1. Raziskovalna organizacija (*Research organisation)*:

Univerza v Ljubljani, *Fakulteta za elektrotehniko*

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

Igor Škrjanc

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

2.06 Sistemi in kibernetika

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

Igor.skrjanc@fe.uni-lj.si

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

Program mladega raziskovalca bo v metodološkem smislu obravnaval področje identifikacije nelinearnih modelov in statistike. V praktičnem smislu pa bo orientiran v načrtovanje eksperimentov, ki je zelo pomembna faza pri preverjanju in vrednotenju modelov. Je pa seveda tudi nepogrešljivo pri identifikaciji procesov. Načrtovanje eksperimentov pomeni pomemben del sistematičnega pristopa k modeliranju procesov. Na ta način z uporabo DOE (Design of Experiments) lahko načrtamo množico strukturiranih testov, ki nam omogočajo pridobiti celostno informacijo o obnašanju sistema. To pomeni, da izvajamo eksperimente pri množici različnih vhodnih signalov znotraj določene vhodne domene in merimo izhodne signale procesa. Ob predpostavki nelinearne dinamike procesov je seveda smiselno postopati tako, da v področju večjih nelinearnosti izvedemo večje število meritev. Seveda pa modela, ki bi nam to informacijo posredoval nimamo in ga gradimo sproti na osnovi trenutnih meritev. Cilj DOE je s čim manjšim številom meritev priti do čim boljšega modela v celotni vhodni domeni problema.

Načrtovanje eksperimentov je zelo pomembno tam, kjer gradimo modele na osnovi izmerjenih podatkov ali pa tudi teoretično. Gre predvsem za področje kemije, biologije, farmacije, strojništva, elektrotehnike in fizike. Pa tudi povsod drugod, kjer se proučuje različne procese in sisteme in se skuša najti povezavo med vhodnimi spremenljivkami, torej spremenljivkami na katere lahko vplivamo in spremenljivkami, ki so predmet našega opazovanja. Obstaja cela vrsta različnih metod, ki so v uporabi pri DOE. Te metode so statistične, lahko temeljijo na eksponencialnih modelih, lahko temeljijo na kovarianci med vhodnimi in izhodnimi spremenljivkami, lahko so osnovane na metodi glavnih komponent (PCA) ali pa na polinomskih modelih, ki jih dobimo z linearno regresijo.

The program of a young researcher will be in the methodological sense from the area of identification of nonlinear models and statistics. In practical terms, it will be oriented to the design of experiments, which is a very important phase in the verification and valuation of models. But it is of course also an essential tool in the identification of processes. Design of experiments is an important part of a systematic approach to modeling processes. In this way, the use of DOE (Design of Experiments) can be used to defined a number of structured tests that allow us to obtain comprehensive information about the behavior of the system. This means that experiments are performed at a number of different input signals within a certain domain where the output signals of the process are measured. Assuming a non-linear dynamics of the process it is reasonable to proceed in such a way that in the area of larger nonlinearity is performed a greater number of measurements. Of course, the model which would give this information is not available and should be build continuously on the basis of current measurements. The objective of the DOE is to get the best possible model in the whole input domain with as few as possible measurements.

Design of experiments is very important where we build models based on measured data, or even

theoretically. Particularly in terms of chemistry, biology, pharmacy, mechanical engineering, electrical engineering and physics. And elsewhere, where the various processes and systems are studied to find the connection between the input variables, i.e. variables that can be influenced and variables that are the subject of our observation. There is a variety of different methods, which are used in the DOE. These methods are statistical, may be based on the exponential model can be based on the covariance between the input and output variables, and may be based on the method of principal component analysis (PCA) or the polynomial models, which are obtained by linear regression.