Visualising Bag-of-Words

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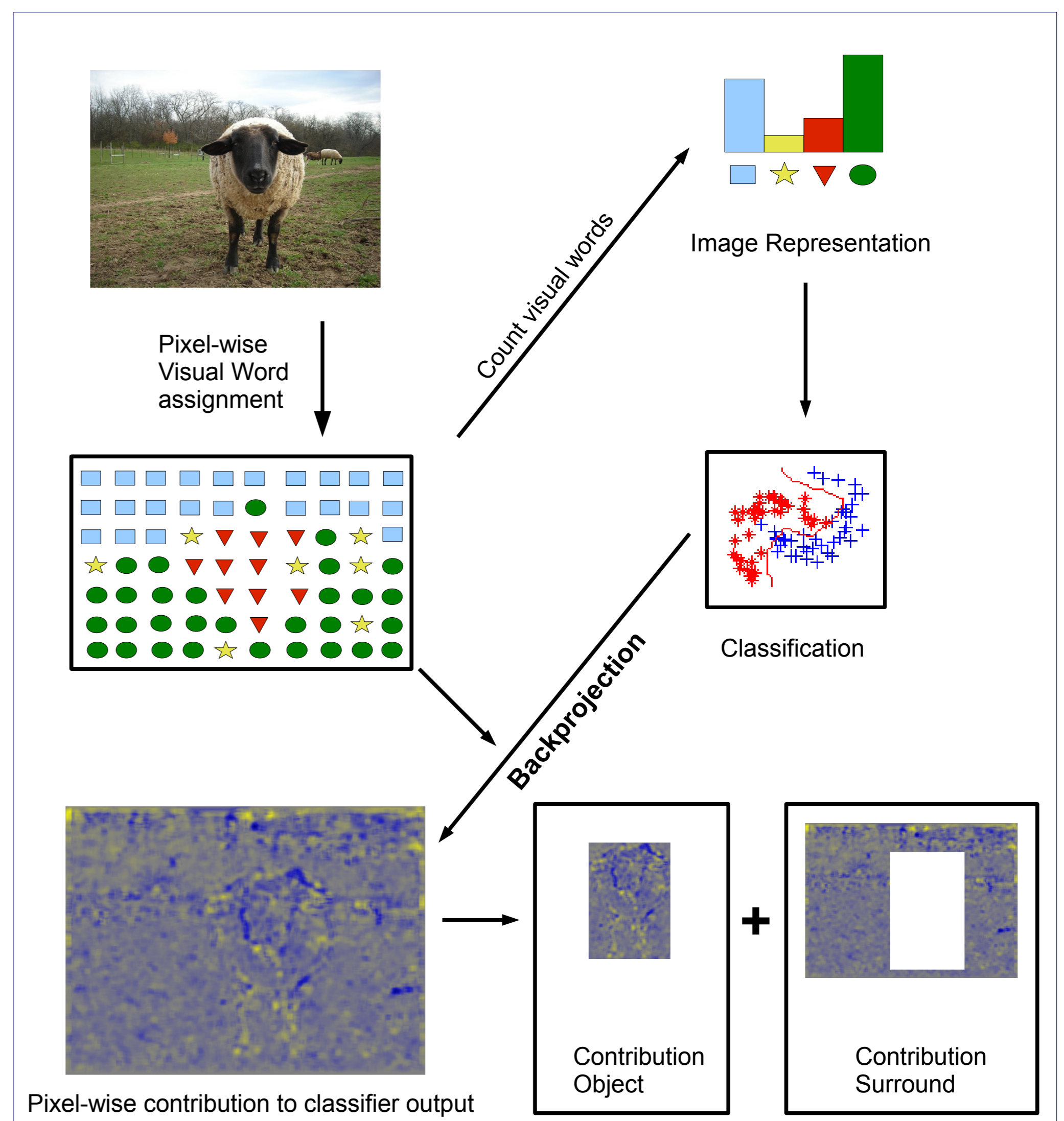University of Amsterdam
The Netherlands

Abstract

• The Highly Successful Bag-of-Words technique forms the basis of all top image classification systems
• In this demo we use a Bag-of-Words implementation that stood at the basis of our highly competitive Pascal VOC 2008-2011 entries.
• To make its workings more insightful, our IJCV paper measures for each pixel how much it contributes to the classification of an object.
• We divide the contribution into Object and Surround.
• We visualise the per-pixel classification contribution.
• Our interactive demo enables exploration of the Pascal VOC 2010 validation dataset based on the Object/Surround contributions

Bag-of-Words details

• Pixel-wise Sampling. Using dense acceleration (Uijlings 2010)
• 5 Colour SIFT (Lowe 2004, Sande 2010)
• Random Forest as vocabulary (Moosman 2006, Uijlings 2010)
• Normalize Codebook Vectors using square root (Peronnin 2010, Uijlings 2010)
• Support Vector Machine (libsvm)
• Histogram Intersection Kernel
• Fast Additive Classification (Maji 2009)
• Good Pascal 2007 performance: 0.585 MAP
 (e.g. Chatfield 2011, Perronnin 2010 report 0.593-0.617 MAP)

Visualisation Framework

Pixel-wise Visual Word assignment · Count visual words · Image Representation · Classification · Backprojection · Pixel-wise contribution to classifier output · Contribution Object + Contribution Surround

Screenshot

Visualising Bag of Words · 2009_000820 rank: 54 · Select Class: Bicycle · Object · Surround · Yellow = Positive Evidence · Blue = Negative Evidence · The Visual Extent of an Object · J.R.R. Uijlings, A.W.M. Smeulders, and R.J.H. Scha · International Journal of Computer Vision · In Press

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This demo showcases:

J.R.R. Uijlings, A.W.M. Smeulders, and R.J.H. Scha. *The Visual Extent of an Object.* International Journal of Computer Vision. In press.