

Research Project Title:

Development of non-invasive technique to characterize biomechanical properties of articular cartilage in synovial joint using magnetic resonance imaging (MRI) image

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Program: PhD

Field: Biomedical Engineering & Mechanical Engineering

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Supervisor:

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Abstract:

Degradation and loss of articular cartilage in synovial joint has been long recognised as the main source of osteoarthritis (OA). The non-invasive MRI techniques were widely used to describe alterations in morphological of cartilage tissue with disease including the thickness, volume and cartilage loss. However, most of the diagnosis on patient with joint pain is performed at the progressive stage of OA. The ability to detect the disease at its earliest stages is crucial and clinically importance because the treatment of OA is often depends on early detection in a symptomatic patient. Studies have shown that changes in biomechanical properties of cartilage will lead to the alterations in cartilage morphology. Therefore, this study aims to characterise the biomechanical properties of articular cartilage based on the MRI scan image. Knee joints of goat will be scanned using extremity MRI machine and the image of cartilage will be segmented and characterised based on the intensity of the image grey-level. Indentation test will be performed on the cartilage to characterise the elastic modulus and permeability properties. A novel technique will be developed to correlate the image grey-level to the characterised properties. The establishment of this method is crucial to enhance the ability to detect degenerated articular cartilage at early stage.