# European researchers are working on a new low-cost, high-resolution system for early detection of glaucoma

Glaucoma is the second most common form of blindness and 4.5 million people are thought to suffer from it all over the world. Early detection is essential to avoid severe incapacity or blindness.

Researchers from the Polytechnic University of Valencia, led by the CVBLab-I3B (Computer Vision and Behaviour Analysis Lab) are helping to develop a new low-cost and high-resolution system for the early detection of glaucoma. This is the main objective of the European Galahad Project (Glaucoma Advanced, Label free High Resolution Automated OCT Diagnostics), coordinated by the British Gooch & Housego company, which is planned to continue until the end of 2019.

According to the figures released by the World Glaucoma Association (WGA), this disorder is at the present time the second most prevalent cause of blindness. It has been calculated that 4.5 million people world-wide are blind due to glaucoma, and in 2020 this number is expected to rise to 11.2m.

Glaucoma is caused by a pathological rise in the intraocular pressure which results in a progressive loss of vision. Early detection is thus essential if the disease is to be checked in time to avoid severe incapacity or blindness.

The device designed to improve diagnosis within the framework of the project is based on a new system of optical coherence tomography. Although OCT systems are at present available in ophthalmology centres, as the UPV research team has pointed out, high-resolution devices are extremely expensive: In the words of Valery Naranjo, director of the UPV's CVBLab-I3B, "*Our aim is to reduce the costs and achieve high-resolution images to aid in the early diagnosis of this disease*".

The novelty of the new Galahad system is its super wideband light source to achieve high image resolution at a reasonable cost. "*The system will measure the layers of the retina with much greater accuracy and will help in the early detection of glaucoma. Clinical studies have already been carried out and indicate that the thickness of certain layers can lead to the diagnosis of this disease,"* adds Sandra Morales, member of the CVBLab's research team.

**Algorithms for image analysis**

The work of the UPV's researchers focuses on the development of a system of image analysis based on the application of advanced algorithms that provide an exhaustive analysis of each image acquired by the new device. This technique is a combination of advanced hardware-software computational techniques that can calculate the results in the shortest possible time to keep costs low.

"*This system is fundamental to segment in depth different layers of the retina and extract information on their thickness, deformation, etc*," says Valery Naranjo. In the UPV, besides the CVBLab, lecturers from other research groups also are taking part: José Manuel Mossi and Francisco José Martínez, of the ITEAM (Multimedia Telecommunications & Applications Institute) and Antonio M. Vidal of the Interdisciplinary computation and Communications Group (INCO2-DSIC).

The system will also incorporate a large image bank of both healthy and affected patients for automatic training of the system. When a new case comes up, the algorithms created by the CVBLab-I3B researchers will be used to discover whether or not the patient is suffering from glaucoma.

"*For the doctor, it will be completely transparent; the system will provide automatic diagnoses and will be able to detect possible glaucoma cases*", adds Valery Naranjo.