UCL

# Perceptual Image Retrieval using Eye Movements

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IMAGING FARADAY partnership

MUSCLE

Multimedia Understanding through Semantics, Computation and Learning

BT

# Problem Area

How can we make use of human visual behaviour to provide a fast and relevant search of an image database?

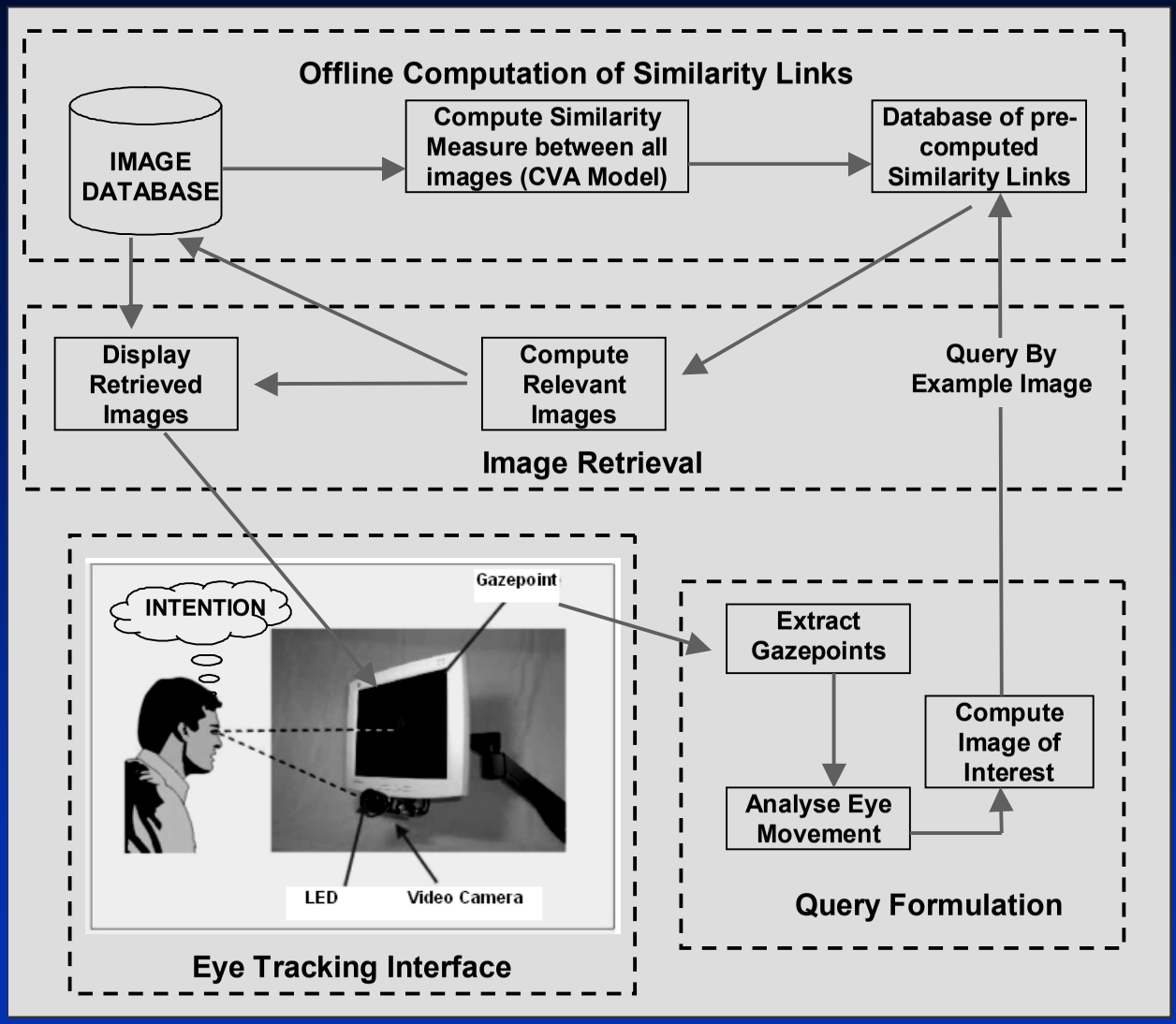
Problems with Information Searching

- Formulating a good query

Research Focus

- New Query Interfaces (Visual Input)

