CAD makes sustained progress

Currently, mammography is the standard technique for routine breast cancer screening for women aged 50 years or more. The technique is relatively simple, cost effective and has been shown to reduce mortality for up to 30-40%. However, for women aged 40-49, it is not clear if screening mammograms help in reducing breast cancer death. Inherent limitations of mammography limit the effectiveness of the modality in depicting masses in dense fibroglandular tissues. This is a problem not to be easily disregarded in Japan, as Japanese women tend to have dense breasts. In addition, the breast cancer incidence rate in Japan is highest among women aged 40-49. This motivated the interest of the Japanese healthcare authorities and industries in modalities specifically developed for breast cancer screening. The acquired three-dimensional volumetric whole-breast data can be reconstructed in a workstation which features a display of whole-breast ultrasound data in axial, coronal and sagittal views as well as by through-breast mode, synchronisation of bilateral images, and computer-aided diagnosis (CAD) functions developed at the Department of Intelligent Image Information, Graduate School of Medicine, Gifu University. Other than the breast ultrasound CAD, included in this IMAGINE exhib-bit are two other CAD projects developed at the department as described in the following.

CAD for Brain MR
Cerebrovascular disease is one of the leading causes of death in developed countries. The prevention of this disease is of paramount importance. MRI and MRA are very useful for the early detection of cerebral and cerebrovascular diseases. In Japan, regular user-screening services for brain diseases are available. Such services typically include screening for lacunar infarcts, unruptured aneurysms and arterial occlusions. Clinical suites or facilities in hospitals that provide such screening services are commonly referred to as ‘Brain Dock’ in Japan (among other suites/facilities such as ‘Human dock’, ‘Whole-body dock’, ‘heart dock’, etc., which provide medical checkup for the body or the specific organ). The CAD system being developed at Gifu University uses MRI and MRA images to detect lacunar infarcts, unruptured aneurysms and arterial occlusions. Clinical suites or facilities in hospitals that provide such screening services are commonly referred to as ‘Brain Dock’ in Japan (among other suites/facilities such as ‘Human dock’, ‘Whole-body dock’, ‘heart dock’, etc., which provide medical checkup for the body or the specific organ). The CAD system being developed at Gifu University uses MRI and MRA images to detect lacunar infarcts, unruptured aneurysms and arterial occlusions. The medical conditions indicate an increased risk of severe cerebral and cerebrovascular diseases. The presence of lacunar infarcts increases the risk of serious cerebral infarction, and a ruptured aneurysm is the major cause of subarachnoid haemorrhage (SAH).

CAD for Fundus Images
Retinal fundus images are useful for the early detection of a number of ocular diseases that can lead to blindness if left untreated. In addition, the detection of diabetic retinopathy and hypertensive retinopathy in retinal fundus images during routine eye checkup can help the diagnosis of diabetes and hypertension, respectively, in the general public who are not already diagnosed with the diseases. Examinations using retinal fundus images are cost effective and are suitable for mass screening. CAD systems for detecting glaucoma, diabetic retinopathy, and hypertensive retinopathy using retinal fundus images are the focus in this project. A new digital stereo fundus camera has been specially developed for the incorporation of CAD systems. The stereo retinal fundus image pairs obtained using the new camera are used to generate depth maps of the optic nerve head and 3D retinal fundus images in the workstation. The computer-genera
ded depth map of the optic nerve head enables automated quantitative depth measurement of the optic nerve head in a retinal fundus and is important for the diagnosis of glaucoma.

The Department of Intelligent Image Information, Graduate School of Medicine, Gifu University, headed by Professor Hiroshi Fujita, is part of the Robotics Advanced Medical Cluster in Gifu-Ogaki, Japan, one of the eighteen co-operative research centers established across Japan since 2002 under the “Knowledge Cluster Initiative” of the Japanese Government, with the aim to promote industrial, academic and governmental cooperation in regional areas in Japan and to conduct innovative and technological research with a focus in advancing the Japanese technological industries.

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