Robot thumb kinematic model optimization

Description
The last few years have seen an explosion of research in the area of dextrous manipulation for humanoid and prosthetics applications. However, there has not been a considerable volume of research in terms of optimizing the morphology and degrees of freedom (DOFs) of thumbs of robotic hands. We hypothesize that by optimizing these parameters, it could be possible to increase the ratio of DOF/active DOF required while maintaining grasp, dexterity and range of motion similar to those of a human hand. In order to prove our hypothesis, we will need to optimize kinematic models of robot thumbs by identifying and using appropriate optimization criteria against models of the human thumb.

Tasks
You will be given a framework that automatically generates randomized kinematic models of robotic thumbs, created using the Robotics Toolbox for MATLAB. Your task will consist of extending the framework with an optimization technique (up for discussion) that selects candidate models based on a particular performance metric. This metric will be based on existing kinematic models of the human thumb.

Applicant
The applicant should be a Computer Science, Mechanical Engineering or Biology student or graduate, with good background in Matlab (C++/Java also good to know), and an interest in robotic/prosthetic applications. The thesis is to be written in English.

References

Supervisor
Your contact for this project is Konstantinos Dermitzakis from the AI Lab Zurich (http://ailab.ch/dermitza). You can best reach him by email (dermitza@ifi.uzh.ch).