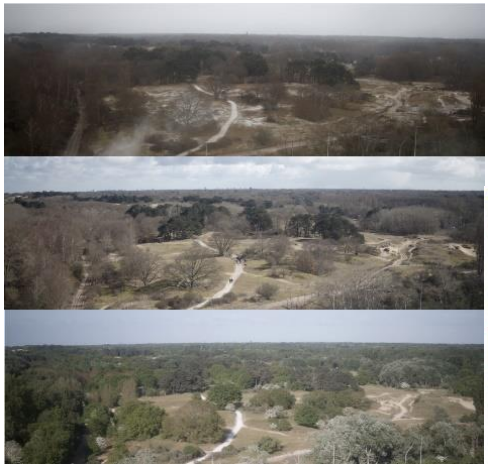
Company name / Institute: TNO
Project name: Mantis Vision
Funding group: Penta ~~/ Xecs / Euripides / ECSEL / KDT~~
Abstract can be published on website: ☒ **YES** ☐ **NO**

Provide abstract of 500 words maximum. Use font ARIAL, size 11.
If figures are used, the text plus figures must stay within this one page.

Automated object detection is becoming increasingly relevant in a wide variety of applications. This includes for example the detection of persons, drones, ships, and vehicles in visible and IR video. For autonomous systems deployed with humans possibly in their vicinity, situational awareness (SA) is of primary importance so that potentially dangerous operations can be adjusted as early as possible. The challenge is to detect and track persons at large distances with a limited number of wide-field-of-view camera systems, which is non-trivial as this results in only a few camera pixels per person. On top of this, light and weather conditions play a role in object detection performance and are an additional challenge. Deep learning-based object detection methods, such as YOLO, have shown to be promising for this purpose in many applications but their performance decreases when the number of pixels on the object reduces. Recent approaches aim to improve the detection of small objects by taking temporal information into account. Such spatio-temporal deep learning models in principle enable the detection of moving persons of sizes down up to 4 square pixels. At such small scales, performance is likely affected by many factors. To obtain a better understanding of these effects we have installed a camera system on an observation tower oriented towards unstructured terrain with trees so that a zone at a distance of 200 to 400 is visible in the field of view. With this setup we can investigate the effect of the contrast between object and background, the resolution of the imaging system and the precision of the deep learning model on the detection accuracy of small persons. We have created a dataset consisting of short clips recorded over an extended period of time and covering several seasons. With the resulting dataset, we compare the object detection performance of different models, but also evaluate the effect of light and weather conditions and demonstrate the limits of state-of-the-art automated small object detection in real-world scenarios.



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