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Objectives:

The main objective of the project consists in the development of material models at microscopic scale and their transfer to macroscopic scale by implementation in computer programmes for the simulation of sheet metal forming processes.

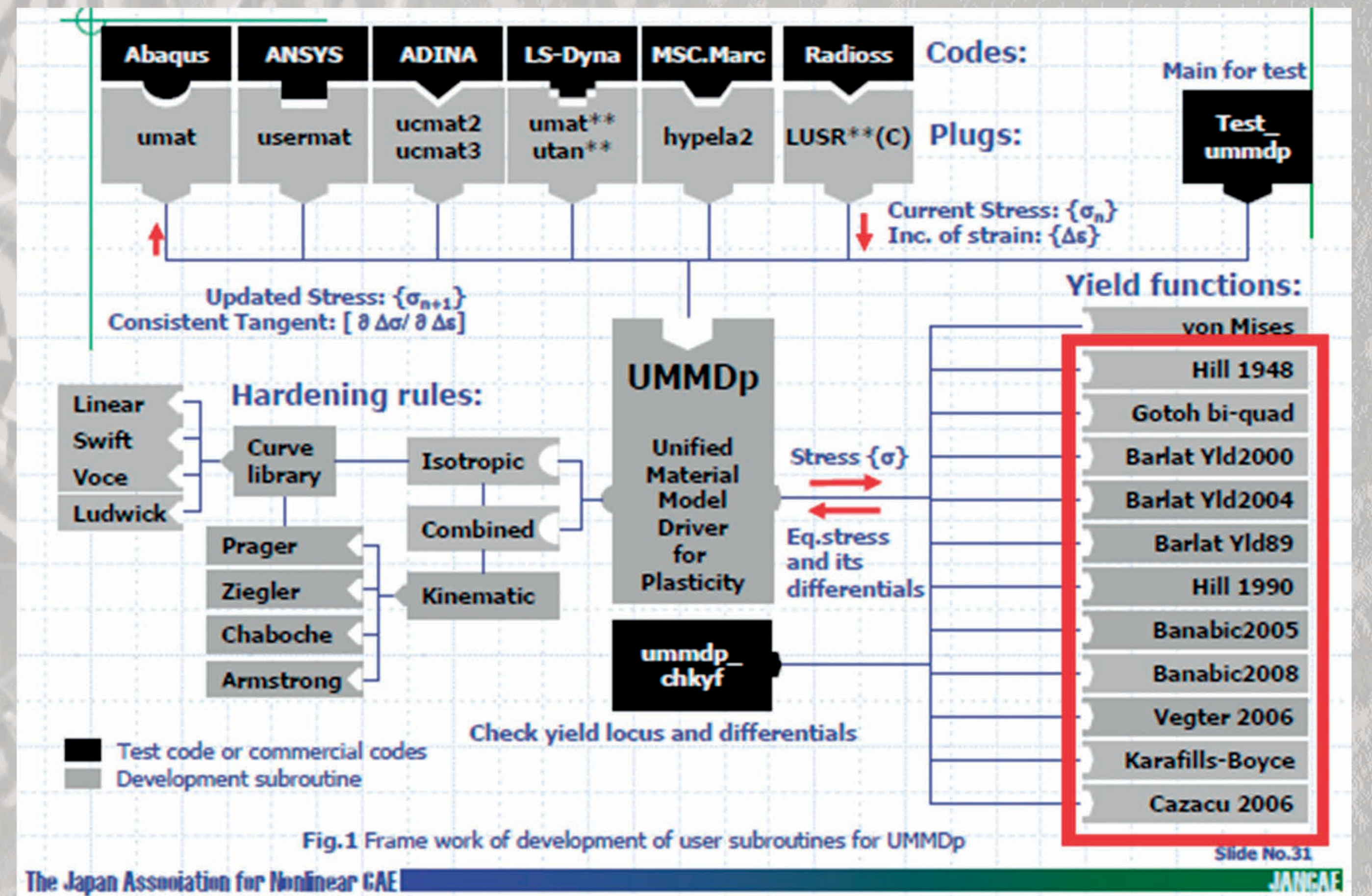


Fig.1 Frame work of development of user subroutines for UMMDp
The Japan Association for Nonlinear CAE (JANCAE)

The models Banabic 2005 and Banabic 2008 implemented in the UMMDp program by the Japan Association for Nonlinear CAE

Material modelling at Volvo cars

- The new Volvo XC90 is the first car where all forming simulations of in-house produced parts have been performed with the BANABIC 2005 material model and 9 parameters (4 stresses, 4 R-values and exponent M).
- This will be standard at Volvo Cars for all future car projects.
- All cold forming data is determined at Industrial Development Center (IDC) in Olofström.
- Hot forming tensile tests have been made at University of Erlangen.



