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From: Vertical Flight Human Factors Program Manager, ATO-P Human Factors
R&D

To: Vertical Flight TCRG

Subj: VERTICAL FLIGHT HUMAN FACTORS FIRST QUARTER '05 REPORT

Ref: Vertical flight human factors execution plans (<http://www.hf.faa.gov/vffunded.htm>)

1. projects listed below

a. Simultaneous Non-interfering Operations - Quantify VFR Navigation Performance.

NASA Ames (Eye Tracking Task):

Implementation of vector quantization of eye images. This is a new procedure developed to cope with the fact that the eye images collected during flight exhibit larger variation than typically encountered in the laboratory. Because there is no fixed set of features which is present in every image, the current strategy is to group the images into sets of "similar" images, and then to provide a tailored algorithm for each set. Because of the large number of images, it was not feasible to compute an optimal vector quantization using the entire set. Instead, an incremental procedure was developed: first the entire set of images is processed sequentially to determine a set of "exemplar" images, such that every image differs from the most similar exemplar by an amount which is below a specified threshold. The first image is used as the first exemplar; subsequent images are compared to the existing exemplars, and if one is found for which the distance is below the threshold then the image is added to that cluster. Through judicious application of the triangle inequality, many exemplars can be rejected without explicit computation of their distance, resulting in significant computational savings. This procedure does not guarantee that a given image will be associated with the nearest exemplar, only that it will be associated with an exemplar whose distance is below the threshold. Therefore a second pass is performed to determine the nearest exemplar image to each image in the sequence (again benefitting from use of the triangle inequality for computational speedup). The

segmentation of the image sequence into non-overlapping sets allows the procedure to be applied recursively with smaller and smaller threshold distances, resulting in a tree structure. This procedure has been successfully applied to all of the night sequences, and is currently being tuned for the day sequences.

Presentation prepared, given at: (a) FAA HQ, (b) Optical Society of America Fall Vision Meeting, and (c) NASA Human Factors Symposium.

Naval Postgraduate School (NPS) (Virtual Model Task):

Task 7. Conduct simulation using multiple SNI scenarios provided by ATO-P Human Factors R&D

- Data collection will begin next quarter.

Project milestones have been delayed due to contractual problems in a supporting contract. As a result, final deliverables will be delayed till FY06 Q1..

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