

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, *Fakulteta za strojništvo*

2. Ime in priimek mentorja (*Name and surname of a mentor*):

Prof. dr. Ivan Prebil

3. Področje znanosti iz šifranta ARRS (*Primary research field*):

2.11 Konstruiranje

4. Kontaktni e-naslov mentorja (*Contact of a mentor*):

ivan.prebil@fs.uni-lj.si

5. Kratak opis programa usposabljanja (*Short description of the program*):

Kandidat za mladega raziskovalca je zaposlen kot raziskovalec na Fakulteti za strojništvo Univerze v Ljubljani in je na Katedri za modeliranje v tehniki in medicini vključen v raziskovalno delo na projektih programske skupine P-109. Kandidat že opravlja prvi letnik na študiju 3. stopnje bolonjskega programa in bo v šolskem letu 2016/2017 vpisan v 2. letnik podiplomskega doktorskega študija.

Tekom podiplomskega študija bo kandidat izvajal raziskave na področju mehanike kolena, kolenskih vezi in mišic ter na področju numeričnih analiz z uporabo končnih elementov za obravnavanje napetostno deformacijskega stanja v kolenskih ligamentih.

Z uporabo modificiranih računalniških orodij bo kandidat razvil 3D numerični model človeškega kolena za uporabo v analizah z metodami končnih elementov. Materialne lastnosti ligamentov bo pridobil z raziskovalnim in eksperimentalnim delom na lastni namensko razviti napravi za natezne preizkuse v laboratoriju za Anatomijo na Medicinski fakulteti Univerze v Ljubljani. Aktivnosti mišic iztegovalk kolena bo kandidat preverjal z raziskovalnim in eksperimentalnim delom z uporabo namensko razvitega zaznavala ter s sprotim preverjanjem z namensko razvito napravo za merjenje momentov v sklepkih. Kandidat bo eksperimentalno delo opravljal v sodelovanju s Fakulteto za šport Univerze v Ljubljani in z Medicinsko fakulteto Univerze v Ljubljani.

Cilj usposabljanja je izdelava delujočega in preverjenega 3D numeričnega modela kolena z uporabo eksperimentalno pridobljenih materialnih lastnosti glavnih ligamentov in štiriglave mišice za uporabo v analizah z metodami končnih elementov. Predlagani numerični model je lahko uporaben za analizo različnih obremenitvenih primerov.

The candidate for a young researcher is employed as a researcher at the Faculty of Mechanical Engineering of the University of Ljubljana and is involved in the research work on projects of program group P-109 at the Chair of Modelling in Engineering Sciences and Medicine. The candidate is already carrying out the first year of studies of the 3rd degree of the Bologna program and will enter the second year of the doctoral studies in the school year of 2016/2017.

During the postgraduate studies the candidate will carry out research in the field of mechanics of the knee, knee ligaments and muscles as well as in the field of numerical analysis using finite elements for addressing the stress-strain state of the knee ligaments.

Using the modified computer tools the candidate will develop a 3D numerical model of the human knee for use in the analysis with the finite element method. He will acquire mechanical properties of the ligaments with research and experimental work on our own specially developed machine dedicated for tensile testing of ligaments in the Laboratory of Anatomy at the Faculty of Medicine of the University of Ljubljana. He will verify the activity of the extensor muscles of the knee with research and experimental work using the specially developed sensors and with continuous verification using the specially developed machine for measuring the torque in the joints. Experimental work will be carried out in collaboration with the Faculty of Sport of the University of Ljubljana and with the Faculty of Medicine of the University of Ljubljana.

The aim of the training is to produce a functioning and tested 3D numerical model of the knee using experimentally acquired material properties of the main ligaments of the knee and of the quadriceps muscle for use in the finite element method analysis. The proposed numerical model may be useful for analysing the different load cases.