TECHNOLOGY

Automatic CAD of Meniscal Tears on Magnetic Resonance Imaging: A Morphology- Based Approach

OVERVIEW

Knee related injuries, including meniscal tears, are common in young athletes and elderly patients, and require accurate diagnosis for optimal treatment. With proper technique and skill, detection rates of meniscal tears are relatively high, but recognition relies on the experience of the physicians and continues to be a challenge for many without experienced and allows for misdiagnosis. To aid in the confidence of meniscus tear detection, UMB inventors have developed a computer-aided detection (CAD) algorithm for automatic detection of meniscus tears in non-invasive MRI scans. Confirmation of accurate meniscus tear identification was validated through the comparison with interpretations of two board certified musculoskeletal radiologists. A high correlation was noted between the CAD algorithm and human observers resulting in identification of complex meniscal tears of the knee. In a preliminary study, the automated meniscal extraction algorithm was able to successfully perform region of selection, thresholding, and object shape constraint tasks to produce an image isolating the menisci in 69% of 28 cases. This invention poses potential use for increasing radiologist productivity and confidence, improving patient outcomes, and applying more sophisticated CAD algorithms to orthopedic imaging tasks.

APPLICATIONS

Meniscal tears are one of the most common knee injuries in the world and consist of two types, acute and degenerative, and account for more than 850,000 surgeries on average in the US alone. The majority of acute meniscal injuries come from sport related activities, about 61 for every 100,000 people. Degenerative meniscal tears occur in older people with approximately 60% of the 65 and older population likely having some sort of degenerative tear as the meniscus weakens and becomes less elastic with age. Long term complications such as degenerative arthritis and functional limitations can occur from untreated injuries to the meniscus. Early diagnosis and interventions are crucial to significantly improve the outcome of meniscal tears and to preserve the integrity and function of the knee. Current clinical methods to test for meniscal lesion are not considered accurate, sensitive, or specific for detecting meniscal lesions and often require advanced imaging such as MRI and arthroscopy. However, without a high confidence rate to detect meniscal injuries, imaging studies are often deferred to physical therapy due to the high cost of health care. Implementation of the CAD algorithm for automatic detection of meniscus tears would significantly improve the outcome of patients with meniscal tears allowing for earlier diagnoses and treatments.

ADVANTAGES

Automated system to detect of meniscus tears utilizing MRI scans with high confidence.

STAGE OF DEVELOPMENT

The CAD algorithm has been tested in a blind test and show high confidence in detecting complex meniscal tears of the knee with high correlations with experienced human observers.

R&D REQUIRED

Additional validation required.

LICENSING POTENTIAL

UM seeks to develop and commercialize by an exclusive or non-exclusive license agreement and/or sponsored research with a company active in the area.

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PATENT STATUS

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CATEGORIES

- Devices
- Imaging devices

INVESTIGATOR(S)

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EXTERNAL RESOURCES

- An automatic computer-aided detection system for meniscal tears on magnetic resonance images.
- MRI for traumatic knee injury: a review.

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