Glaucoma is an eye disorder which is prevalent in the aging population and causes irreversible loss of vision. Hence, computer aided solutions are of interest for screening purposes. Glaucoma is indicated by structural changes in the optic disc (OD), loss of nerve fibres and atrophy of the peripapillary region of the OD in retina. In retinal images, most of these appear in the form of subtle variation in appearance. Hence, automated assessment of glaucoma from colour fundus images is a challenging problem. Prevalent approaches aim at detecting the primary indicator, namely, the optic cup deformation relative to the disc and use the ratio of the two diameters in the vertical direction, to classify images as normal or glaucomatous.

We explore the use of global motion pattern-based features to detect glaucoma from images and propose an image representation that serves to accentuate subtle indicators of the disease. These global image features are then used to identify normal cases effectively. The proposed method is demonstrated on a large image dataset consisting of 1845 images annotated by 3 medical experts. The global approach is extended to detect atrophy and two hierarchical system designs are proposed. In the first design, only global analysis is used, while in the second both global and local analysis are employed.

In the first design, the first stage is based on features capturing information mainly of primary indicators while the second stage is based on features extracted for detecting atrophy (secondary visual indicator).

The second design attempts to combine the strengths of global and local analysis of the OD region. Global features are used to remove as many normal cases as possible in the first stage and local features are used to perform a finer classification in the second stage. This system has been tested on 1040 images with ground truth collected from 3 glaucoma experts. The results show the hybrid approach offers a good solution for glaucoma screening from retinal images