# System Architecture



# Search Task

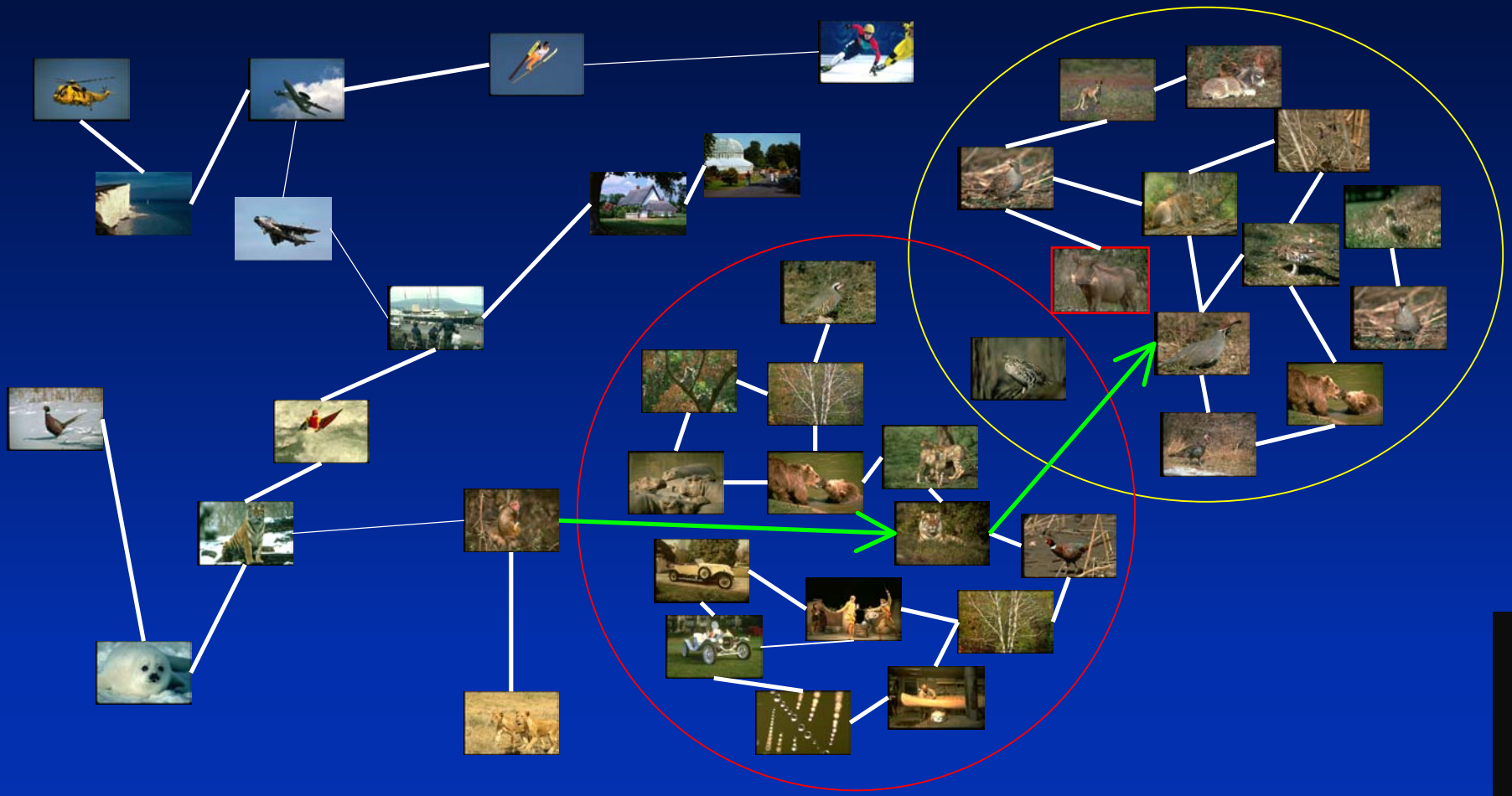
Steps to target

Time to target

Fixation Numbers

# Similarity Measure

Representation of pre-computed similarity links

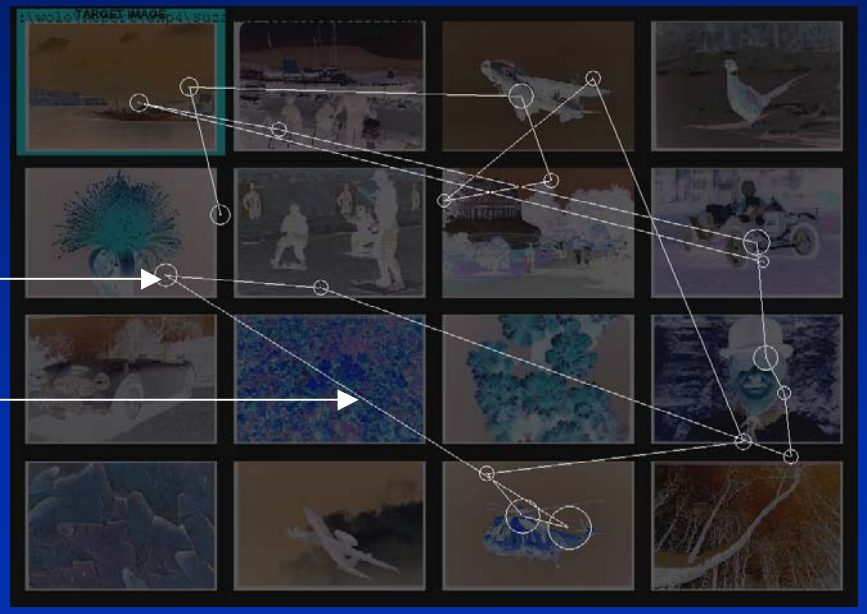


# Experiment Design

- Database: 1000 images
- Selection factors
  - Fixation Threshold: 400ms and 800ms
  - Image Types: 4 Easy-to-find and 4 Hard-to-find images
  - Number of images retrieved randomly: none and one

