



REGIM (REsearch Group on Intelligent Machines)

University of Sfax

National Engineering School of Sfax (ENIS),

Tunisia



REGIMRobvid: Objects and scenes Detection for Robot vision 2013

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RobotVision



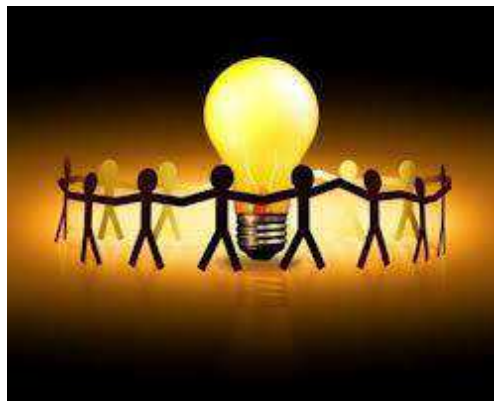
Outline

- ❖ Introduction
- ❖ The proposed system
- ❖ Experiments and results
- ❖ Conclusion



Introduction

- ❖ Robotics has a large growth and profound change in scope.
- ❖ Visual detection one of the most popular research topics
- ❖ Vision playing an important role in robotics



RobotVision



Introduction

- ❖ 10 rooms/categories appear in the competition



(a) Hall



(b) Professor office



(c) Secretary

Introduction

❖ 8 objects can appear in any image of the database



(a) Extinguisher



(b) Computer



(c) Chair



THE PROPOSED SYSTEM

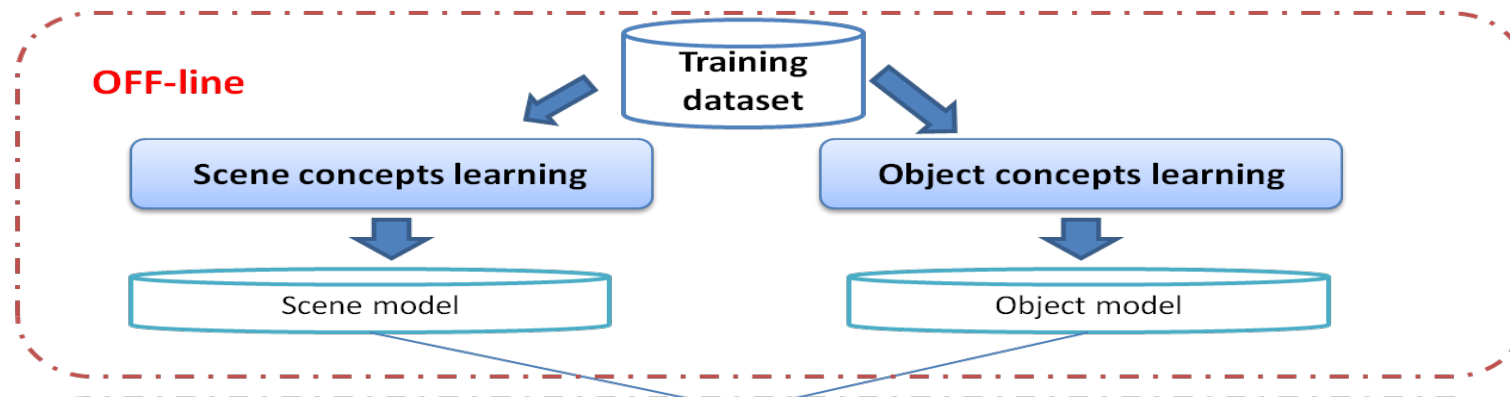
- ❖ 2 concepts are used:

