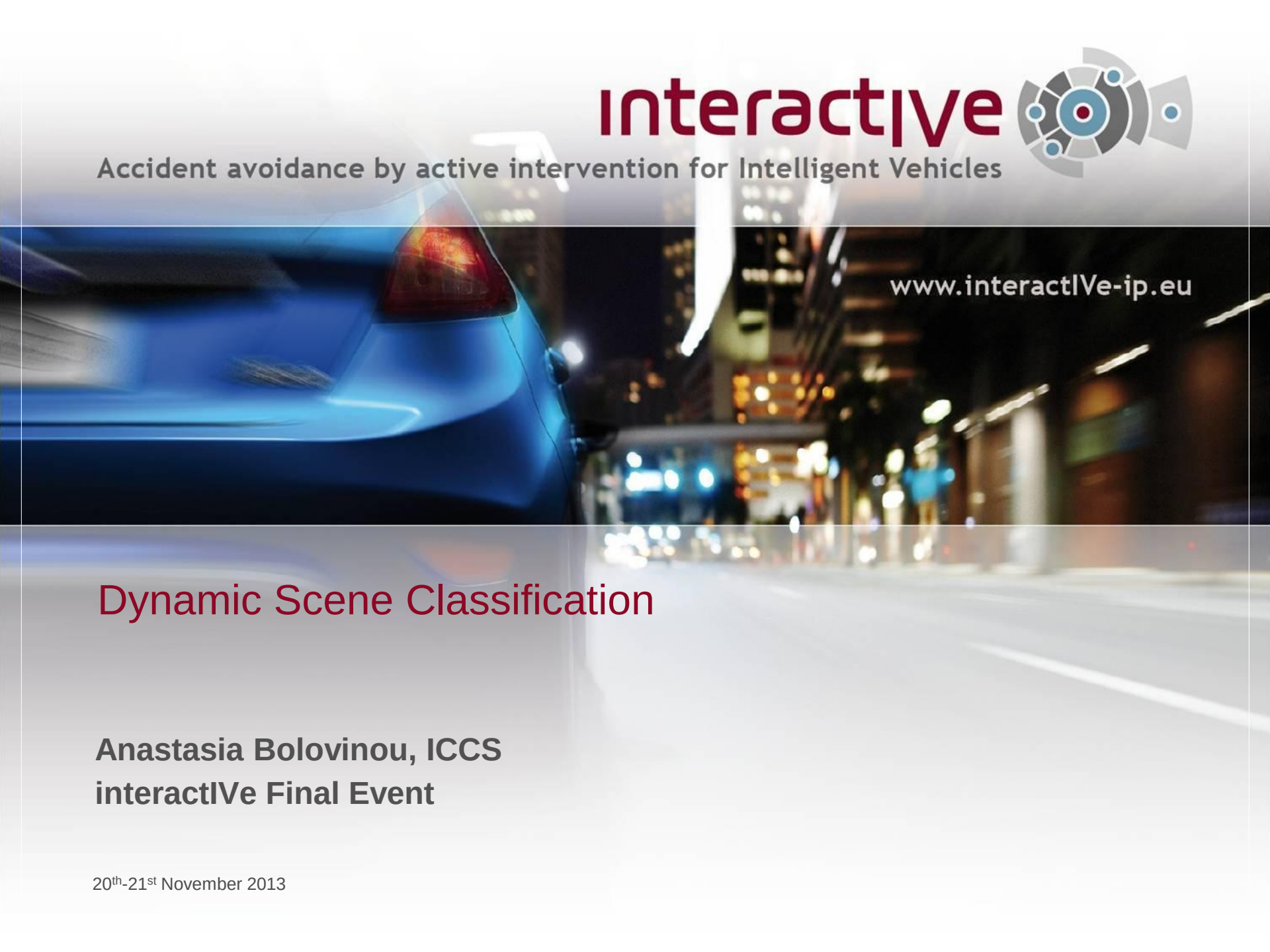

Dynamic Scene Classification

Anastasia Bolovinou, ICCS

interactIVe Final Event

20th-21st November 2013

Contents

- Introduction to vision-based scene classification
  - Motivation
  - Problem Setting
- Research approach
  - Algorithm
  - Experimental setup and results
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- Conclusions

