

Postdoctoral Fellowship under the Marie S. Curie Actions Cofund project “Opening Sphere UAB-CEI to Postdoctoral Fellows (P-Sphere)” Gran Agreement 665919.

Department or Institution involved



Ultimate color descriptor including multiple light effects

Topic description

The project will aim for the definition of a color descriptor able to represent the color of an object surface including the common variations of color which are derived from multiple light effects, such as shading (including self-shadows and cast shadows), specularities, and light source color. With this goal we propose to go a step further from current color descriptors which are just RGB extensions of gray level descriptors, and which are usually trained in the frame of computer vision applications such as object detection or classification. This project's descriptor pursues the simulation of an active vision process where an observer is looking at the object from different points of view to evaluate the color appearance of an object.

To achieve these goals, we propose to work on the definition of a descriptor that considers multiple partial views or multiple surface windows of the same object surface. Capturing the color coherence between these multiple object portions will be the main problem to solve. To this end, different image formation models will be considered, such as the dichromatic reflection model, and previous generic color descriptors will be reformulated and combined using machine learning techniques.

The fellow should work on,

- Reviewing previous works of the hosting group that takes into account the reflectance properties of the materials, the geometry of the scene, and the color of the light source to represent the color.
- Using Convolutional Neural Networks to learn the best features based on diverse ground-truth data, either synthetic or physically acquired with the acquisition system developed in the MILETRANS project.
- Evaluating the defined descriptors by performing experiments on different problems, such as autonomous driving assistance or smart factory assistance with augmented reality glasses.

Project supervisor & hosting group

Prof. Maria Vanrell will supervise the Fellow with the support of the hosting group (Color in Context group: www.cic.uab.cat) which is widely recognized for the contribution in color representation for Computer Vision.

Group publications related to this project:

- M. Serra, O. Penacchio, R. Benavente, M. Vanrell, and D. Samaras. The Photometry of Intrinsic Images. IEEE Conference on Computer Vision and Pattern Recognition, pp.1494-1501, 2014.
- N. Murray, M. Vanrell, X. Otazu, and C. A. Parraga. Low-level Spatio-Chromatic Grouping for Saliency Estimation. IEEE Transaction on Pattern Analysis and Machine Intelligence, 2013.
- J. Roca-Vila, C. A. Parraga, and M. Vanrell. Chromatic settings and the structural color constancy index. Journal of Vision, 13(4):3, pp.1-26, 2013.
- M. Serra, O. Penacchio, R. Benavente, and M. Vanrell. Names and Shades of Color for Intrinsic Image Estimation. IEEE Conference on Computer Vision and Pattern Recognition, pp. 278-285, 2012.
- J. Vazquez-Corral, M. Vanrell, R. Baldrich, and F. Tous. Color Constancy by Category Correlation. IEEE Transactions on Image Processing, 21(4):1997-2007, 2012.
- S. Alvarez, A. Salvatella, M. Vanrell, and X. Otazu. Low dimensional and comprehensive color texture description. Computer Vision and Image Understanding, 116(1):54-67, 2012.
- S. Alvarez and M. Vanrell. Texton theory revisited: a bag-of-words approach to combine textons. Pattern Recognition, 45(12):4312-4325, 2012.
- E. Vázquez, R. Baldrich, J. van de Weijer, and M. Vanrell. Describing Reflectances for Colour Segmentation Robust to Shadows, Highlights and Textures. IEEE Transaction on Pattern Analysis and Machine Intelligence, 33(5):917-930, 2011.
- N. Murray, M. Vanrell, X. Otazu, C. A. Parraga. Saliency Estimation Using a Non-Parametric Low-Level Vision Model. IEEE Conference on Computer Vision and Pattern Recognition, pp. 433--440, 2011.
- X. Otazu, C. A. Parraga, M. Vanrell. Toward a unified chromatic induction model. Journal of Vision, Volume 10(12):6, 2010.
- E. Vázquez, J. van de Weijer, and R. Baldrich. Image Segmentation in the Presence of Shadows and Highlights. European Conference on Computer Vision, Lecture Notes in Computer Science, vol. 5305, pp. 1-14, 2008.
- X. Otazu, M. Vanrell, C. A. Parraga. Multiresolution Wavelet Framework Models Brightness Induction Effects. Vision Research, 48(5):733-751, 2008.
- J.M. Alvarez, and R. Baldrich. Illuminant-invariant model-based road segmentation. In IEEE Intelligent Vehicles Symposium, pp. 1175-1180, 2008.

Group projects related to this project:

- MILETRANS - Deep study of intrinsic scene properties to minimize lighting effects in vision-based intelligent transportation systems (TIN2014-61068-R). PI: Maria Vanrell and Robert Benavente. Spanish of Economy and Competitiveness, 114.345€, 2015-2017.
- BioColTex - Image understanding based on biologically-inspired computer vision models (TIN2010-21771-C02-1). PI: Maria Vanrell. Spanish Ministry of Science and Innovation, 148.830€, 2011-2013.
- Colour Visual Content Management: Modelling spatial perception and Semantics (TIN2007-64577). PI: Maria Vanrell. Spanish Ministry of Science and Innovation, 134.310€, 2008-2010.
- Multimodal Interaction in Pattern Recognition and Artificial Vision (CSD 2007-00018). PI: Enrique Vidal. Spanish Ministry of Science and Innovation (Consolider-Ingenio), 397.700€ (group share: 63.886€), 2007-2011.
- Audiovisual signal processing in multimodal interfaces (TIN2006-26901-E). PI: Nicolás Pérez de la Blanca. Spanish Ministry of Science and Innovation, 30.000€, 2006-2008.
- Automatic Textual annotation on image databases based on visual descriptors combining spatio-chromatic information (TIN2004-02970). PI: Maria Vanrell. Spanish MInistry of Education, 82.340€, 2004-2007.
- CREATE – Colour Research for European Advanced Technology Employment (MSCF-CT-2006-045963). PI: Carinna Parraman. EU Marie Curie Actions: Conference and Training Courses, 532.363€, 2007-2010 (group participation: 2009-2010).
- TS-VICI - Task Specific Description of Visual Color information (Ref: 224737). PI: Maria Vanrell. EU Marie Curie Actions: European Re-integration, 45.000€, 2008-2011.

Planned Secondments

The Fellow will do stays at:

-Dimitris Samaras group (Stony Brooks University)

Capabilities: Background on the estimation of light effects such as shadows and shading

-Theo Gevers group (University of Amsterdam)

Capabilities: Background on the definition of color descriptor for image classification

Candidate's profile

Applicants should hold:

- A PhD in computer vision, machine learning, or closely related field.
- Some background in deep learning and computational color techniques.
- A good record of publications in the top conferences and journals on computer vision and/or machine learning.

- High motivation and ability to work as part of a team and willing to work with PhD students.
- Proficiency in written and spoken English and good communications skills.

Research contact:

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