1006-62-251 **Hilary W Thompson*** (`hthomp2@lsuhsc.edu`), Louisiana State University Eye Center, 2020 Gravier Street, Suite B, New Orleans, LA 70112-2234. *A Review of Recent Advances in the Mathematical Treatment of Image Analysis Problems, with Examples from Biomedical Image Analysis.* Preliminary report.

Maturing experimental techniques and knowledge in neurophysiology and cognitive neuroscience provided data on visual processing in mammalian brains that led to computational understanding of visual (image) processing, allowing mathematically more sophisticated approaches.

I will discuss some problems of current interest, with examples from biomedical imaging, which suggest problems for mathematics. Specifically, in problems of motion detection in time series of images, known as optical flow, the changes in the position and value of pixels between images can be characterized as a vector field. In turn instantaneous apparent velocities can be characterized in such a manner as to find optical flow constraints for a given series of images. Methods that have been applied to the solution of the resulting equations must deal with the problem that one scalar equation is inadequate to find both components of the velocity field. Methods that have been applied to this problem include the use of second order derivative constraints, weighted least squares approaches, parametric models of velocity and regularization of the velocity field using minimization techniques and smoothing terms that permit edge preservation and noise reduction. (Received February 15, 2005)