Introduction | Motivation

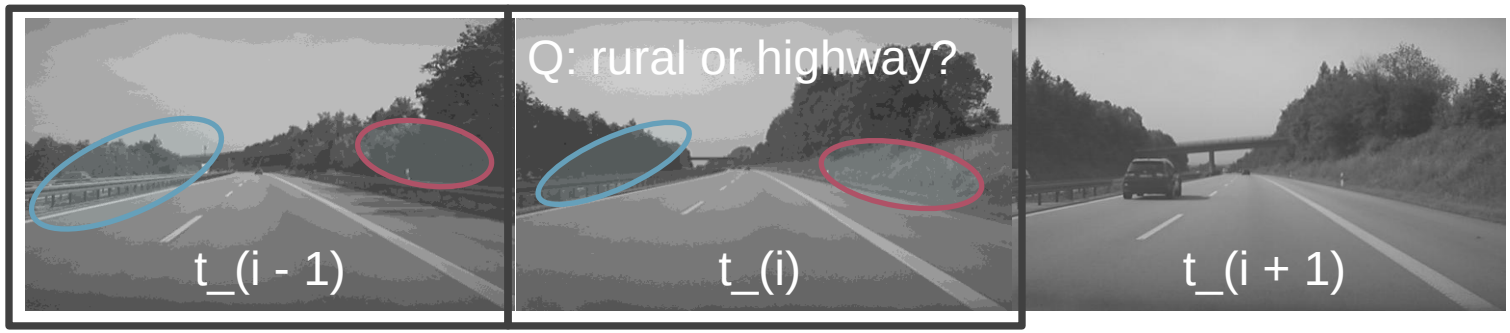
- Vision-based scene classification from a moving vehicle
  - *part of SP2 advanced research (mono-vision approach)*

Motivation: Provide holistic scene understanding information based on a cost-effective monochrome camera system

(challenges)

- Cope with lower quality images coming from a moving vehicle (pitch effect, low-cost sensor)
- Select efficient visual features for fast processing

