Opis delovnega mesta mladega raziskovalca/ke (D*escription of the Young Researcher's position)*

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za strojništvo

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Prof. dr. Mitjan Kalin mitjan.kalin@fs.uni-lj.si

3. Raziskovalno področje (*Research field*):

2.11 Konstruiranje

4. Opis delovnega mesta mladega raziskovalca/ke (D*escription of the Young Researcher's position)*: Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce.

slo: Obnašanje realne kontaktne površine predstavlja eno pomembnejših raziskovalnih tematik na področju tribologije. Kljub številnim raziskavam zadnjih 60 let, zaradi kompleksnosti problema do danes še vedno ni enolično določena odvisnost med vplivnimi parametri (topografskimi, materialnimi in obremenitvenimi) in velikostjo realne kontaktne površine. Na podlagi dosedanjih raziskav je bilo postavljenih več kontaktnih modelov za napovedovanje realne kontaktne površine glede na začetne topografske in materialne lastnosti površin v kontaktu ter zunanje obremenitve, a razlike in odstopanja med modeli so velika. Prav tako manjka relevantnih eksperimentalnih dokazov, saj se pojavi odvijajo na submikronskem nivoju, zato je njihovo določevanje zahtevno. Mladi raziskovalec bo v okviru svoje doktorske naloge obravnaval kontakte inženirskih površin na submikronskem nivoju in vrednotil pojave, ki vplivajo na razvoj in velikost realne kontaktne površine. Uporabil bo lastno razvito preizkuševališče, ki s pomočjo optične metode popisuje razvoj realne površine, preko ustreznih senzorjev pa sočasno še pomik in silo, ki omogočajo spremljanje deformacij stanja na nanometrski skali. Uporabljal bo različne inženirske materiale in različne hrapavosti. Te podatke bo uporabil za razvoj teoretičnega modela realne kontaktne površine. Glavni cilj doktorske naloge bo na podlagi izvedene eksperimentalne analize in natančnega poznavanja vpliva posameznih materialnih in topografskih parametrov določiti teoretični model, ki bo ob upoštevanju znane topografije in materialnih lastnosti inženirskih površin omogočal napovedati obnašanje realne kontaktne površine pri dani obremenitvi. To bo za področje inženirskih ved predstavljalo pomemben doprinos k znanosti, saj bo na novo razviti model temeljil na izsledkih natančnih eksperimentov, kakršni v literaturi do danes še niso bili predstavljeni.

eng: The behaviour of a real contact area represents one of the most important research topics in the field of tribology. Despite numerous research in the last 60 years, due to the complexity of the problem, the dependence between the influencing parameters (topographical, material and load) and the size of the real contact area has not been uniquely determined. Based on previous research, several contact models have been set up to predict the real contact area based on the initial topographical and material properties of the surfaces in contact and external loads, but the differences and deviations between the models are large. There is also a lack of relevant experimental evidence, as

the phenomena take place at the submicron level, so their determination is challenging.

As part of his doctoral thesis, young researcher will consider the contacts of engineering surfaces at the submicron level and evaluate the phenomena that affect the development and size of the real contact area. He will use in lab developed testing machine, which, with the help of optical method, records the development of the real area, and through the corresponding sensors measures, displacement and force at the same time, which enables monitoring of deformations on a nanometre scale. He will use different engineering materials and different roughnesses. This data will be used to develop a theoretical model of the real contact area.

The main goal of the doctoral thesis will be to determine a theoretical model, based on the experimental analysis and accurate knowledge of the influence of individual material and topographical parameters, which, considers the known topography and material properties of engineering surfaces, which will make it possible to predict the behaviour of a real contact area under a given load. This will represent an important contribution to science for the field of engineering sciences, as the newly developed model will be based on the results of precise experiments that have not been presented in the literature to date.