

Abstract

Meniscus is an important part in human knee and it can be torn when people do sports or physical exertion. Patients suffer pain when they move their joint with damaged menisci. Removing damaged meniscus is usually recommended by doctor; however, it is not capable of solving the problem in long term. Artificial meniscus is the way to deal with meniscus injury in long term. The goal of this project is to develop a machine which is able to produce a meniscus scaffold. By weaving polymer string on a pin board, this machine can manufacture a meniscus scaffold which can have collagen injected into it. Finally, the meniscus scaffold with collagen will be capable of being used as knee tissue regeneration. In order to produce a meniscus scaffold, the machine is designed in two parts, a weaving system and a path-planning algorithm. This machine should be able to weave a series patterns (layers) of meniscus scaffold on a pre-designed pin board. The structure of the scaffold allows the liquid collagen to pour into. This machine should be capable of fabricating customized meniscus scaffold based on the Magnetic Resonance imaging (MRI). In the future, this machine will be improved to enhance the cooperation between the weaving system and collagen system which allows to inject collagen into the scaffold. A process checking system will be added to current machine in order to automatically and perfectly manufacture a complete meniscus. The complete menisci will be capable of being used to repair and replace patients' injured menisci.