Introduction | Problem setting

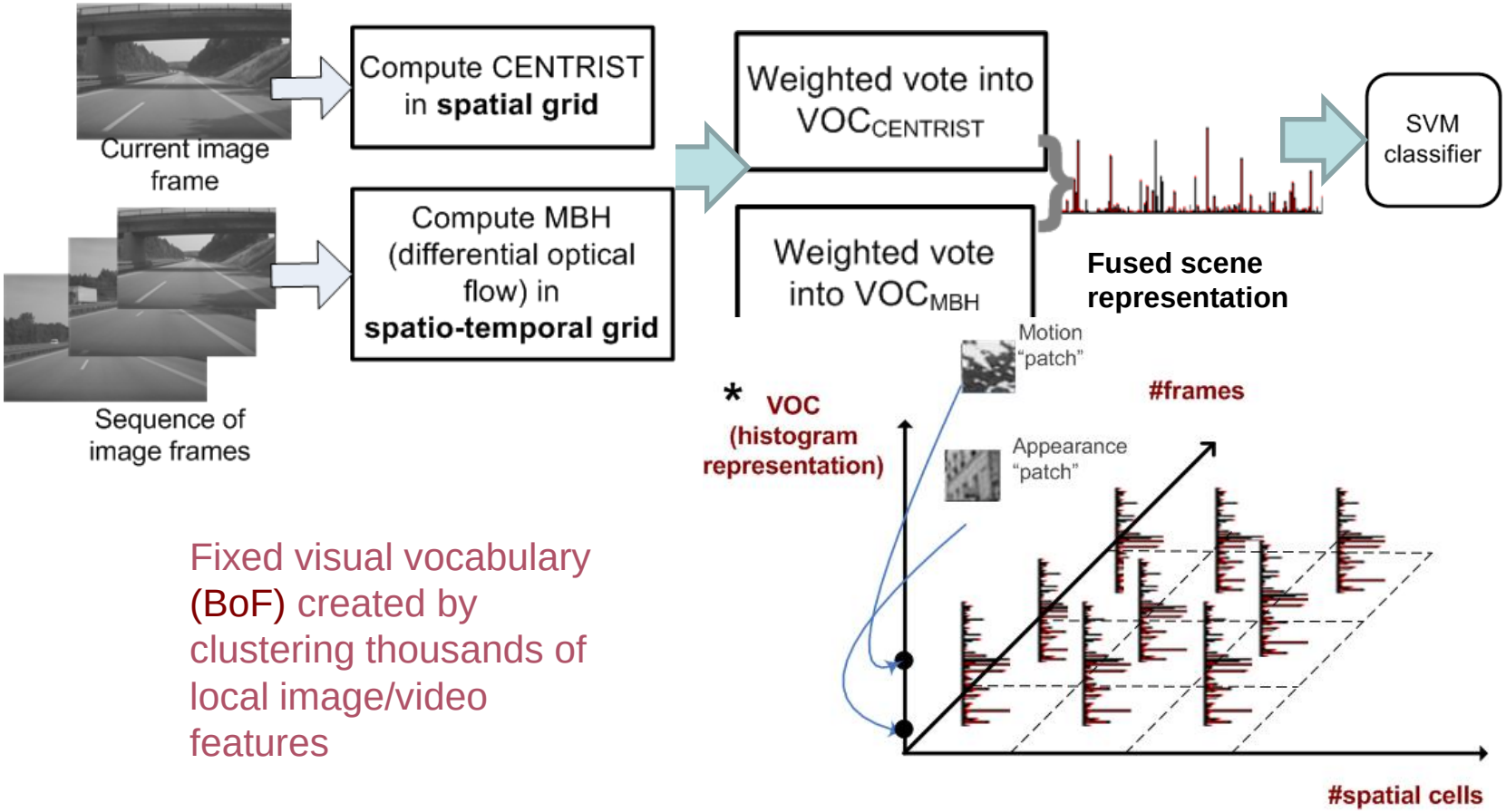


- Motion attributes can show different properties in different time or spatial scale space **>> local degree of busyness varies**
  >> optical flow granularity varies

- Video = visual history record (overcome occlusions, restricted field of view)

The algorithm | Overview

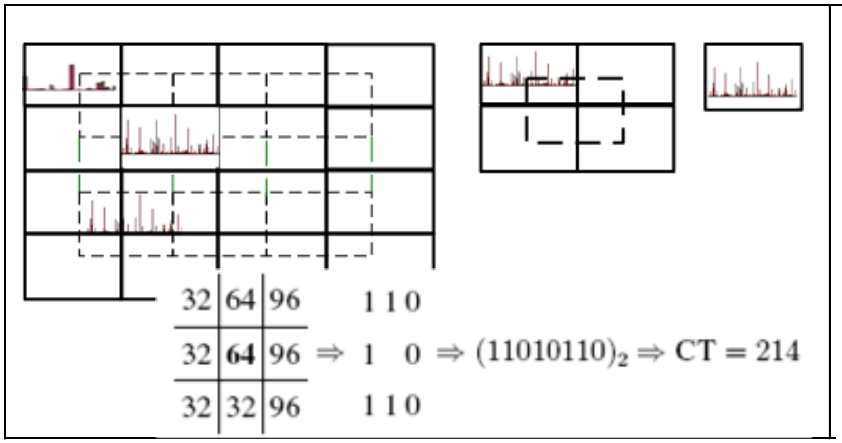
- Histogram-based Time & Space representation

