Classification of Diploma Thesis – opponent

Author of classification: prof. Ing. Radim Halama, Ph.D.

Supervisor: Sebastian Basterrech, PhD.

Opponents: prof. Ing. Radim Halama, Ph.D.

Title: Calibration of Advanced Material Model for 3D Printing Materials using Optimization and Machine Learning Methods

Thesis version: 1

Student: Avinash Musiri Ramalingam Pillai Baskar

1. *Problematics of thesis*

   The thesis are focused on calibration of cyclic plasticity models by means of classic optimization techniques as well as machnine learning approaches. The problematics is really important for practise.

2. *Achieved results*

   First of all a traditional least square method is applied for calibration of Chaboche model with two backstress parts in order to describe cyclic plasticity of Stainless Steel 316L manufactured by SLM technology. Ratcheting with increasing rate chracteristic for materials with cyclic softening is described by superposition of the kinematic hardening model mentioned above with a nonlinear isotropic hardening rule. The second part of thesis is dealing with neural networks application. The developed approach with emphasis on monotonic loading is so general that can be used for any material revealing plastic strain.

3. *Originality of thesis*

   The thesis brings new methodology for calibration of plasticity models. It is a pity, that student focused just to monotonic loading, but the approach is applicable also in cyclic plasticity domain.

4. *Formal essentials of thesis*

   There are many typing errors and other faults, for example:
   page 2 - citation of references should be done in increasing order, not [1], [31]...
   page 3 - the title of chapter 2.1 - OVERVIEWOF
   page 10 - eq.(5): eps_p and alpha_i are tensors should be depicted in bold
   page 10 - eq.(6): DeltaEps_p is not tensor (it cannot be in bold), the equation is valid just for uniaxial loading
   page 12,13 - the equations (9) and (10) contains deviatoric parts of backstress alpha, but it is not mentioned in the text (a is not present in the list of symbols).
   page 13 - the equation (11) is wrong
   page 27 - eq.(13) - there should be eps_p instead of eps
   page 27 - tables 3-5: missing units for R_0,R_inf,SigY,C, b0, b1, b4
   page 27 - table 5: Results of R0 and C are swapped
   etc.

5. *Questions to student*

   Please, comment meaning of parameters R0 and C in the combined cyclic plasticity model in your thesis. Is it possible to have negative value of C?

6. *General revaluation of thesis*

   Thesis of Avinash Baskar could be written in better form than it was done. The reason is probably lack of time. It might be caused by difficult part of machine learning application, which is new for students of applied mechanics branch. As a conclusion, in my opinion, there is enough amount of work done and that is why I recommend this thesis for defence.

Overall classification: good

Ostrava, 06.08.2020   prof. Ing. Radim Halama, Ph.D.