



**Project no.:** IST-FP6-FET-16276-2  
**Project full title:** Learning to emulate perception action cycles in a driving school scenario  
**Project Acronym:** DRIVSCO  
**Deliverable no:** D9.3  
**Title of the deliverable:** Scientific Publication List

<b>Date of Delivery:</b>	14.6.2008
<b>Organization name of lead contractor for this deliverable:</b>	BCCN
<b>Author(s):</b>	F. Wörgötter, BCCN
<b>Participant(s):</b>	BCCN, ALL
<b>Work package contributing to the deliverable:</b>	WP9
<b>Nature:</b>	R
<b>Version:</b>	2.0 (revised 10/06/2008)
<b>Total number of pages:</b>	10
<b>Start date of project:</b>	1 Feb. 2006 <b>Duration:</b> 42 months

Project Co-funded by the European Commission		
Dissemination Level		
<b>PU</b>	Public	<b>X</b>
<b>PP</b>	Restricted to other program participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

**Summary:** This Deliverable lists all publications of the DRIVSCO group until month 28 into the project.

## DRIVSCO Publication List, Month 28

Publications marked with \* are Peer Reviewed Conference Papers (n=28), all others are Journal Papers (n=21).

Publications listed in 8pt font are currently of status: "*Submitted*".

Publications are listed according to the WP to which they contribute and a short statement is being provided above each explaining why.

---

### WP1

(Submitted December 2005, accepted June 2006). This paper is based on work previous to DRIVSCO project. But during the revision process, the paper has been updated including results and state-of-the-art comparison obtained from DRIVSCO project (paper accepted on June 2006). The results represent a first approach to a stereo processing engine.

*Díaz J, Ros E, Carrillo R, and Prieto A (2007) Real-time system for high-image-resolution disparity, IEEE Trans. on Image Processing, 16(1): 280-285.*

(Submitted October 2006, accepted January 2007). The paper describes a processing engine for extracting local contrast descriptors (Energy, phase and local orientation). It represents a first approach of one of the engines under development in WP1. This work published in LNCS was presented at the International Workshop on Applied Reconfigurable Computing 2007.

*\*Díaz J, Ros E, Mota S, Carrillo, R (2007) Image Processing Architecture for Local Features Computation, Lecture Notes in Computer Science, 4419: 259-270.*

(Submitted May 2006, accepted December 2006). This paper describes a motion extraction engine. This work has been produced in WP1. It describes a contingency processing engine that could be used instead of phase based method.

*Díaz J, Ros E, Mota S, Rodriguez-Gomez R (2007) FPGA-based architecture for motion sequence extraction, International Journal of Electronics, 94(5): 435 – 450.*

(Submitted September 2006, accepted November 2007). Joint work between UGR and Hella. Mainly related with the development of motion processing engine development and its application and benchmark in the framework of vehicle applications. Related to WP1. The main work was done previous to DRIVSCO project although new results and performance quantifications were included from DRIVSCO results. These included comments referencing driver reaction times.

*Díaz J, Ros E, Mota S, Rotter A and Muehlenberg M (2007) Lane change Decision Aid system based on motion driven car tracking. IEEE Transactions on Vehicle Technology. (in press).*

(Submitted December 2006, accepted March 2007). The work describes how different modalities extraction engines (stereo and motion) can be implemented on the same device.

*Díaz J, Ros E, Prieto A, Pelayo F.J (2007) Fine grain pipeline systems for real-time motion and stereo-vision computation, Int. J. High Performance Systems Architecture, 1(1): 60-68.*

(Submitted November 2006, accepted on February 2007). The work describes the implementation of motion estimation scheme which is made robust by using *rank order coding* in the confident estimation selection process.

*Díaz J, Ros E, Rodríguez-Gomez R, Pino B (2007) Real-time Architecture for Robust Motion Estimation under Varying Illumination Conditions, Journal of Universal Computer Science, 13 (3): 363-376.*

(Submitted February 2005, accepted July 2006). Joint work between UGR and UGE. The work describes the implementation of phase based stereo scheme. Although the main work has been developed before DRIVSCO project, during the revision process, updates of the performance and optimization of the implementation have been made.

*Díaz J, Ros E, Sabatini S P, Solari F and Mota S (2007) A Phase based stereo system-on-a-chip, BioSystems, 87: 314–321.*

(Submitted February 2007, accepted March 2007). This work published in LNCS was presented at the International Work conference on Artificial Neural Networks 2007. The work presents the implementation of a visual scheme based on artificial retinas. Although the sensor is radically different to the one being used in DRIVSCO it was considered an interesting approach to explore event-driven communication schemes. It is related to WP1 (low level vision cues extraction) and WP3 (event-driven communication in the framework of condensation schemes).

