Painting-to-3D Model Alignment Via Discriminative Visual Elements

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Notre Dame Paris

ONLY RESULTS WITH IMAGES

ENGLISH / ESPAÑOL

HELP

Advanced search +

SULLURG. FR

/ RÉSULTATS (> 10000)



SOURCE : Cat'zArts (Beaux-arts de Paris)

Anonyme - Le derrier de nostre Dame de Paris en perspective

Le derrier de nostre Dame de Paris en perspective ... Le derrier de nsotre Dame de paris en perspevtiue ... Paris, Cathédrale Notre-Dame ... Paris,... Tous droits réservés

Notice Abrégée v



SOURCE : RMN-Grand Palais

/ accéder au document

/ accéder au document

Le Quai Saint Michel et Notre-Dame de Paris

Le Quai Saint Michel et Notre-Dame de Paris ... Paris, musée d'Orsay Photo (C) RMN-Grand Palais (musée d'Orsay) - Hervé Lewandowski

Notice Abrégée v



SOURCE : Cat'zArts (Beaux-arts de Paris)

Baldus, Edouard-Denis - Cathédrale Notre-Dame de Paris; (Titre forgé)

Cathédrale Notre-Dame de Paris ... Notre Dame de Paris ... Paris, Cathédrale Notre-Dame ... Notre-Dame de Paris (France) ... Paris,... Tous droits réservés

Notice Abrégée 🗸

/ accéder au document



SOURCE : RMN-Grand Palais

Façade de Notre-Dame de Paris

Façade de Notre-Dame de Paris ... Paris, musée Carnavalet Photo (C) RMN-Grand Palais - Agence Bulloz

Notice Abrégée 🗸



SOURCE : Cat'zArts (Beaux-arts de Paris)

Quinet, Achille - Façade principale de Notre Dame de Paris; (Titre forgé)

Façade principale de Notre Dame de Paris ... Notre Dame ... Paris, Cathédrale Notre-Dame ... Notre-Dame de Paris (France) ... Paris,... Tous droits réservés

Notice Abrégée v

/ accéder au document

SOURCE : RMN-Grand Palais

Notre-Dame, flanc sud Entre 1852 et 1857. Album de Sèvres : photographies de vues de monuments de France...

Notre-Dame, flanc sud ... Paris, musée d'Orsay Photo (C) RMN-Grand Palais (musée d'Orsay) - Droits réservés

Notice Abrégée v

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SOURCE : Cartolis

Façade de l'Eglise Notre-Dame; Paris; Paris(75); lle-de-France; France

Façade de l'Eglise Notre-Dame ... Paris, Paris(75), lle-de-France, France ... Paris Droits réservés.

Notice Abrégée v

/ accéder au document

SOURCE : Cartolis

Notre-Dame (façade); Paris; Paris(75); lle-de-France; France

Notre-Dame (façade) ... Paris, Paris(75), Ile-de-France, France ... Paris Droite récords





Browsing across time 1889

<u>Inputs</u>





3D model

Goal

Painting

<u>Output</u>



Approximate viewpoint

1980s: 2D-3D Alignment

Photograph





3D model

[Roberts 1963]





[Huttenlocher and Ullman 1990]

[Faugeras&Hebert'86], [Grimson&Lozano-Perez'86], [Lowe, '87]

Modern 2D-3D alignment



[Snavely et al. SIGGRAPH 2006]



[Sattler et al. ICCV 2011]



[Philbin et al. CVPR 2007]

See also [Rothganger et al. CVPR 2003], [Arandjelović and Zisserman ICCV 2011], [Wu et al. 2008], [Li et al. ECCV 2012], [Lim et al. ICCV 2013], [Baatz et al. ECCV 2012] ...

Difficulty: limits of SIFT matching







See also: [Chum & Matas CVPR 2006], [Schechtman & Irani, CVPR 2007], [Russell, Sivic, Ponce, Dessalles 2011], [Hauagge & Snavely CVPR 2012]

Modern 2D-3D alignment



[Snavely et al CGCRAPH 2006]



[Philbin et al. CVPR 2007]

See also mothganger et al. CVPR 2003], [Arandjelović and Zisserman ICCV 2011], [Wu et al. 2008], [Li et al. ECCV 2012], [Lim et al. ICCV 2013], [Baatz et al. ECCV 2012] ...

Retrieval using a global descriptor



[Russell, Sivic, Ponce, Dessales, 2011] used GIST [Oliva and Torralba 2001]



[Shrivastava, Malisiewicz, Gupta, Efros, 2011]

Discriminative part-based representation

What makes Paris look like Paris? [Doersch et al. SIGGRAPH 2012]



Unsupervised Discovery of Mid-Level Discriminative Patches [Singh et al. ECCV 2012]



See also [Bourdev & Malik ICCV 2009], [Juneja et al. CVPR 2013], [Jain et al. CVPR 2013], ...

This work: Discriminative parts ... in 3D



Alignment with a large scale vocabulary of discriminative 3D parts

Select parts
Match parts
Recover view

Step 1: Selecting parts



Step 1: Discarding parts from unlikely views

Synthesize ~10,000 viewpoints for an architectural site



See also: [Irschara et al. CVPR 2009], [Baatz et al. ECCV 2012]

Step 1: Selecting parts













Representative



Step 1: Selecting discriminative parts



[Dalal and Triggs 2005], [Felzenszwald et al 2010]

Step 1: Selecting parts













Discriminative



Step 1: Selecting stable parts



Step 1: Selecting stable parts



ire elements to be reliably detectable in near-by views





See also [Doersch et al. SIGGRAPH 2012] [Singh et al. ECCV 2012], [Juneja et al. CVPR 2013]

Step 1: Selecting parts













Stable



Summary: representation of the 3D model

a) Representativeb) Discriminativec) Stable

Step 2: match across style



Step 2: match across style



Step 2: match across style













Run RANSAC on the top 25 matches



Evaluation data

• Four 3D models from three sites





Notre Dame (CAD)









60 Drawings

85 Historical photographs

147 Paintings

45 Engravings

Results: painting



Input

Aligned 3D model

Results: historical photograph



Results: painting



Results: drawing



Results: drawing



Results: engraving



Results: Watercolor



Recovered camera frusta



Failure modes: 3D symmetries



Failure modes: unusual viewpoints





Benchmark matching results



Results on [Huagge and Snavely 2012] dataset

User Study

Rate the alignment as:









GOOD







COARSE

Quantitative Results

	Good matches
Exemplar-SVM [Shirivastava et al. 2011]	34 %
SIFT on rendered views	40 %
Ours	51 %

Quantitative Results

	Good	Coarse	No
	match	match	match
Photographs	59%	20%	21%
Paintings	53%	30%	18%
Drawings	52%	29%	19%
Engravings	57%	26%	17%

CVPR 2014 work





Seeing 3D chairs: exemplar part-based 2D-3D alignment using a large dataset of CAD models M. Aubry, D. Maturana, A. Efros, B. Russell and J. Sivic

Conclusion



Leverage large vocabulary of discriminative 3D parts

Reliably align non-photographic depictions to 3D model

More results, data and soon code <u>http://www.di.ens.fr/willow/research/painting_to_3d/</u>



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