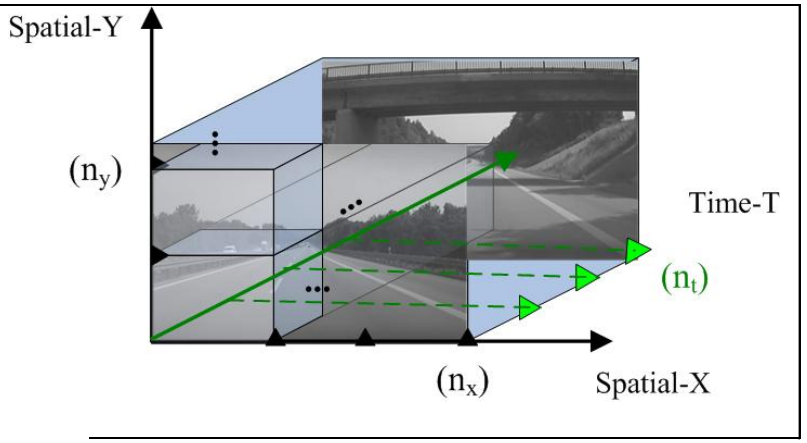


Fixed visual vocabulary (BoF) created by clustering thousands of local image/video features

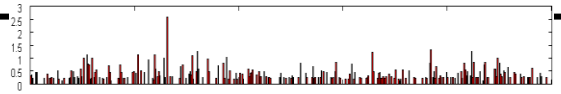
The algorithm | Scene representation

- **Feature extraction from grid pyramids in time and space**



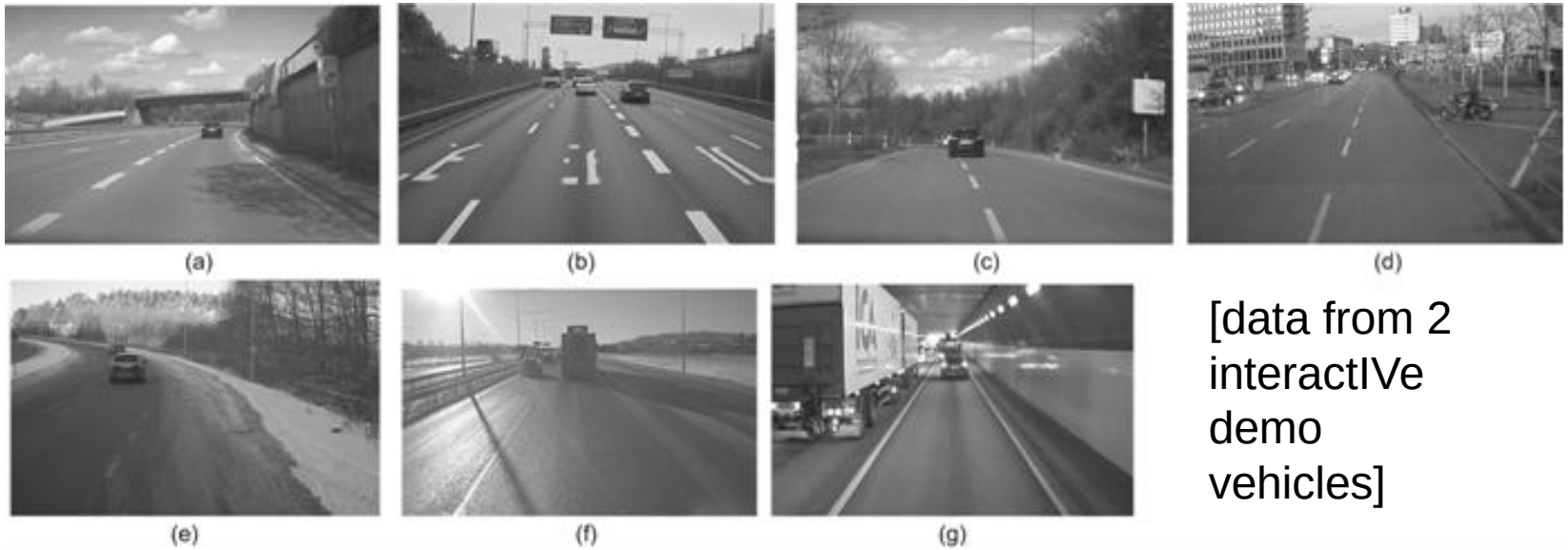


• Appearance record: CENTRIST on 31 spatial sectors of different sizes	• Motion records: MBH on 3x3 spatial sectors x 9 frames
•For Voc_length =200, 6200-d image representation	•For Voc_length =200 and #sampled frames= 9, 16200-d video representation



Experimental setup (dataset + parameterization)

Video database was split in 7 classes:



[data from 2 interactIVe demo vehicles]

Fusion method: vector concatenation

SVM kernels for comparison: X2 radial-basis kernel, HI kernel

Grid partitions for comparison: {[n_x] x [n_y] x [n_t]} = {[1,2,3], [1,2,3], [3,6,9]}

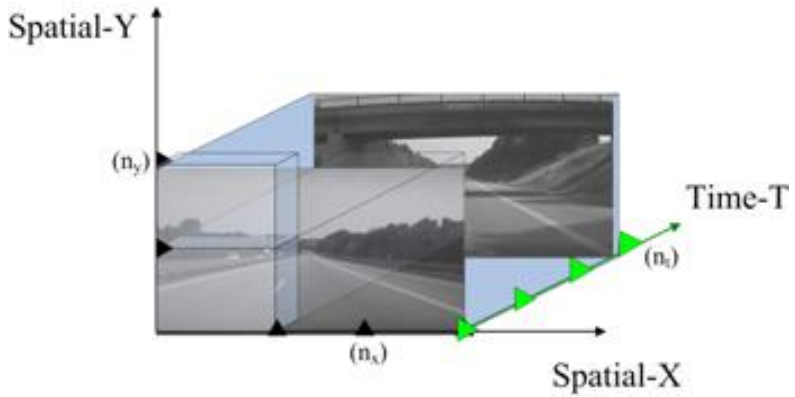
Results

***Visit our paper**:*
A. Bolovinou, C. Kotsiourou, A. Amditis "Dynamic Road Scene Classification: Combining motion with a visual vocabulary model" ,ISIF 2013, Istanbul.

Scene Classes	Mean Performance (%) per scene class				
	only static (CENTRIST)	only Dynamics			Static+ Dynamics
		MBH_x	MBH_y	MBH	
 highway smooth	83.6	71.6	73.2	74.8	86.2
 highway traffic	82.4	69.6	70.9	72.0	88.6
 rural	73.3	63.4	66.1	67.9	74.8
 urban	**85.2**	72.2	**74.6**	78.2	89.1
 snow	71.2	60.5	69.3	70.7	73.8
 back lighting	72.3	34.6	41.2	43.8	68.4
 tunnel	84.1	**77.2**	74.1	**79.5**	88.9
Avg (%)	78.9	64.2	67.0	69.5	81.4

Future work

- Large dataset evaluation in order to quantify empirical observations
- Investigate other motion features (faster than optical flow)
- Investigate robustness of the algorithm in fast scene changes and night vision



Conclusions

- Recent scene classification methods based on local features can be used to discriminate among many semantic classes (used for big data mining)

- Motion analysis in different directions can help
- Motion consideration helps mores in busy scenes

- For real-time apps, faster motion feature extraction is needed OR regions of interest should be pre-selected.

- Include camera motion compensation pre-processing

interactive

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- I-Sense group of ICCS

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interactIVe

Accident avoidance by active intervention for Intelligent Vehicles

Thank you.

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SEVENTH FRAMEWORK
PROGRAMME

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ΕΠΙΣΕΥ
ICCS