abstract
There are a large group of amputees living in the country and the number of them is supposed to increase a lot in the following years. Among them, lower-limb amputees are the majority. In order to improve the locomotion of lower-limb amputees, many prostheses have been developed. Most commercially available prostheses are passive. They can not actively provide pure torque as an intact human could do. Powered prostheses have been the focus during the past decades. Some advanced prostheses have been successful in walking on level ground as well as on inclined surface and climbing stairs. However, not much work has been done regarding walking on compliant surfaces. Our preliminary studies on myoelectric signals of the lower limbs during walking showed that there exists difference in muscle activation when walking on compliant surfaces. However, the mapping of muscle activities to joint torques for a prosthesis that will be capable of providing the required control to walk on compliant surfaces is not straightforward. In order to explore the effects of surface compliance on leg joint torque, a dynamic model of the lower limb was built using Simscape. The simulated walker (android) was commanded to track the same kinematics data of intact human walking on solid surface. Multiple simulations were done while varying ground stiffness in order to see how the torque at the leg joints would change as a function of the ground compliance. The results of this study could be used for the control of powered prostheses for robust walking on compliant surfaces.