- Friday, February 3, 1995
Various Projects

1.0 Here are the minutes for the meeting that took place on Feb 3rd. The meeting was run by Ian Howard on his research.

The meeting for MARCH (March 3rd) will be given by John Tsotsos (see 6.0 below). The meeting for APRIL (April 7th) will be given by Josee Rivest.

2.0 I am not sure what we want to do about using the meeting as a way to meet people that are in the vision group. Here is a role call based on the people that I think were there. It probably contains errors in both directions. Please let me know of corrections -- especially if your name is MISSING. Brackets means I think those people were not there but should have been...

SENIOR MEMBERS POST DOCS GRAD STUDS UNDERGRADS

Laurence Harris, (Kristiina McConville), Peter Mente, Eliana Klier, (Emre Onat), Lani Lieberman, (Dan Zikovitz), Jorge Sousa

(Otmar Bock), (John Lipitkas), (Sean Hickey)

Josee Rivest

Keith Grasse, Andrea Downie, (Natalie Gringordo), Randy Penfield, (Susahna Yanifka)

Peter Kaiser

(Martin Regan), Marian Regan .(Rob Gray), Alex Vincent, (Christine Yeomans)

(Hiro Ono), (Mako Ichikawa), (Renate Korn), Igor ??, Lorraine Gunther

Ian Howard, Alan Ho, Rob Allison, Hiro Kaneko

(Marty Steinbach), (Beth Irving), (Jennifer Steeves), Carol Dengis, (Herb Goltz)

(John Tsotsos) <--- Uof T computing department

(Doug Crawford)

(Michael Jenkin), (Nicole Aucoin), (Kelvin Cheung)

3.1 Ian Howard started the meeting with a little game as it characteristic of his style. We were invited to guess the names of people who had made a number of fundamental contributions to visual science such as "If a child is shown two things they will choose the attractive one", "two eye's actions are always identical", "induced motion", "Panum's fusional area". The choices were from a number of well known visual scientists such as Helmholtz, Hering etc.. or somebody else. The answer to them all was "somebody else" since they were all contibutions made by Al-Haytham in the tenth century. Ian has just discovered this book ("Optics" by Ibn Al-Haytham, London, Warburg Institute, (1989) ISBN 0-85481-072-2) in translation.

3.2 Ian listed his projects under five headings:

i visual vestibular interactions in self orientation

when can vision overcome vestibular cues?
the role of visual motion
exps using a rotating room
a polarized room (ie, with a clear ceiling)
a virtual room (on earth and in space)
ii visual and proprioceptive cues to self rotation

iii cyclovergence (rotations of the eyes about the lines of sight in opposite directions

eg. left eye clockwise, right eye anti-clockwise)
previously thought to be very small
here shown to depend on VERTICAL DISPARITIES (horizontal disparities produced a sensation of SLANT but no cyclovergent eye movements -- see below)
iv stereoscopic vision

v vertical disparities and the perception of slant

3.3 The last of these projects was the topic for the rest of the meeting. My summary of what I take to be the main points of this talk are given in section 5.0 below).

There are five categories of disparities:

occlusion disparity (one object in front of one eye's view of another object but not the other eye's view)
displacement disparity (conventional HORIZONTAL disparity)
relative shear (of groups of features)
relative size (one eye nearer to the object)
vertical disparity (part of relative size: if something is bigger in one eye the top and bottom are separated by a larger vertical distance)
3.4 Some experiments were described which showed that perceived SLANT depended on the RATIO of horizontal to vertical disparities. The simultaneous presence of horizontal signals that the verticals do not belong to a slanting stimulus but instead are due to a) a big looming shape or b) a magnification problem in one eye (aniseikonia).

3.5 When put into competition with the relative shear model for slant perception, the ration of horizontal to vertical disparity model makes very different predictions -- all of which, Ian claimed, have been tested and shown to favour the ratio model.

4.0 Ian Howard then passed over the floor to Hiro Kaneko who described four experiments about the conceptual consequences of VERTICAL disparities.

exp 1

vertical disparities alone cause slant. If RE smaller, slant is found with left side of picture closer. horizontal disparities alone also cause slant. But in the opposite direction ie. the right side of the picture looks closer when the right eyes's image is smaller. I have to admit that I didn't understand why this was at the time, but if you draw it out, then you can see that the right side (in this example) has crossed disparities and the left side has uncrossed disparities. a border INCREASES the H disp effect a border DECREASES the V disp effect

exp 2 if only some of the dots have H disparities, then TWO surfaces are seen if some dots have vertical disparities and others don't, then still only one surface is seen whose slant is proportional to the number of dots with disparities.

Exp 3 if a field has opposite-direction polarities on the two sides (eg. left half of visual field has RE smaller; right has RE bigger) then the two halves of the field appear slanted in the predicted directions whether they are H or V disparities. Except that varying the H disp results in a clear edge but V gives a rounded edge.

Exp 4 This is one of the strangest findings to my mind: if a grating is constructed by vertical disparities, then, although its frequency (number of cycles across the screen) can be well determined if it is defined with H disp, no more than 2 cycles are ever reported from V disparities....
....even when there are as many as six cycles present!

5.0 So the vertical disparity system is a functional part of the visual system, it carries low spatial frequency information and probably works by averaging over large areas of the visual field. Its interpretation relies on the simultaneous horizontal disparities that are present (presumably even in the experiments described here - where the simultaneous HORIZ was ZERO). Under natural circumstances, vertical disparities can carry a lot of useful information about SLANT once it has been verified that the disparities are not caused by accidental twists of the eye, looming of big objects or aniseikonia. These can be ruled out by comparing VERTS to HORIZ.

6.0 So next time John Tsotsos will run the discussion group. This is what he says he is going to talk about: "I will describe in detail my model for visual attention, and then spend some time showing how it relates to the available experimental findings. The model has been implemented and performs well in real situations driving a robotic head. Key comparisons such as to the Moran and Desimone 1985, Motter 1993, 1994 results are included. The model is intended to deal with covert attention as well as some aspects of overt attention. Also, I will compare the model to those of the Crick, Koch and Neibur group and the Van Essen, Anderson and Olshausen group. My goal is to not only tell you about what I am doing, but to elicit feedback on the biology side - in an attempt to ensure that I am kept honest about the biological plausibility of the model"

6.1 --- see you there!!! We'll keep him honest.....

Ian Howard
York University