

Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*)

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, Fakulteta za strojništvo

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

Tomaž Pepelnjak, tomaz.pepelnjak@fs.uni-lj.si

3. Šifra in naziv raziskovalnega področja (*Research field*):

2.10 *Proizvodne tehnologije in sistemi*

4. Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*):

Navedite tudi morebitne druge zahteve, vezane na usposabljanje mladega raziskovalca (npr. znanje tujih jezikov, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje...).

slo:

Proizvodnja izdelkov in komponent s postopki preoblikovanja omogoča spremembo od začetne oblike surovca do končne oblike izdelka brez odvzemanja ali dodajanja materiala. Pri tem so ključne karakteristike vsakega preoblikovalnega postopka preoblikovalne lastnosti gradiva in zmožnost premeščanja materiala do kompleksnih oblik izdelka.

V zadnjih letih ima ključno vlogo v industrijski proizvodnji skokovit porast zahtev po prilagodljivosti izdelovalnih sistemov, kar velja tudi za postopke preoblikovanja. Zahteve po fleksibilnosti dodatno povečujejo oženja izdelovalnih toleranc procesov in potrebe po nenehnem prilagajanju tehnoloških parametrov spremembam vhodnih parametrov sistema. Prepletanje digitalnega in realnega okolja se odraža v filozofiji industrije 4.0, kjer preko t.i. digitalnega dvojčka gradimo avtonomne sisteme optimizirane proizvodnje. V te kibernetško-fizične sisteme se vključujejo tudi procesi optimiziranega preoblikovanja. Del te optimizacije se izvede s kontroliranim gibanjem preoblikovalnega stroja, del pa s prilagajanjem preoblikovalnega procesa z adaptivno geometrijo ali gibanjem orodja.

V okviru usposabljanja mladega raziskovalca bo z namenom razvoja novih konceptov optimiziranih preoblikovalnih procesov razvit in ovrednoten sistem pametnih preoblikovalnih orodij implementiran v industrijo 4.0. Preoblikovalni sistem bo zajemal komponente z integriranimi zaznavali za sprotno spremljanje preoblikovalnega procesa, aktuatorje za korekcije procesnih parametrov preoblikovanja in komponente za povečano prilagodljivost delovanja. Cilj vzpostavitve prilagodljivega preoblikovalnega sistema integriranega v pametno tovarno bo zagotoviti dvig fleksibilnosti izdelave s postopki preoblikovanja do nivoja, pri katerem se z razvitimi tehnološkimi rešitvami lahko obvladuje poljubna pametna orodja za preoblikovanje tako kovinskih ali polimernih izdelkov kot tudi kovinsko-polimernih kompozitov.

Zahteve pri izboru kandidata:

Obvezno:

- znanje tujih jezikov: angleščina

Zaželeno:

- inovativnost, kreativnost in ročna spretnost,
- izkušnje z delom v laboratoriju
- znanje programskih jezikov: Solidworks ali Creo, Matlab, Labview, Java, Python
- poznavanje simulacijskih okolij za analize postopkov preoblikovanja: ABAQUS, QForm, Moldflow ali Moldex
- poznavanje senzorjev in mikro-krmilnikov (npr. Arduino) za nadzorovanje fleksibilnih preoblikovalnih sistemov

eng:

The manufacturing of products and components by forming processes allows a change from the original shape of the raw material to the final shape of the product without removing or adding material. The key characteristics of any forming process are the forming properties of the material and the ability to move the material to create complex product shapes.

In recent years, the greatly increased flexibility requirements for manufacturing systems have played a decisive role in industrial production, and this also applies to forming processes. The flexibility requirements are further increased by the narrowing of the tolerances of the manufacturing process and the necessity to constantly adapt the technological parameters to the changes in the system input parameters. The interweaving of digital and real environment is reflected in the philosophy of Industry 4.0, in which autonomous systems of optimized production are built by so-called digital twins. Optimized forming processes are also included in these cyber-physical systems. One part of this optimization is achieved by controlled stroke of the forming machine, another part by adapting the forming process with adaptive geometry or tool movement.

The Young Researcher's training is aimed to build new concepts of optimized forming processes. Therefore, a developed and evaluated system of smart forming tools will be implemented in Industry 4.0. The forming system will comprise components with integrated sensors for real-time monitoring of the forming process, actuators for adjusting the forming process parameters and components for increasing the operational flexibility. The objective of setting up a flexible forming system integrated into a smart factory is to increase the flexibility of production with forming processes to a level where the technological solutions developed can handle any smart tools for manufacturing of metal or polymer products as well as metal-polymer composite parts.

Requirements for candidate selection:

Required:

- Knowledge of foreign languages: English

Desirable:

- Innovation, creativity and manual dexterity,
- Experience with laboratory work
- Knowledge of programming languages: Solidworks or Creo, Matlab, Labview, Java, Python
- Knowledge of simulation environments for the analysis of forming processes: ABAQUS, QForm, Moldflow or Moldex
- Knowledge of sensors and micro-controllers (e.g. Arduino) to control flexible forming systems