*\*Granados S, Ros E, Rodríguez R, Díaz J (2007) Visual Processing Platform Based on Artificial Retinas, Lecture Notes in Computer Science, 4507: 506-513.*

(Submitted October 2006, accepted January 2007). Paper describing an approach for dealing with the perspective deformation of the scene from a camera installed in the vehicle. This work published in LNCS was presented at the International Workshop on Applied Reconfigurable Computing 2007.

*\*Mota S, Ros E, Díaz J, Rodríguez R, Carrillo R (2007) A Space Variant Mapping Architecture for Reliable Car Segmentation, Lecture Notes in Computer Science, 4419: 337-342.*

(Submitted October 2006, accepted January 2007). The work applies a basic motion processing scheme to track moving objects. It describes a potential application of a processing engine. The work published in LNCS was presented at the International Workshop on Applied Reconfigurable Computing 2007.

*\*Tomassi M, Díaz J, Ros E (2007) Real Time Architectures for Moving-Objects Tracking, Lecture Notes in Computer Science, 4419: 365-372.*

(Submitted November 2007, accepted May 2008). The paper describes a high performance optic flow processing engine based on a superpipelined datapath. This requires a design strategy in which the different resources are finely managed. The performance obtained is more than one range of magnitude faster than any other implementation so far.

*Díaz J, Ros E, Agís R, Bernier JL (2008) Superpipelined High-Performance Optical-Flow Computation. Computer Vision and Image Understanding (in press).*

(Submitted May 2007, accepted September 2007). The work describes a processing engine to extract the local contrast descriptors (Energy, phase and orientation).

*Díaz J, Ros E, Mota S, Carrillo R, Image Processing architecture for local features computation, International Journal on Electronics (in press).*

(Submitted November 2006, accepted December 2006) Paper on joint multichannel early vision processing. The performances of the DRIVSCO phase-based front-end algorithms are analysed and compared.

*\*Sabatini S P, Gastaldi G, Solari F, Díaz J, Rós E, Pauwels K, Van Hulle M M, Pugeault N, Krüger N (2007) Compact (and accurate) early vision processing in the harmonic space. In 2<sup>nd</sup> International Conference on Computer Vision Theory and Applications (VISAPP '07), Barcelona Spain, March 2007, vol. IA, pp. 213-220.*

(to be Submitted, June 2008) Journal paper of the above manuscript. It frames the phase-based approach adopted in DRIVSCO's front-end vision modules in a wider perspective.

*Sabatini S P, Gastaldi G, Solari F, Díaz J, Rós E, Pauwels K, Van Hulle M M, Pugeault N, Krüger N (2008) A Compact Harmonic Code for Early Vision based on Anisotropic Frequency Channels. Computer Vision and Image Understanding.*

(Submitted January 2007, accepted March 2007) Paper discussing the flexibility of the computational primitives available at the front-end from a modeling point of view. A biologically-inspired strategy for building a hierarchy of complex stereo-motion visual descriptors is proposed.

*\*Sabatini S P, Chessa M, Gastaldi G, Solari F, Bisio G M (2007) Cortical Architectures for Early Joint Coding of 3D Dynamic Visual Parameters: Complex Feature Mapping and Distributed Representations. Intern. Conf. on Computer Vision Systems –“From Computational Cognitive Neuroscience to Computer Vision”, Bielefeld, Germany, 21-24 March 2007.*

## WP2

(Submitted September 2006, accepted October 2006) Paper on adaptive methods for extracting linear patch-wise flow-field descriptors. These descriptors contribute to SVEs definition.

*\*Chessa M, Sabatini S P, Solari F, Bisio G M (2007) A Recursive Approach to the Design of Adjustable Linear Models for Complex Motion Analysis. In Proc. IASTED Conference on Signal Processing, Pattern Recognition, and Applications (SPPRA'07), Innsbruck, Austria, 14-16 February 2007, Acta Press.*

---

## WP3

(Submitted September 2007, accepted November 2007) Paper describing the signal-symbol loop concept and application low contrast edge detection based on the rigid body motion principle.

