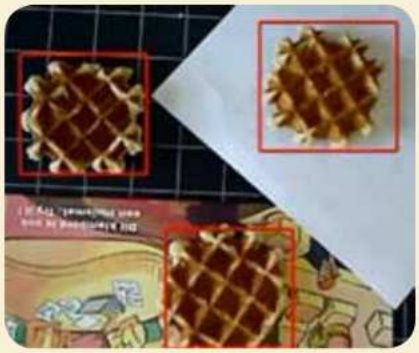
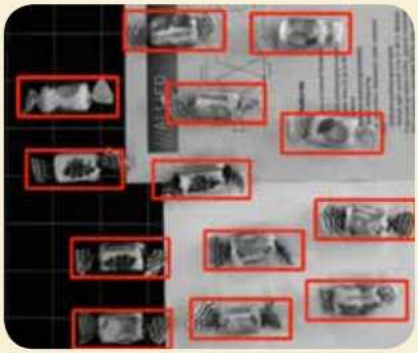
TOBCAT: Industrial applications of object categorization techniqu

During this IWT-TETRA project we will investigate the possibility of using state-of-the-art object categorization algorithms, developed in academic research context, to solve object detection problems in industrial applications.

Object detection is a well spread computer vision algorithm used for the automation of production processes, which tries to solve industrial computer vision problems. These basic camera systems still require that an object, which needs to be recognized and localized, has a known appearance (shape, size, colour, ..) every single time it appears in the image. Simple computer vision techniques like thresholding pixel values in different colour spaces and pattern matching, allow these computer vision systems to successfully detect objects in 2D images.



However, in many industrial applications, we do not want to detect a single object, but rather a set of objects, which is also called an object class. The appearance of these objects inside a single object class vary a lot (e.g. pedestrians or natural grown products). Simple computer vision techniques do not succeed in detecting these object classes with a large intra-class variability, giving rise to a demanding need for more global and more robust detection techniques.



Object classification algorithms, developed in academic research context, are ideal techniques to cope with this intra-class variability. The proposed techniques also create a robustness against multiple object variations like illumination, object pose, clutter, occlusion and viewpoint. During this IWT-TETRA project, we will study these state-of-the-art object categorisation algorithms, in order to be able to apply and optimize these techniques from academic research, so that we can solve more practical and more realistic industrial problems. Examples of these industrial cases are the detection of pedestrians and cars for traffic analysis, picking of fruit and vegetables, counting of micro-organisms, counting of objects on a conveyor belt, detection of elderly people using walking aids, ...

We also want to put some research into simplifying the training process. Until now, multiple thousands of positive and negative images are needed to train a robust object classification algorithm. However, since many of these industrial environments actually form constraints on the scene (constant illumination, known scale, fixed camera position, known background, ...) we are convinced that it should be possible to reduce the amount of needed examples drastically. These known constraints can also be used to reduce the search space in which the algorithm has to look for candidate objects for a specific class. First normalizing each image window to a standard orientation, creating a 2D scale-location map, using colour or movement information to segment interesting regions, .. are all elements that can speed up the classification algorithms a lot.

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As an end result, we want to present a set of open-source object classification techniques, based on available open-source computer vision software like OpenCV, which are easy to adapt and use in an industrial environment. This will push the participating companies into using more robust and better techniques for detecting objects inside the production process pipeline.

Industrial partners / User committee

IWT, DSP Valley, Eurosense Belfotop N.V., Van Hoecke Automation N.V., RoboVision, GeoVisat – Vansteelandt, Vistalink, Aris BV, Traficon – FLIR, Grontmij Belgium NV Monitoring & Testing Services, Data Vision, Case New Holland, Biobest, Entelec, Visielab – Universiteit Antwerpen, Creative Computing, Induct

Project title	TOBCAT: Industrial applications of object categorization techniques
Goal	The goal of this project is investigating the possibility of using state-of-the-art object categorization algorithms, developed in academic research context, to solve object detection problems in industrial applications.
Academic	Thomas More, Universiteit Hasselt
Contact person	Toon Goedemé (toon.goedeme@lessius.eu) Steven Puttemans (steven.puttemans@lessius.eu) Campus DE NAYER, KULeuven|Thomas More Jan de Nayerlaan 5 • 2860 Sint-Katelijne-Waver
Website	http://www.eavise.be/tobcat/
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Scientific partners

Thomas More Geel – Mobilab, Universiteit Hasselt – IMOB

Contact Information

Xenics' InGaAs SWIR detectors observe the earth out of space • p.1
Mrs. Myriam Gillisjans, Marketing Xenics • Tel. +32 38 99 00
www.xenics.com • myriam.gillisjans@xenics.com

FMTC makes better machines with model-based design • p.2
Mr. Marc Engels, CEO FMTC• Tel. +32 16 32 80 50 • Fax +32 16 32 27 46
www.fmtc.be • marc.engels@fmtc.be

Barco Silex FPGA design speeds transactions in award-winning Atos Worldline HSM • p.2
Mr. Geert Decorte, Sales and Marketing Manager Barco Silex • Tel. +32 10 486 407
www.barco-silex.com • geert.decorte@barco.com

GreenPeak Announces The Year of ZigBee • p.5
Mrs. Elly Schietse, General Manager Greenpeak Belgium • Tel. +32 52 45 87 30
www.greenpeak.com • elly.schietse@greenpeak.com

Verum's Analytical Software Design (ASD) Technology Receives U.S. Patent • p.6
Mr. Maarten van Alphen, Marketing Manager Verum • Tel. +31 40 235 9090
www.verum.com • maarten.van.alphen@verum.com

MinDCet exhibits at PCIM 2013 in Nürnberg • p.6
Mr. Mike Wens, CEO MinDCet • Tel. +32 16 40 14 88 • www.mindcet.com • mike@mindcet.com

AnSem: continued growth in Analog ASICs & RFIC design • p.7
Mr. Joan Ceuterick, Business Development Manager AnSem • Tel. +32 16 38 65 07 • www.ansem.com • business@ansem.com

Healthier by nanoelectronics and smart specialization – GENEESS project • p.8
Mr. Frederik Horemans, Project Coordinator GENEESS DSP Valley • Tel. +32 16 24 14 46
www.dspvalley.com • frederik.horemans@dspvalley.com

TOBCAT: Industrial applications of object categorization techniques • p.9
Mr. Toon Goedemé • toon.goedeme@lessius.eu
Mr. Steven Puttemans • steven.puttemans@lessius.eu • http://www.eavise.be/tobcat/

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