Predicting the Visual Saliency of Building using a Top Down Approach

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Motivation

Almost all biological brains have evolved to rapidly detect the salient objects in the cluttered visual world.This has helped them to improve their survival instincts.The high dimensionality of visual data received by the brain makes it necessary for the brain to quickly throw away data which is of less importance thus reducing the search space.The studies have shown that the human brain tackle this problem with bottom up and top down approaches.Since top down is task driven approach which does not corresponds to the way we look in an unknown environment.So we would primarily focus on bottom up approach to estimate visual saliency .Furthermore, we would then try to present a model which could predict the most visual salient building in a cluster of buildings .

This application of visual saliency detection for buildings holds relevance in today's world ,since this approach could be further extended to guide robots in unfamiliar environment by detecting the obstacles.Also it has application in human- computer interaction.

Literature and earlier work done

Researchers have primarily focused on salient object detection using features like multi-scale contrast,spatial distribution of color, texture,motion.These works have been able to segment out a subset of salient objects

but performed poorly while modeling the way humans percept the sensory data.Also using depth as a feature to detect saliency have not been explored fully.

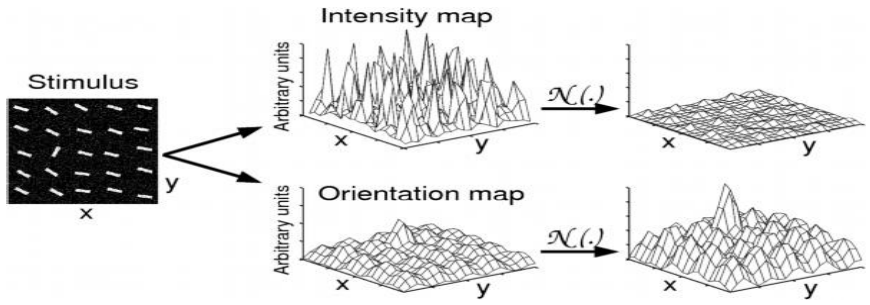

Fig-1 Salience depends on context and on how unique of a response is elicited by a given item in a display (Itti et al., 1998)

According to a recent work ,"a benchmark of Computational Models of Saliency to Predict Human Fixations " at MIT researchers have successfully quantified the success rate of different models developed over the years and has also proposed a learning model to predict saliency.

Their model has been quiet similar to the way humans look at world.

Performance of various models wrt to humans

Models	**Success Rate (highest 1)**
Humans	1
Judd et al.	0.506
Region contrast (cheng et al.)	0.4705
Graph based visual saliency	0.472
Saliency for Image Manipulation	0.439
Random center surround saliency	0.42
Itti&Koch2	0.405

Our Approach

Visual saliency of building in cluster depends on certains factors like color,texture,orientation wrt to observer,neighbourhood,user familiarity with the environment.

As a first target for this research project we would like to develop a robust model to represent the saliency of building. We would test and compare our model against the general saliency detection algorithms and would also explore whether depth can be good parameter in case of buildings by exploiting the visual cues as in Make3D project.

Also if time permits we would try to present a learning variant of our model and plans to estimate the efficiency of our model against existing databases or developing our database of buildings and landmarks.

Tentative tools, codes and databases

- Saliency Toolbox
- Nick's Machine Perception Toolbox
- MSRA Salient Object Database
- http://people.csail.mit.edu/tjudd/WherePeopleLook/index.html for database

References

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