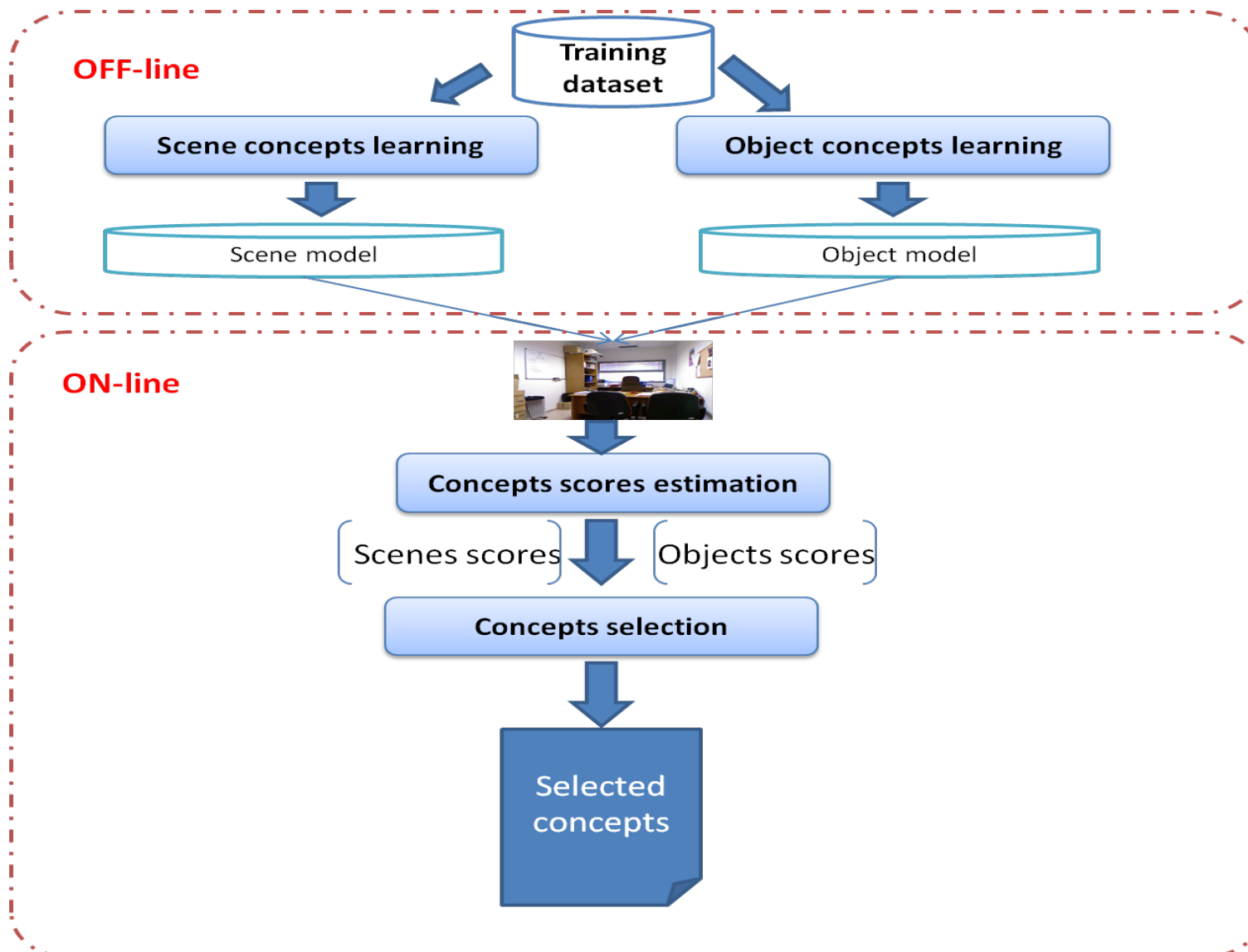
 - Object concepts and Scene concepts

- ❖ Learn 2 appropriate classifiers multi-classes using visual features and machines learning

- ❖ Detect one appropriate location and some objects.

THE PROPOSED SYSTEM







THE PROPOSED SYSTEM

Concept learning

1) PHOW features extraction

- ❖ Visual images by a Pyramid Histogram of Visual Words (PHOW) which are a variant of dense SIFT descriptors, extracted at multiple scales.
- ❖ a dictionary of visual words was first generated by quantizing the SIFT descriptors that capture the local spatial distribution of gradients



THE PROPOSED SYSTEM

Concept learning

2) Object and scene learning

- ❖ train the PEGASOS stochastic gradient descent as a linear SVM classifier
- ❖ perform a step of data pre-transforming through computing the homogeneous kernel map that provides a linear representation of a Chi2 kernel.



