

B Sumanth Kumar

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Education

Doctor of Philosophy

Quest-lab

2020-2025

Department of Computational and Data science
Indian Institute of Science, India

Master of Technology

Computational and Experimental Mechanics

07/2018-05/2020

Department of Applied Mechanics, Indian Institute of Technology Madras, India

CGPA: 8.93/10

B.Tech and M.Tech in Mechanical Engineering

2012-2017

Jawaharlal Nehru Technological University Hyderabad College of Engineering Hyderabad, India

Percentage: 76.73

Projects

Finite inflation analysis of a dielectric toroidal membrane.

Dr. Ganesh Tamadapu, Department of Applied Mechanics, IIT-Madras, India

Software: MATLAB, MATHEMATICA

August 2019-May 2020

- In this work we studied the inflation of a hyperelastic dielectric toroidal membrane subjected to internal pressure and electric voltage applied across the membrane thickness.
- The membrane material was assumed to be a Mooney-Rivlin solid.
- The inflation problem was formulated as a variational problem for total potential energy comprising the membrane strain energy, internal energy of the gas and external work due to applied voltage.
- A two-point boundary value problem for the membrane was solved by constructing an optimization function.
- Optimization problem was then solved using Nelder-Meads search technique to find the equilibrium configuration of the membrane.
- Stability of symmetric inflation path of the membrane has been investigated by using perturbation techniques.

Analysis of Process Parameters of Parabolic Cups of Ni 201, Fabricated by Single Point incremental Sheet Forming Process Using Abaqus Software (Graduate Thesis)

Prof. A.ChennaKesava Reddy, Department of Mechanical Engineering, JNTUH, India

Software: ABAQUS

2016-2017

- Numerical simulation of single point incremental forming process (SPIF) for Ni-201 sheet material was carried out using finite element analysis software and Taguchi experimental techniques.
- Four process parameters each at three different levels had considered and to carry out the simulations in Abaqus, $L9$ Orthogonal Array was preferred.
- Reduction in thickness during SPIF process of the parabolic cups was estimated.
- Formability diagrams were drawn based on minor and major strains, and normalized major and minor stresses.
- The significant process parameters were identified using analysis of variance (ANOVA).

- It has been found that the maximum thinning ranges from 58% to 61% in the parabolic cups drawn from Ni 201 using SPIF

Publications

“FORMABILITY ANALYSIS OF PARABOLIC CUPS DRAWN FROM Ni 201 USING SINGLE POINT INCREMENTAL FORMING PROCESS”, International Journal of Engineering Sciences & Research Technology (IJESRT) volume 6, Issue 5 [May 2017] PP: 619-628

Internship

Studies on Numerical Simulation of Blast effect on a Plate (RCI, DRDO)

Mentor: Dr. Vijaybhaskar Narayanamurthy (Scientist-F, DRDO)

Software: ABAQUS, FORTRAN

- Studied various experimental and numerical techniques, that are used to study the response of blast loaded plates.
- Initial work was carried out to reproduce the results of the reference paper on Impacts by using Johnson-Cook material model and its damage criteria in ABAQUS (Modified Johnson-Cook material model and, Cockcroft and Latham damage criteria were considered in literature).
- As there were deviations in the results compared to the paper results, an attempt was made to simulate the phenomenon in ABAQUS by implementing the non-linear material model (Modified Johnson Cook) along with Cockcroft and Latham damage criteria for a plate by writing VUMAT subroutine in FORTRAN.

Course Projects

Dynamic Analysis of an Inverted Beam Pendulum Considering Higher Modes

Prof. Shaikh Faruque Ali, Department of Applied Mechanics, IIT-Madras, INDIA

Software: MATLAB

March-April 2019

- In this research, the effect of multiple modes was studied in the dynamics of inverted cantilever beam with tip mass subjected to base excitation.
- The cantilever beam had a tip mass and exhibits parametric bifurcation when the tip mass reach Euler buckling load.
- In this work, a function was proposed which represented higher modes of the linearized system.
- Equations of motion for the inverted beam pendulum had been developed from Lagrangian formulation and the mode shapes were approximated for this continuous system using Eigen function which satisfy the geometric boundary conditions of the system.
- The system, at low frequency of excitation showed linear motion about the equilibrium position. With increase in excitation, the system started showing geometrically large deformations around two stable equilibrium positions and it also showed Chaos at certain excitation frequencies. All these were explained through nonlinear phase portraits, bifurcation diagrams and frequency sweep analysis.

Conference Paper:

Dec-2019

This work was presented at International Congress on Computational Mechanics and Simulation **ICCMS-2019** held at IIT-Mandi, India.

Numerical analysis of fluid flow in a lid driven cavity

Dr. K Arul Prakash, Department of Applied Mechanics, IIT-Madras, India

Software: MATLAB

March-April 2019

- Stream-Vorticity formulation scheme was used. In this method governing equations and boundary conditions were redefined in terms of stream and vorticity functions of fluid flow.
- Finite Difference Method with explicit FTCS scheme was implemented in MATLAB to run the simulation in order to find the velocity distribution inside the lid driven cavity.

Experiences

Graduate Teaching Assistant

- Applied Mechanics Lab Jul-Nov 2019
 - Assisted Prof. A.Rajan in demonstrating experiment about photoelasticity, evaluation of reports, and grading in the course offered to students.
- Perturbation methods for Engineering Problems Jan-May 2020

Skills

Programming Languages: **C, Python**

Computational Software: **MATLAB, MATHEMATICA**

Libraries: **Tensorflow, Pytorch.**

Academic Achievements

- Secured **ALL INDIA RANK 2014** in Graduate Aptitude Test in Engineering (GATE-2018) out of 0.2 million aspirants.
- Passed my Bachelors in First Class with Distinction.
- Scored **92.83%** in Secondary School Certificate examination with **100%** marks in **Mathematics** subject.
- Scored **95.6%** in Intermediate Board Examination.

Extra Curricular Activities

IMMERSE: Worked as a writer for IMMERSE magazine (2018-2019) which is a research magazine of IIT MADRAS.