Wavelets crunch through doctors' day long struggle to diagnose brain tumors

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Today if doctors devote a full day to analysis and expert thought, they may be able to provide just half a dozen patients with a diagnosis of the precise type of brain tumour they face. Now researchers at the University of Warwick have devised an automated technique that can give a preliminary analysis of the precise brain tumour type within seconds.

Meningiomas are tumours of the brain and nervous system and they account for 20% of all brain tumours. Doctors have a major problem of discriminating between the four different subtypes of meningiomas but doctors face three key problems in making such a diagnois:

-- The work can be painstakingly slow requiring up to two hours of analysis and expert consideration of a full "slide" of information.

-- The finest tumour specialists (histopathologists) can at times come up with completely contradictory findings based on slight variations in their method of analysis.

-- Currently the slides that specialists examine contain a few million pixels of data and the task of tumour diagnosis is painstakingly slow already. This problem is quite literally growing as medical equipment is coming on stream that can produce slides with hundreds of millions pixel resolution.

Clearly they would welcome any technological support which could

speed up this process, use more of the information available, and allow them time to diagnose and treat many more patients.

Now researchers in the University of Warwick's Department of Computer Science have devised a method of using "wavelets" to provide an automated analysis of the varying texture of the tumours and guidance to doctor's within seconds of being presented the data.

A wavelet filter is a computing tool that could be thought of as acting like a virtual microscope to analyse signals at various frequencies and positions in space. Each different kind of wavelet can be used to analyse a different aspect of a signal.

The Warwick researchers have used their wavelet analysis to examine slides of tumour structure and texture from patient case history that have already been diagnosed and treated.

Within seconds the analysis can examine hundreds of slides with hundreds of thousands of pixels of data and is able to give a full diagnosis of precise tumour type with 80% accuracy. The wavelet method is also able to analyse all of the millions of pixels employed in a current slide. The wavelet technology can also be employed, if sufficient computing power is available, to quickly analyse the massive-sized data that are becoming available on the latest high resolution slides.

Researchers believe that the technology should be used to support a tumour specialist's (histopathologist's) own expert abilities. They will be able to use this new computing power to sharply focus their own diagnostic expertise on the most crucial pieces of data, preserve a consistent form of analysis using the latest and best expert thought, and help guide tumour experts down the most efficient avenues of investigation.

The lead researcher on the project, University of Warwick doctoral researcher Hammad Qureshi says:

"This partnership of computing power and human expertise could produce a ten fold increase in the number of these difficult tumours that a doctor could specifically identify in a day."

Dr Nasir Rajpoot, an Associate Professor in the University of Warwick's Department of Computer Science said:

"We are now looking for histopathologists who would like to share real time patient data with us. We fully expect to be able to replicate our lab results in a real patient environment."

Source: University of Warwick