*\*Kalkan,, S., Yan, S., Krüger, V., Wörgötter, F. and Krüger, N. (2008). A Signal-Symbol Loop Mechanism For Enhanced Edge Extraction, Int. Conf. on Computer Vision Theory and Applications (VISAPP'08), (in press).*

(Submitted May 2008). Paper describing the signal-symbol loop concept and application with stereo images.

*Ralli, J., Díaz, J., Ros, E. Krüger, N., and Kalkan, S. (2008) Disparity Disambiguation by Fusion of Signal- and Symbolic Level Information. IEEE Transactions on Image Processing (under revision).*

---

## WP4

(Submitted June 2007, accepted July 2007) An overview paper of our early cognitive vision framework for scene representation with different applications in particular focussing on the use of 3D information.

*\*Baseski, E., Pugeault, N., Kalkan, S., Kraft, D., Wörgötter, F. and Krüger, N. (2007). A Scene Representation Based on Multi-Modal 2D and 3D Features. ICCV 2007 Workshop on 3D Representation for Recognition 3dRR-07 (in press).*

(Submitted Februar 2008, accepted March 2008) Paper on Bayesian Reasoning on higher order semantic relations at the example on lane detection.

*\*Jensen, L. B. W., Başeski, E., Pugeault, N., Kalkan, S., Wörgötter, F. and Krüger, N. (2008). Semantic Reasoning for Scene Interpretation. International Cognitive Vision Workshop, ICVW 2008, at the International Conference on Computer Vision System, ICVS 2008, (in press).*

(Submitted November 2006, accepted January 2007) Paper on junction extraction with an algorithm for improved localisation. This paper is relevant in

the context of extending our early cognitive vision framework to intrinsically two dimensional signals.

*\*Kalkan, S., Shi, Y., Pilz, F. and Krüger, N. (2007). Improving Junction Detection by Semantic Interpretation. VISAPP 07. 8-11 March, Barcelona, Spain (in press).*

(Submitted March 2007; accepted July 2007) Paper on the investigations between statistical dependencies between first and second order visual events that are similar than the ones coded in the visual primitives. This paper is more a basic research paper in particular important for the understanding of the co-planarity relation used for, e.g., lane detection.

*Kalkan, S., Wörgötter, F. and Krüger, N. (2007). First-order and Second-order Statistical Analysis of 3D and 2D Structure. Network: Computation in Neural Systems, 18(2),129-160.*

(Submitted March 2007) Paper on the extraction of multi-modal primitives and its applications which is at the core of SVE extraction. This paper is the first technical description of the early cognitive vision framework. We received the reviewer comments that were critical however in a very constructive sense and our revision is close to be ready for resubmission.

*Krüger, N., Pugeault, N. Wörgötter, F. (2008). Multi-modal Primitives: Local, Condensed, and semantically rich visual Descriptors and the Formalisation of contextual Information, under revision at IEEE PAMI.*

(Submitted July 2007, accepted August 2008) Paper on the combination of junction and line segment information for motion estimation. This paper is relevant in the context of using motion to disambiguate semantic maps in which SVEs become extracted. (Note: This paper has no reference to any project in the acknowledgement. However, it is very relevant for Drivscop, we simply forgot to put in the appropriate reference).

*\*Pilz, F., Shi, Y., Grest, D.,Pugeault, N., Kalkan, S. and Krüger, N. (2007). Utilizing Semantic Interpretation of Junctions for 3D-2D Pose Estimation. 3rd International Symposium on Visual Computing (ISVC'07).*

(Submitted November 2006, accepted January 2007) Paper on the reconstruction uncertainty of multi-modal primitives. This paper is of particular relevance to control the temporal and spatial merging of 3D information.

*\*Pugeault, N., Kalkan, S., Başeski, E., Wörgötter, F. and Krüger, N. (2008). Relations Between Reconstructed 3D Entities Int. Conf. on Computer Vision Theory and Applications (VISAPP'08), January 22-25, Funchal, Madeira, Portugal (in press).*

(Submitted, May 2008, resubmission!) Paper on an efficient method for flow-field extraction which avoids the aperture problem. Flow is a part of the SVE definition.

*Dellen, B.K. and Wörgötter, F. (2008) Computing local velocity estimates of image sequences by constructive interference of global Fourier components. IJCV.*

(Submitted, May 2008) Biophysical variant of the above paper. Demonstrates the wider impact of this part of the DRIVSCO work.

*Dellen, B.K., Clark, J.W. and Wörgötter, F. (2008) Motion processing with wide-field neurons in the retino-tecto-rotundal pathway. J. Comp. Neurosci.*

(Submitted, Feb. 2008, resubmission!) Paper on image segment extraction where segment can be traced across frames. Segments can be use to find objects in a scene for defining SVEs.