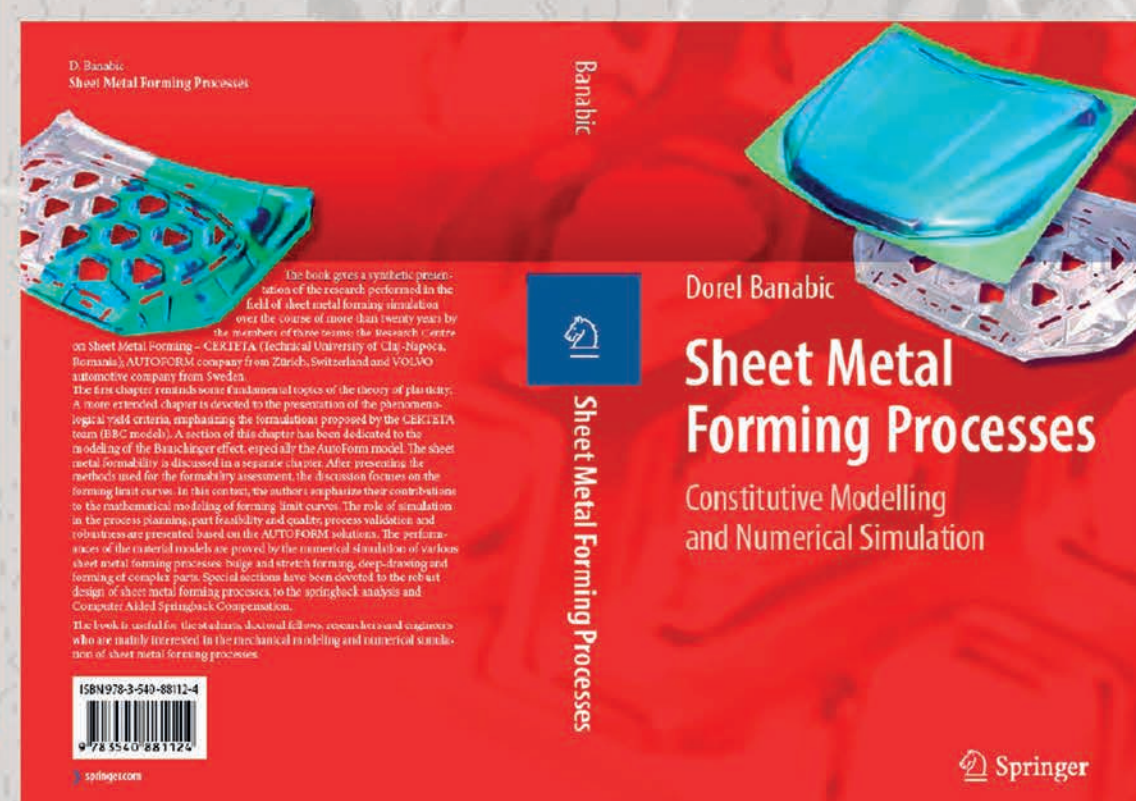
2014/10/1 Material characterisation, 81153 Stamping CAE & Die Development, Mats Sigvant, msigvan1

The material model Banabic 2005 will be standard at VOLVO cars for all future cars projects



The main results of the project FROM MICRO TO MACRO - CONTINUUM SCALE MODELING OF ADVANCED MATERIALS IN VIRTUAL FABRICATION are included in the book MULTISCALE MODELLING IN SHEET METAL FORMING

The book SHEET METAL FORMING PROCESSES has been translated in Chinese by SCIENCE PRESS Beijing



Achievements:

In order to achieve the purpose of the project four objectives have been defined. The first objective consists in the experimental characterization of the materials selected for testing at micro- and macro-level. By achieving this objective, a database referring to the plastic behaviour of the tested materials will be created. The second objective consists in the development of plasticity models at micro- and macro-level. By achieving this objective, the members of the consortium will have a set of realistic and robust plasticity models able to describe the anisotropic behaviour of materials. The third objective consists in the implementation of the previously developed models in computer programmes for the simulation of the sheet metal forming processes. By achieving this objective, the consortium will have a set of robust and efficient computer programmes for the numerical simulation of hydraulic bulging, deep-drawing of cylindrical parts and prediction of the forming limit curves. The last objective of the project consists in the experimental validation the simulation programmes previously elaborated. The achievement of the general purpose needs the cooperation between experts from Romania and abroad from interdisciplinary domains and having a rich expertise in modelling, numerical methods, experimental procedures, with a comprehensive understanding of the phenomena that occur at micro- and macroscopic scale. With this aim in view, an interdisciplinary and complementary consortium as concerns the scientific background and the laboratory equipment has been established.

The results of the collaboration between CERTETA research centre, AUTOFORM Switzerland) and VOLVO (Sweden) companies have been included in the book SHEET METAL FORMING PROCESSES

Application fields:

A set of simulation programmes having a high accuracy have been available for the use in industrial applications with the aim of obtaining a realistic and robust virtual prototype. The main results have been used by the AUTOFORM Company from Switzerland in the AutoForm commercial Finite Element program. AutoForm program is used by more 95% of the cars makers. VOLVO company use exclusive the CERTETA models in the design of the body of the new cars. The Japan Association for Nonlinear CAE (JANCAE) have implemented the materials models developed in CERTETA Centre in the program UMMDp, used by all the FE simulation commercial programs (ABAQUS, LS DYNA, MARC, RADIOSS, ADINA).