regularities of scenes, specifically the power spectrum slope (i.e., contrast distribution across spatial frequency), structural sparseness (i.e., edge density), and orientation bias. Accordingly, all stimuli (targets and surrounds) were selected such that the power spectrum slope was constant at -1.2, -1.8, or -2.6 (i.e., -0.6, -0.9, or -1.3 in terms of the amplitude spectrum). Within each slope constant, the amount of structural sparseness was systematically varied (2-3 levels). Lastly, the oriented content of all the stimuli was fixed (isotropic or anisotropic) across all levels of power spectrum slope and structural sparseness. Target stimuli consisted of variable rms-contrast circular natural scene patches (1.17° diameter) embedded in fixed high rms-contrast natural surround annuli (4.11° outer diameter), and all stimuli were presented at 3° eccentricity. Threshold contrast sensitivity for detecting natural image targets was assessed with a standard spatial 2AFC staircase protocol, either alone or embedded in natural scene surrounds. For isotropic targets and surrounds, the results show that target contrast threshold suppression was significantly modulated by the power spectrum slope and structural sparseness of the targets, but not the surrounds. A similar trend was observed for anisotropic targets and surrounds, except that the structural sparseness of the surrounds significantly modulated suppression. Such findings preclude an account based on simple inter- (or intra-) channel interactions as a function of available contrast as it relates to the contrast sensitivity function.

Acknowledgement: Acknowledgement: Coligate Research Council Grant to BCH NSERC to APJ

43.430 Statistics of edge profiles in natural scenes
Kedarnath Vilankar1(kedarnath.vilankar@okstate.edu), James Golden1, Damon Chandler1, David Field2, 1School of Electrical and Computer Engineering, Oklahoma State University, 2Department of Psychology, Cornell University

It is widely known that edges in natural scenes are formed by both luminance and texture differences between two objects. However, little effort has focused on studying the statistical properties of such edges. Computing these statistics could provide important insights into how the visual system processes natural scenes. Ten high-resolution natural scenes were selected from the McGill Color Image Database. Three human subjects traced the edges of occlusion boundaries on grayscale versions of the images. Patches of size 80x40 pixels, centered on the marked edges, were extracted for analysis. The 5000 extracted edge patches were then aligned in terms of polarity (brighter side on top). We analyzed the edges in both linear and log luminance domains. First-order statistics revealed that the mean edge is a blurred step in luminance with greater variance and less skewness in the brighter half than in the darker half. The distribution of Michelson contrast between the brighter and darker halves is uniform with a bias towards low contrast. We also classified the edge patches into four categories: (1) Luminance-defined edges, which have high contrast and small standard deviation. (2) Textured-defined edges, which have low contrast and high standard deviation. (3) Luminance-textured edges, which have high contrast and large standard deviation. (4) Object-defined edges, which exhibit neither a difference in luminance nor a difference in texture between the two halves; these edges likely contain boundaries that subjects marked via interpolation/extrapolation based on object recognition. Approximately 40% of the edges were luminance-defined, 10% of the edges were textured-defined, 32% of the edges were luminance-textured edges, and 18% of the edges were object-defined. We discuss the implications of these findings for neural and computational coding. In particular, edge detectors and various wavelets have been tuned to detect luminance-defined edges; such templates would fail on 30% of occlusion boundaries.

Acknowledgement: This project was supported by the National Science Foundation. "CAREER: Content-Based Image and Video Coding Using Higher-Level Models of Human Vision", Pt: Damon Chandler, Oklahoma State University Award #1054612.

Visual memory: Encoding and retrieval

Monday, May 14, 8:15 - 12:15 pm
Poster Session, Orchid Ballroom

43.431 Presenting and testing sets of memory items simultaneously or sequentially do not affect change detection performance
Junha Chang1(junha.chang88@gmail.com), Joo-Seok Hyun1; 1Department of Psychology, Chung-Ang University, Seoul, Korea

Classic studies of short-term memory have used a sequential presentation method for memory items whereas many of recent visual short-term memory (VSTM) studies have used a change detection paradigm in which items for memory are presented at the same time. Despite the fact that the sequential presentation of memory items can lead to a different temporal context for VSTM encoding compared to the simultaneous presentation, only few studies have addressed a concern about whether such contextual difference in the testing paradigms may lead to a substantial difference in VSTM performance. In the present study, we tested if presenting two sets of memory items sequentially can lead to any significant difference in change detection performance compared to presenting the sets simultaneously. In Experiment 1, subjects were asked to remember colors of six memory items that would be either displayed simultaneously or displayed sequentially with two subsets of three items. For a test array for change detection, we also presented test items either simultaneously or sequentially. In Experiment 2, we manipulate display set size into 2, 4, 6, 8 items across the simultaneous and sequential presentation conditions. We found the patterns of change detection accuracy between the simultaneous and sequential presentation conditions were virtual identical to each other, and found no difference even when the set size was manipulated. The results indicate that the presenting memory items simultaneously or sequentially does not affect the change detection performance, and suggest that temporal context for VSTM encoding may not play a significant role for accurate formation and recognition of memory representation in change detection.

Acknowledgement: This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (NRF-2010-0003607)

43.432 Active retrieval from long-term memory aids change detection
Melissa R. Beck1(mbeck@isu.edu), Amanda E. van Lamsweerde1; 1Psychology, Louisiana State University

The current study further examined the hypothesis that post-cues can encourage the retrieval of long-term memory (LTM) representations and lead to improved change detection performance (Beck & van Lamsweerde, 2011) using a gaze contingent change detection task. Nine objects were presented and after seven objects were fixated, a brief blank screen was presented followed by the test image in which one item changed identity or all items were unchanged. The potential change object was either cued in the test array or not cued. The change object could be any of the seven items fixated prior to the change (lags 0-6) or one of the two items never fixated. The availability of identity information in the periphery was manipulated by using a moving window technique for half of the participants. When an object was not being fixated, it was blurred so that its location was visible but its features were not. Change detection performance was better for the cue trials than the no-cue trials at all lags for both the moving-window and no-moving-window conditions. When there was no moving window, the cue benefit was also found for objects that were never fixated. However, when the moving window was used, performance on the cue trials was not better than performance on the no-cue trials for items that were never fixated. Therefore, cues do aid change detection performance for items no longer stored in visual working memory (~lags 3-6), and cues improve change detection performance for items that were never fixated if features can be identified in the periphery. Furthermore, fixating the change object in the test array was predictive of accurate performance for the cue trials, but not for the no-cue trials, suggesting that the cue does encourage LTM retrieval that does not necessarily occur without a cue.

43.433 Saccade execution, not covert attention, leads to automatic encoding of distractors into VWM
Caglar A. Tas1(caglar-tas@uiowa.edu), Steven J. Luck2, Andrew Hollingworth3; 1Department of Psychology, University of Iowa, 2Center for Mind and Brain, University of California, Davis

Visual attention plays an important role in encoding objects into VWM (Schmidt et al., 2002). According to one view, VWM and visual attention may reflect the same mechanism (Theeuwes et al., 2009), in which case covertly attending an object should be equivalent to encoding that object into VWM. Alternatively, saccade execution, rather than covert attention, may be the central factor controlling VWM encoding. VWM spans gaps in perceptual input, and a perceptual gap is generated only when a saccade is executed. Thus, VWM consolidation may be tied most directly to pre-saccadic shifts of attention. In the present study, we tested the roles of