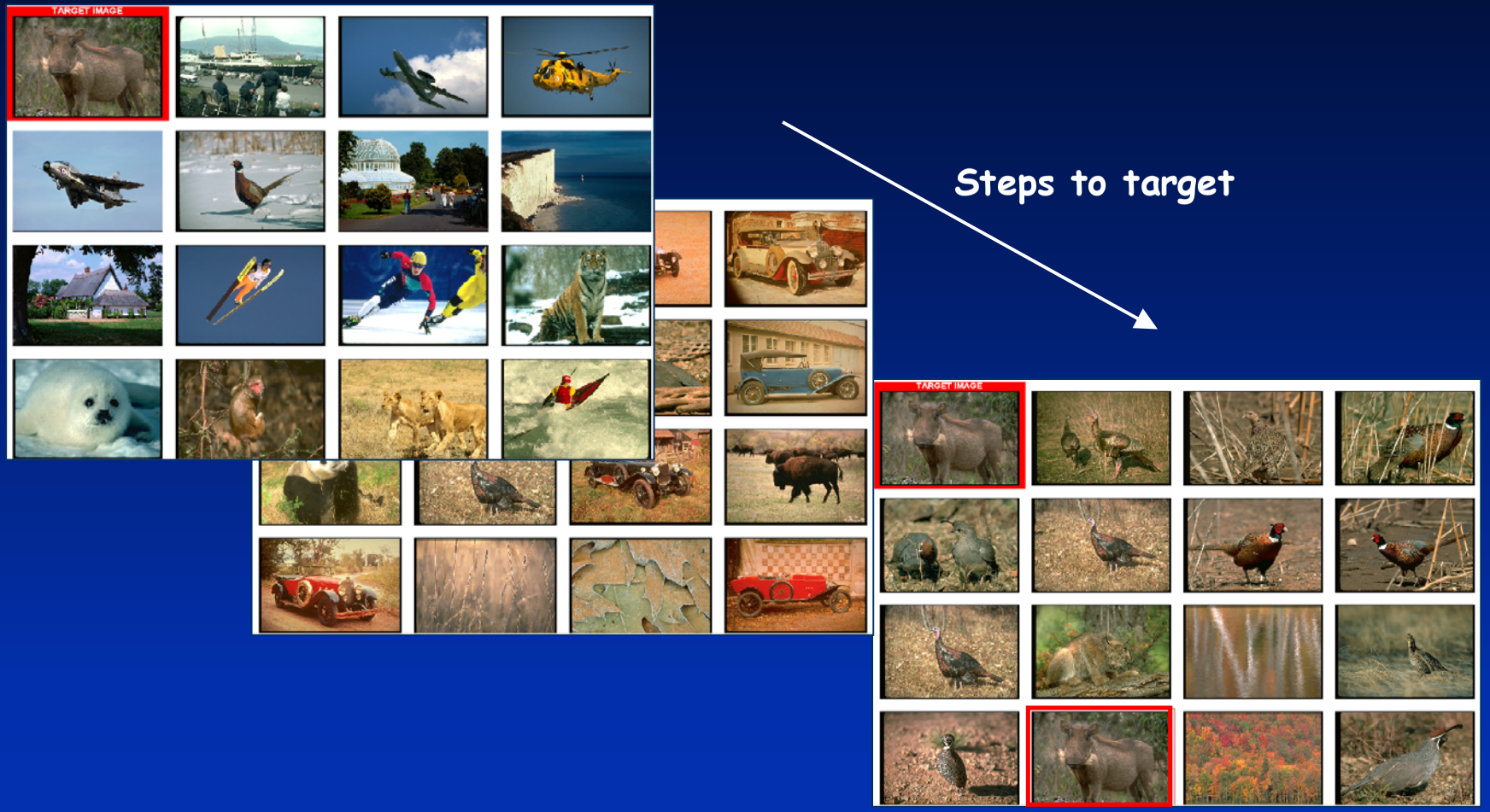
# Display Change

- Gaze selection of an image is determined by using the sum of all fixations of 80ms and above on an image position, up to a fixation threshold. The next set of images are then retrieved from the database and displayed for the next selection using a similarity model.




Video Replay?

# Random Gaze Strategy



# Results

- The participants using the eye tracking interface found the target in significantly fewer steps when compared with an automated random gaze strategy.

- Easy-to-find target images were found in fewer steps, fewer fixations and shorter time by participants than the hard-to-find images.

# Results

- Setting a higher threshold did not have a significant effect when either 400ms or 800ms was used for the easy-to-find images, but it did for the hard-to-find images.

- Inclusion of one randomly retrieved image in each display made little or no difference in the steps to target, time to target and fixation numbers.

# Recent Findings

- Refixation or revisit on an image may be an indication of interest in an image.
- Pre-attentive Vision: Participants were able to find target images on a 200ms fixation threshold.
- Saccade speeds may be frequently slower just before selection of an image.

# Conclusion

- The eye tracking interface together with pre-computed similarity measures yield a significantly better performance than random selection using the same similarity information.

http://www.ee.ucl.ac.uk/~ooyekoya/