

Seeing through tooth decay

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Dental caries afflict at least 90% of the world's population at some time in their lives. Detecting the first signs of this disease, which can be lethal in extreme cases, just got easier thanks to work by researchers in India discussed in the latest issue of the *International Journal of Biomedical Engineering and Technology*.

R. Siva Kumar of the Department of Electronics and Communication Engineering, at RMK Engineering College, in Tamil Nadu, explains that dental caries, known colloquially as tooth decay or dental cavities, is an infectious disease which damages the structures of teeth. The disease causes toothache, tooth loss, infection of the jawbone and beyond, and in severe cases, death.

Caries are caused by acid-producing bacteria that feed on fermentable carbohydrates including sucrose, fruit sugars, and glucose. The higher level of acidity in the mouth due to this bacterial activity effectively dissolves the mineral content of the tooth. In the USA, dental caries is the most common chronic childhood disease, being at least five times more common than asthma. It is the primary cause of tooth loss in children, while between a third and two thirds of people over 50 years experience caries too.

There are two types of dental caries, those that form on the smooth surfaces of the teeth and those in the pits and fissures. The latter are difficult to detect visually or manually with a dental explorer. Detecting caries in the early stages of development is important for saving affected teeth and avoiding the possibility of tooth loss and invasive surgery at

later stages. Siva Kumar suggests that X-rays of a patient's teeth analyzed by specialist software could help.

The researchers at RMK engineering college have now developed an X-ray image analysis technique that reveals the pixel intensities at different X-ray wavelengths, much like the histogram analysis of images by a high-specification digital camera. Siva Kumar explains that the software reveals that the X-ray histogram and spectrum are very different depending on whether the teeth X-rayed are normal or exhibiting the early stages of decay. The researchers found that in the X-ray histogram the pixel intensities are concentrated in different ranges depending on degree of decay.

The technique could be very useful for dental clinicians, the researchers explain, and could be extended using neural networks to automatically identify the different stages of dental caries.

Source: Inderscience Publishers

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