*Dellen, B.K. and Wörgötter, F. (2008). Extraction of region correspondences via an n-d conjoint spin relaxation process driving synchronous segmentation of image sequences. IJCV.*

(Submitted October 2005; accepted July 2006 after including important new results from DRIVSCO) Paper on a novel method for optimal estimation of rigid camera motion from instantaneous velocity measurements.

*Pauwels K, Van Hulle M M (2006) Optimal Instantaneous Rigid Motion Estimation Insensitive to Local Minima. Computer Vision and Image Understanding (CVIU), 104 (1): 77-86.*

(Submitted April 2006; accepted June 2006) Paper on a novel stabilization method that enables the extraction of optic flow from short unstable sequences.

*\*Pauwels K, Van Hulle M M (2006) Optic flow from unstable sequences containing unconstrained scenes through local velocity constancy maximization. In British Machine Vision Conference (BMVC 2006), Edinburgh Scotland, September 2006, vol.1, pp. 397-406.*

(Submitted March 2008; accepted April 2008) Paper on a real-time implementation of our optic flow algorithm. This will make IMO detection in real-time feasible.

*\*Pauwels, K., and Van Hulle, M.M. (2008). Realtime Phase-based Optical Flow on the GPU. Workshop on Computer Vision on GPU (in conjunction with CVPR 2008), June 27, Anchorage, Alaska, in press.*

(Submitted June 2007, accepted August 2007) Paper on the use of efficient encoding techniques for optic flow derived from natural scene statistics.

*\*Calow, D. & Lappe, M. (2007). An Efficient Encoding Scheme for Dynamic Visual Input Based on the Statistics of Natural Optic Flow. In: Wang, R, and Gu, F (editors) Cognitive Neurodynamics, Springer Lecture notes in Computer Science, in press .*

(Submitted March 2008, revised May 2008) This article describes a novel scheme for efficiently encoding optic flow based on natural scene statistics.

*Calow, D. & Lappe, M. Efficient Encoding of Natural Optic Flow. Network: Computation in Neural Systems, in revision.*

(Submitted August 2007, accepted February 2008) Encyclopedia article on optic flow.

*\*Lappe, M. Optic Flow. In: M. D. Binder, N. Hirokawa, U. Windhorst, and M. C. Hirsch (editors) Encyclopedia of Neuroscience. Springer Verlag (in press) .*

## WP5

(Submitted January 2007, accepted February 2007) This article describes an experimental study on the binocular visual motion perception.

*Kandil, F. I. & Lappe, M. (2007). Spatio-temporal interpolation is accomplished by binocular form and motion mechanisms. PLoS ONE. 2(2): e264.*

(Submitted August, 2007; accepted September, 2007) Paper on analysis of steering action prediction, where parameters for prediction are investigated and two drivers' behaviour is compared. DRIVSCO funding has been used but due to inexperience of the VMU partners the fact was not mentioned in the paper, but that has been mentioned when giving the talk in the conference.

*\*Vidugiriene, A. and Tamosiunaite, M. (2007). Parameter Analysis for Steering Angle Prediction Using Neural Networks, Proceedings of the 11th international conference "Transport Means 2007", 111-113, Kaunas.*

(Submitted December, 2007; accepted February, 2008) Paper comparing two different methods for driver's action prediction: regular neural networks with back-propagation and Extreme Learning Machines.

*\*Demcenko, A., Tamosiunaite, M., Vidugiriene, A., Saudargiene, A. (2008). Vehicle's Steering Signal Predictions Using Neural Networks, Proceedings of the 2008 IEEE Intelligent Vehicles Symposium, (in press).*

(Submitted June 2008) Experimental study of the eye movement strategies during steering along curves.

*Kandil, F. I., Rotter, A. & Lappe, M. (2008) Driving Smoother and Stabler With the Tangent Point. Journal of Vision.*

---

## WP6

(Submitted April 2006; accepted June 2006) Paper on the technique described in the TA (feature extraction based on mutual information). A detailed benchmarking between two methods is performed.

