Mobile Landmark Recognition

Introduction

Approach taken

Computer Vision part

J2ME

Conclusion

MOBILE LANDMARK RECOGNITION Working title - POIRE: Point of Interest Recognition

njgroene, bgroot, ahalma, mtromp, bquiroga

DOAS Progress Meeting



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Computer Vision part

J2ME

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Conclusion

Mobile Landmark Recognition

SHORT PROJECT DESCRIPTION

- Approach taken
- Computer Vision part
- J2ME
- Conclusion

- Landmark recognition;
- Computer Vision is done on local device;
- Approximate location is known: set of objects is small.

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LIMITED HARDWARE

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We can't use computationally expensive algorithms

- Photos can't be stored in a database, only a symbolic representation;
- Only machine learning algorithms which have a easy to calculate decision boundary.

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NO LAB CIRCUMSTANCES

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- Different lightning conditions;
- Rotation/translation/scaling;
- Different cameras.

Introduction	Approach taken	Computer Vision part	J2ME	Conclusion
Mobile Landmark	Two sub-prob	LEMS		
Introduction				
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Computer Vision part				
J2ME	- Catting familia			
Conclusion	Getting familia	Ir with JZIVIE;		
	 Creating a cor demands. 	nputer vision applica	ation wich sati	fies our

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Landmark Recognition	I WO MAJOR AI	PPROACHES		
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Computer Vision part				
J2ME				
Conclusion	Use features	which are robust;		

Find a representation of images which is robust.

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POSSIBLE FEATURES

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- Skyline detection combined with a descriptor (fft, distance between corners);
- Features of straight lines within an image (orientation, length, color pairs on either side);
- Corner features (location, angle etc.);
- Color histograms;
- Clusters in a colorspace (i.e. HVC).

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FINDING A ROBUST REPRESENTATION

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- Problem is hard because of extrinsic variation;
- So: find a way to neutralize this variation;
- Many possibilities...
- Example: Möbius-Radon transformation.

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EXAMPLE: MÖBIUS-RADON TRANSFORMATION

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Steps:

- Obtain edge image
- Apply Radon transformation:



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EXAMPLE: MÖBIUS-RADON TRANSFORMATION

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Now connect $\theta = 180$ and $\theta = 0$

And 'normalize' by shifting important lines to $\theta = 0$.



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EXAMPLE: MÖBIUS-RADON TRANSFORMATION

- The shift over the Möbius ring corrects for rotation;
- For other corrections, things aren't so easy.

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Mobile EXAMPLE: MÖBIUS-RADON TRANSFORMATION Landmark Recognition Computer Vision part Sin CAS < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □ > < □

Mobile Landmark Recognition

CURRENT SITUATION ON MOBILE PHONES

- Approach taken
- Computer Vision part
- J2ME
- Conclusion

- Lots of image retrieval systems;
- There exists an open source computer vision library for Symbian (cpp). Drawback: support on a limited number of phones;
- We have chosen J2ME because of its widespread availability.

Mobile Landmark Recognition

JAVA 2 MOBILE EDITION

- Approach taken
- Computer Vision part
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- Conclusion

- We've built an application which takes a picture and we're able to manipulate that image;
- We're now designing a small computer vision library which supports the most basic computer vision algorithms.

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Computer Vision part

J2ME

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Conclusion

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WHAT REMAINS TO BE DONE

- Experiment with features; choose final set;
- Decide upon learning algorithm;
- Implement J2ME feature extraction methods;
- Develop real-world test environment.