

Gaze Detection via Self-Organizing Gray-Scale Units

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Submitted to the Computer S

phase, the system uses the model image to create and arrange gray-scale subimages, or units, in an elliptic pattern. The units are then correlated with the trial image at locations that are determined in the learning phase. The learning phase consists of a number of epochs. In each epoch, the units move towards the trial eye. Each unit and its neighborhood learn their best positions and organize themselves in a final arrangement. The center of the final arrangement is an estimate of the position of the eye center in the trial image. The best-correlating pupil position in the trial image is then determined. The location of the pupil center with respect to the eye center is used as an estimate of the gaze direction and is the system output.

3 Setup Phase

In the setup phase, learning units are created from a model image of the eye and arranged around the eye of a trial image.

3.1 Initial Arrangement of Units in Model Image

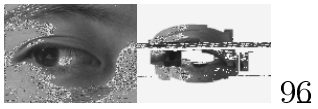
For each subject, a model image $m(x, y)$ of one of the subject's eyes is **er**

$(i - \lfloor \frac{n}{2} \rfloor) \bmod n, \dots, (i + \lfloor \frac{n}{2} \rfloor) \bmod n$. The results are

after ξ epochs the units have

| M _____

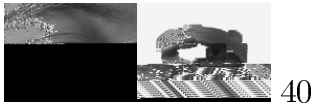
Frame



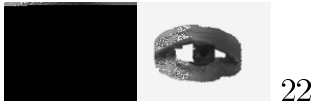
96



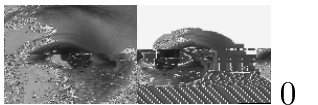
76



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- [3] S. Baluja, D. Pomerleau, "Non-Intrusive Gaze Tracking Using Artificial Neural Networks," *Advances in Neural Information Processing Systems (NIPS) 6*, 1994.
- [4] M. Betke, N. C. Makris, "Information-Conse