

Project Imaggie

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Using XCode 4 to develop iOS 5 app for iPad and iPhone

Project Goal:

Use **Real-time && Segmentation Algorithm** to perform color adjustment on the wall portion of the wall to deliver the true natural experience. Imagine if you can just look through your iPad to see your room transformed into new colored walls and furniture under different light conditions.

Our Current Project Development

Responsibility separation:

Serena: iOS Developer - focused on illumination, color adjustment development

Jeff: iOS Developer - focused on real-time segmentation development

David: Algorithm designer - focused on designing an efficient algorithm that work in theory (i.e tracking)

The core of our image processing algorithm is split into 2 parts: real-time feature segmentation and illumination adjusted color modification.

Real-time Feature Segmentation

According to web researches, following feature detection algorithms are in literature. The initial idea is to try these feature detection algorithms to evaluate which algorithm will run most effectively and quickly. The feature detection algorithm must run sufficiently fast so that there is no lag from frame to frame. Then, these features are used to determine the global motion in the form of affine transformation. Next, the delta between the consecutive frames are detected, which in turn, allows us to do tracking and extending our segmentation to new region.

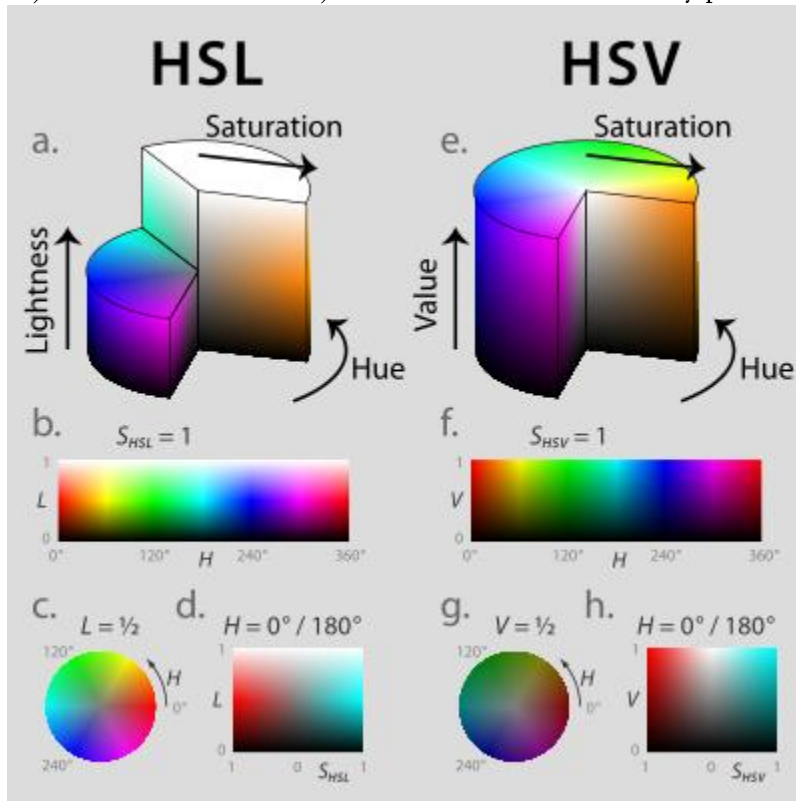
Common feature detectors and their classification:			
Feature detector	Edge	Corner	Blob
Canny	X		
Sobel	X		
Harris & Stephens / Plessey	X	X	
SUSAN	X	X	
Shi & Tomasi		X	
Level curve curvature		X	
FAST		X	
Laplacian of Gaussian		X	X
Difference of Gaussians		X	X
Determinant of Hessian		X	X
MSER			X
PCBR			X
Grey-level blobs			X

[http://en.wikipedia.org/wiki/Feature_detection_\(computer_vision\)](http://en.wikipedia.org/wiki/Feature_detection_(computer_vision))

We will need mentorship from the teaching team to determine which algorithm/s to pursue for this project. Furthermore, we may need an algorithm to stitch input images together in real-time for real-time tracking. The selection of algorithm may also depend on the API provided by iOS devices and algorithmic complexity that does not hinder user experience.

Illumination adjusted color modification

Once the wall portion of the image is determined from the above feature detection algorithm, it's time to apply color adjustment algorithm. We will assume that the entire wall will have same spectral reflectance. While, we do not know what the reflectance is, we will use clever algorithm to approximate the illuminance. Finally, we are hoping to apply a natural RGB adjustment such that the adjusted wall looks like a real newly painted wall!



http://en.wikipedia.org/wiki/HSL_and_HSV

Algorithm Research

Derek Hoiem. "Surface Context"

Computer Science at University of Illinois at Urbana-Champaign

URL: <http://www.cs.uiuc.edu/homes/dhoiem/projects/context/index.html>

Srinath Sridhar, Yu Xiang. "Vanishing Point Detection in Indoor Scene"

Department of Electrical and Computer Science, University of Michigan, Ann Arbor

URL: http://srinathsrividhar.com/wp-content/research/gradleecs442/vanpoints_report.pdf

Stauffer, C.; Grimson, W.E.L.; , "Adaptive background mixture models for real-time tracking," *Computer Vision and Pattern Recognition*, 1999. IEEE Computer Society Conference on. , vol.2, no., pp.2 vol. (xxiii+637+663), 1999

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=784637&isnumber=17024>

Nir Friedman, Stuart Russell

Image segmentation in video sequences: a probabilistic approach

Computer Science Division, University of California, Berkeley, CA

UAI'97 Proceedings of the Thirteenth conference on Uncertainty in artificial intelligence

URL: <http://dl.acm.org/citation.cfm?id=2074247>