

Description of the Attention demonstration (run OWL-demo-1.exe)

The Plymouth OWL robot is a five-degrees of freedom stereo vision robot, with steerable eyes (unlike an Owl!), and rotatable neck (see Fig.1). It is used to teach active stereo vision techniques and to introduce cognitive psychological theories to robotics engineers and computer science students.



Figure 1: A parliament of Plymouth Owl Robots

The Owl was designed to offer three theoretical concepts to students, verged camera depth through triangulation, fixed camera disparity-based depth and a cognitive model of visual attention in humans that controls rapid eye movements called saccades. This demonstration explores the latter, emulating (albeit simplistically) what a human would attend to if they were asked to take in the scene, and look at interesting things. Referring to Fig.2 the programme outputs eleven windows. In sequence (a) camera input from left and right cameras (only right shown) are processed to extract colour, edge and detail feature maps (b, c, d). these are linearly combined through weights (defined by sliders in window j) resulting

in (e) a saliency map. To avoid looking at the same stimulus all the time, the model has a familiarity map (window f) that is used to ignore targets after a time. The cameras can only see a small portion of the room, so the world view (window g) is formed by moving the neck as well as the eyes, in a manner similar to humans. The robot forgets where it has been over time, as shown by the decaying brightness of saccade-captured images in the world-view attention model. Servo commands are listed in window (i), and a frequency/saccade distance plot is maintained in window (h).

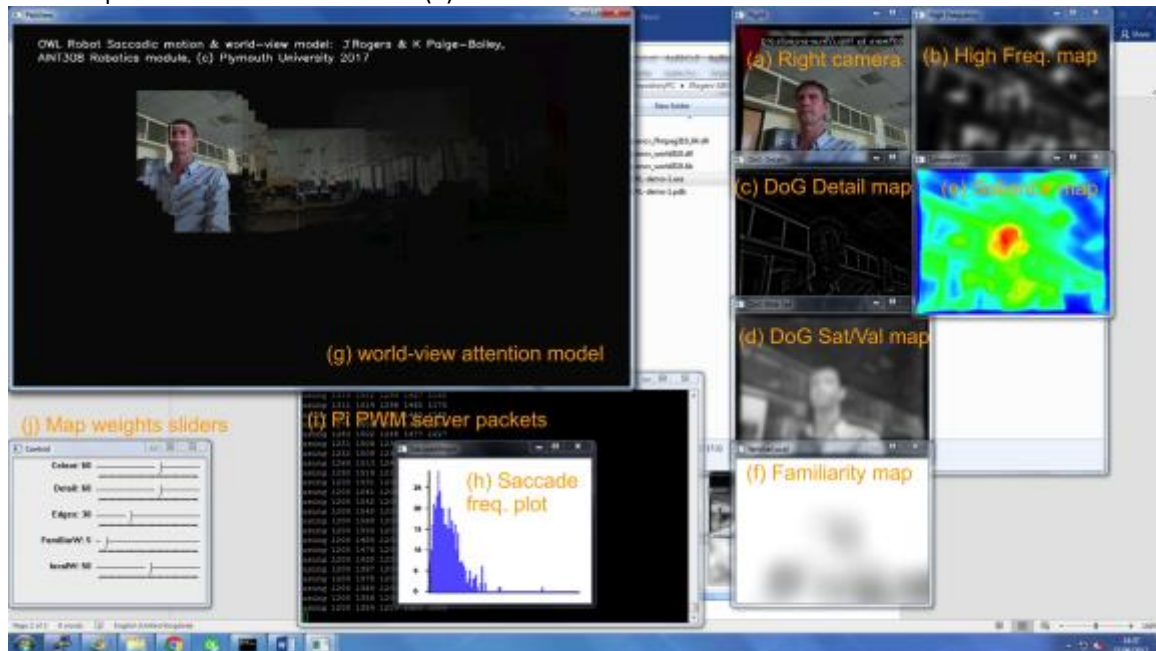


Figure 2: Screen output from Plymouth OWL attention model

The robot will continually search the entire scene for things it finds interesting, saccade to them, mark them as seen in the Familiarity map, then move to the next most interesting or salient target. The neck will move to try and re-centre the cameras on the target, so that the saccade is always near the centre of the field of view. This is like the way human visual attention system operates. Imagine if you were asked to just take in a scene, and try and see everything that is interesting. This is what is happening in the software. This demonstration was developed by students as final year coursework in module AINT308 Computer Vision and Behavioural Computing, where they learn to emulate animal vision systems as a way of engineering systems for new products. We have twenty-one Plymouth OWL robots.