THE PROPOSED SYSTEM

Concept learning

3) Concept scores estimation

- ❖ classify the test image using two obtained models for object and scene detection
- ❖ The outputs of each classifier are the concept having the best score and the detection scores vectors.



THE PROPOSED SYSTEM

Concept learning

4) Concept Selection

❖ Normalization

- discriminate the most representative objects and the most probably detected scene

$$Vector[i] = \frac{vector[i] - min}{max - min}$$

Where: $i=1 \dots N$

Scores normalization by each image and each concept

THE PROPOSED SYSTEM

Concept learning

4) Concept Selection

❖ Threshold for concepts selection

the threshold calculated with respect to the distribution of scores of this object in all images in the validation dataset.

$$\tau = \begin{cases} \frac{1}{N} \sum_{i=1}^N c_i^q \\ \frac{1}{N} \sum_{i=1}^N c_i^q + \sigma \end{cases}$$

Where: N is the number of images,
c is the score of concept q in image i.
 σ is the standard deviation of all scores for N images.



THE PROPOSED SYSTEM

Concept learning

4) Concept Selection

❖ Threshold for concepts selection

▪ Scene selection

Threshold is equal to the average of all scores of images according to this scene concept.



EXPERIMENTS AND RESULTS

- ❖ PHOW features extraction and PEGASOS SVM classifier with normalization and **1** threshold
- ❖ PHOW + PEGASOS SVM but with normalization and **2** thresholds

=> Our system ranked 4th, achieving 4638.25 points on this task.

CONCLUSION

❖ 1st Participation of REGIM Lab to Robot Vision

Future considerations

- ❖ the process of scene selection needs to be improved, the system will give the result "unknown"
- ❖ Visual (RGB) images and depth images generated from 3D cloud points
- ❖ Objects tracking



ACKNOWLEDGMENT

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<http://icbr.regim.org/>



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CALL FOR PAPERS



The 2013 International Conference on Individual and Collective Behaviors in Robotics (ICBR'2013) will be held in Sousse, Tunisia on December 15-17, 2013. ICBR'2013 is organized by the REGIM-Lab. at the University of Sfax, and technically co-sponsored by the IEEE Robotics & Automation Society.

The robotics field borrows its knowledge from different disciplines: mathematics and logic (formalization, modeling of behaviors), engineering (development of increasingly complex microprocessors, development of new architectures, new sensors, new communication tools, new control systems, etc.), neurosciences (comprehension of the brain, new methods dealing with computational collective intelligence), biology and Natural Science (living observation, bio-inspiration, stigmergy, etc.), psychology (validation of theories in relation to the memory functioning, language, individual and collective behavior, etc.), linguistics (models of interactive language handling), social Sciences (studies of adaptation to environment and to collective works), philosophy (questions related to the thought character).

The aim of ICBR conference is to bring together researchers in automation and behavioral aspects for robotics; it helps us exchange innovative ideas in designing robots and also in applying computational and collective intelligence, and benefit the progress of each research theory and application.

Papers containing original and unpublished works are solicited in all areas of robotics, including (but not limited to) the following:

- Kinematics Dynamics and Control

<http://robocomp.ieee-enis.org/>

CALL FOR PARTICIPATION



16 December 2013
Sousse - TUNISIA



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Following the great success of RoboComp'2010-11-12, the **4th International Robotics Competition (RoboComp)** will be held on December 16, 2013 in Sousse. The competition is organized by the REGIM-Lab. at the University of Sfax, the IEEE Robotics & Automation Society (RAS) Tunisia Chapter, and the Scientific Association for the Support of Research and Technological Innovation (ASARIT).

RoboComp'2013 is jointly organized with the Int. Conf. on Individual and Collective Behaviors in Robotics (**ICBR'2013**)

<http://icbr.regim.org/>

RoboComp'2013 aims to promote the development of robotics in Tunisia. It aims also to bring together young researchers, professionals and international robotics experts to exchange ideas and share problem solving strategies pertaining to robotics.

RoboComp'2013 is a global competition in which teams of students and robotics fans compete to solve robotics problems.



Thank you!

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