11. 학사논문 지도교수: 박 종 우

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11-1. Optimal design tools for soft robots

Unlike today's conventional rigid-link robots, soft robots consist of deformable materials and novel actuators and sensors, and as such new tools are required for their analysis and development. The goal of this research project will be to develop a software system for the analysis, simulation, and design of basic soft robots. The essential components of this system include (i) a means for modeling deformable materials that is more efficient than traditional finite element methods without sacrificing too much in the way of accuracy; (ii) a dynamic modeling and simulation technique for multiple contacts with friction; (iii) an integrated simulation and optimization framework for the design and control of soft robots. **Prerequisites:** Introduction to Robotics, experience in C/C++ programming.

11-2. 3D printing of human-like robotic skin

The goal of this research project will be to develop an empirical approach for realistic skinning on mechanical body, based on 3D mesh capture and 3D printing technology. The main idea of the proposed method is implanting sub-structure on the bone that can affect the outer skin to be shaped as real as possible. The project will involve both analysis and experimental evaluation to determine whether the proposed skinning method can achieve realistic shape deformations for simple motions. **Prerequisites:** Introduction to Robotics, basic lab skills. Part of the work may be conducted at the Korea Institute of Science and Technology (KIST).

11-3. Machine Learning and financial engineering

Machine learning methods are receiving considerable attention in the financial engineering literature, and the goal of this research project is to investigate the effectiveness of various machine learning algorithms in the modeling and prediction of complex derivative instruments. A predictive model for high-dimensional derivative pricing data will be constructed, and used in conjunction with a position optimization engine. **Prerequisites:** Interest in learning about financial engineering, background in linear algebra, differential equations, and random variables and processes, some experience in C/C++ programming.