*\*Chumerin N, Van Hulle M M (2006) Comparison of two feature extraction methods based on maximization of mutual information. In 2006 IEEE Workshop on Machine Learning for Signal Processing, Maynooth Ireland, September 2006, IEEE , pp. 343-348.IEEE.*

(Submitted March 2007; accepted June 2007) Paper on a first attempt to perform IMO (i.e., a particular SVE) disambiguation by fusing IMO maps (from WP4) with object recognition. The latter is based on a convolutional neural network. -> links to WP4

*\*Chumerin N, Van Hulle M M (2007) An Approach to On-Road vehicle Detection, Description and Tracking. In 2007 IEEE Workshop on Machine Learning for Signal Processing, Thessaloniki Greece, August 2007, IEEE, CD ROM, 43, pp. 265-269, IEEE.*

(Submitted April 2007; accepted June 2007) Paper on a neural network paradigm for object recognition. Funding of DRIVSCO was by mistake not mentioned.

*\*Oberhoff D, Kolesnik M, Van Hulle M M (2007) Hierarchical neural learning for object recognition. In 2007 IEEE Workshop on Machine Learning for Signal Processing, Thessaloniki Greece, August 2007, IEEE, CD ROM, 60, pp. 366-371, IEEE. (Funding of DRIVSCO was by mistake not mentioned)*

(Submitted April 2006; accepted August 2006) Paper on an alternative technique for feature selection, based on mutual information.

*\*Van Dijck G, Van Hulle M M (2006) Speeding up the wrapper feature subset selection in regression by mutual information relevance and redundancy analysis. Lecture Notes in Computer Science, 4131 / 2006, pp.31-40, Berlin, Heidelberg: Springer*

(Submitted April 2007; accepted June 2007) Paper on a speed-up technique for feature selection based on mutual information.

*\*Van Dijck G, Van Hulle M M (2007) Speeding up Feature Subset Selection through Mutual Information Relevance Filtering. In 18<sup>th</sup> European Conference on Machine Learning (ECML) and the 11<sup>th</sup> European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD), Warsaw Poland, September 2007, pp. 277-287, Berlin, Heidelberg: Springer.*

(Submitted January 2007; accepted March 2007) Paper on a biological version of the IMO detection algorithm.

*\*Chumerin N, Van Hulle M M (2007) Biologically – inspired model of vision – based independently moving objects detection system. In Ninth International Scientific Conference Pattern Recognition and Information Processing (PRIP 2007), Minsk Belarus, May 2007, volume 1, pp. 64-68.*

(Submitted May 2007; accepted November 2007) Paper on image surface coding as done in the inferior temporal cortex, which could inspire the development of new algorithms for computer vision for recognizing objects.

*Köteles K, De Mazière P A, Van Hulle M M, Orban G A, Vogels R (2007) Coding of images of materials by macaque inferior temporal cortical neurons. European Journal of Neuroscience, 27(2), 466-482.*

(Submitted February 2008; accepted April 2008) Paper on ground plane estimation using the flow and disparity computed in WP4. This ground plane is used for detecting obstacles. -> links to WP4

*\*Chumerin, N., & Van Hulle, M.M. (2008). Ground Plane Estimation Based on Dense Stereo Disparity. The Fifth International Conference on Neural Networks and Artificial Intelligence (Minsk, Belarus, May 27-30), in press.*

(Submitted July 2007; accepted October 2007) Paper on cue fusion of the IMO maps of WP4 and the LIDAR sensor data from the CANBUS for disambiguating IMOs. -> links to WP4

*\*Chumerin, N., & Van Hulle, M.M. (2008). Cue and Sensor Fusion for Independent Moving Objects Detection and Description in Driving Scenes. In Signal Processing Techniques for Knowledge Extraction and Information Fusion, D.P. Mandic, M. Golz, A. Kuh, D. Obradovic, and T. Tanaka (Eds.), Springer, Boston, USA, pp. 161-180.*

---

## **WP7**

(Submitted January 2007, accepted August, 2007) Paper on ISO-Learning and its chaining. In the work for this paper we realized that ISO-learning cannot be easily be combined with supervised learning (from a human), which led us to drop the ISO approach from DRIVSCO.

*Kulvicius, T., Porr, B. and Wörgötter, F. (2007) Chained learning architectures in a simple closed-loop behavioural context. Biol. Cybern. 97, 363-378, doi:10.1007/s00422-007-0176-y.*

(Submitted March 2008, accepted May 2008) Paper on the human learning of robot driving.

*\*Markelic I, Kulvicius T, Wörgötter F (2008) Anticipatory Driving for a Robot-Car based on a Two-Level Control and Supervised Learning. Workshop on Anticipatory Behavior in Adaptive Learning Systems, ABiALS, Proceedings Springer LNAI series, (in press).*

---

## **WP8-WP10**

Publications do not arise from these WPs

---