Irfan Habeeb C N

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Profile

Researcher with experimental and numerical knowledge and experience.
Enthusiastic about structural mechanics and materials.

Skills

- Materials and solid mechanics.
- Finite element analysis.
- Image processing.
- Programming in – Fortran, Python and Javascript.
- Software - Matlab, Mathematica, Abaqus, SolidWorks, AutoCAD, Pro-E and FEAPpv.

Experience

- **Researcher:** (*Technion-Israel Institute of Technology, Oct 2016 - Present*)

Doctoral degree focusing on brittle fracture at different loading conditions with applications in the concept '*Design to demise*' to reduce the threat of debris from spacecrafts. Effect of holes on the dynamic fracture is studied using experiments and numerical methods.

- **Internship:** (***Airbus*** *Defense and Space S.A.U, Madrid, July-Sept 2019*)

Numerical model development and implementation of bolt-cutter employed in the stage separation unit of the satellite launcher. Finite element model was developed and implemented in Abaqus software to simulate the system.

- **Exchange program**: (*LEM3 - University of Lorraine, France, July-Sept 2018*)

Worked with Dr. C. Dascalu on implementation of the damage model in FEA and calibration using experimental data. The validity of the damage model is examined using the experimental data obtained from previously conducted tests.

- **Research assistant**: (*Indian Institute of Technology Madras, India, Apr-Sept 2016*)

Worked with Dr. Asokan Thondiyathu on the control system development of robotic fish.

- **Software developer**: (*Moonraft Innovation Labs, Bangalore, Sept 2015 – Apr 2016*)

Front end web development and android app development.

- **Aeroclub coordinator**: (*Indian Institute of Technology Madras, India, 2010-2015*)

Built RC controlled aircraft such as fixed wing aircraft, quadrotor and ornithopter (mechanical bird) through Aeroclub and conducted workshops to teach building aircrafts to nearly 1000 students from several universities in India.

Education

- Bachelors in Aerospace Engineering, IIT Madras, India. (*2010-2014*)
- Masters in Aerospace Engineering, IIT Madras, India. (*2014-2015*)
- PhD in Mechanical Engineering, Technion-IIT, Israel. (*2016-Present*)

Achievements

- **Marie Skłodowska-Curie ITN-ETN** scholarship from Project ITN OUTCOME organized by European Union's Horizon 2020 research and innovation program.
- All India Rank 89 in Graduate Aptitude Test in Engineering-2014 (top 0.5%).

Projects

- Fracture of brittle materials: Role of holes in the brittle fracture using experimentation and numerical methods. Dynamic experiments are conducted at different loading rates and high speed photography is employed to capture the instances during the fracture. Data is extracted using Digital Image Correlation and FEA is used for numerical analysis. The project has application in the concept *'Design to Demise*' to reduce the risk debris from spacecrafts.
- Static and dynamic fracture of 3D printed polymers: Influence of a soft interface on fracture under different loading conditions are studied using experiments on 3D printed specimens containing Verowhiteplus and Tangoplus.
- Effect of strain rate on forming using GTN damage model: Effect of strain rate, temperature, and friction on ductile forming by engaging the numerical model of Nakajima test. GTN damage model is implemented in the finite element frame to develop the numerical model.
- Yield surface of Gyroid structure (metamaterial): Development of yield surface of Gyroid and analysing the mechanical properties using finite element method.
- Dynamic brittle fracture of additively manufactured SiC: Dynamic brittle fracture characteristics of SiC are studied using Highspeed photography.

Developed tools

- **GTN damage model**: Implemented in a VUMAT&UMAT subroutine for Abaqus FEA analysis with strain rate, temperature, shear stress dependency.
- **Phase Field damage Model (PFM)**: UEL (User Element subroutine for Abaqus) to implement the continuous damage model developed from the PFM for implicit system (developed from the work of MA Msekh) in the finite element framework.
- **Matlab codes**: Assessment of fracture characteristics (J-Integral, Stress Intensity Factor, crack path and crack propagation velocity) from fracture images by means of the DIC and additional image processing tools.
- **Abaqus subroutines (VUMAT&UMAT)** : For Cohesive Zone Model, Viscoelastic material model(Kelvin-Voigt) and Johnson-Cook material model were developed for FEA.
  The tools are public in https://github.com/irfancn.

Research

- **Doctoral thesis**: Crack-flaw interactions under dynamic brittle fracture.

  Experiments and numerical analysis of the dynamic fracture of brittle material to examine the influence of pre-existing flaws on fracture. High-speed photography and Digital Image Correlation are employed for the data extraction.

- **Masters thesis**: Strength distribution of planar local-load sharing bundles.

  Numerical analysis and modeling of the failure patterns in uniaxial fibrous composite under axial load to predict the macroscopic composite characteristics.

Research articles

- C. N. Irfan Habeeb and S. Mahesh. "*Strength distribution of planar local load sharing bundles*". Physical Review E, 2015. 92(2):022125.
- C. N. Irfan Habeeb and Shmuel Osovski. "*Experimental and numerical study of the interaction between dynamically loaded cracks and pre-existing flaws in edge loaded PMMA specimens*". (submitted - 10.31224/osf.io/4v762).
- "*Effect of strain rate on fracture using 3D printed soft materials*" - C. N. Irfan Habeeb, S. Osovski, V. Slesarenko and S. Rudykh. (**in Preparation**).
- *"Effect of strain rate on metal forming using GTN damage model"*- C. N. Irfan Habeeb, S. Osovski (**in preparation**).

Scientific events

- **Conference & symposium**:
  - Irfan Habeeb and S. Mahesh. "*Reliability of fibre bundles*". Talk at PRAVARTANA conference, held at Indian Institute of Technology, Kanpur (March 2015).
  - 22nd European Conference on Fracture (ECF22), Serbia on the topic, "*Crack-flaw interactions in brittle materials under brittle fracture*" **(**Aug 2018).
  - Symposium "*Damage and Failure Mechanics: from Microstructure to Macroscopic Response*" held within the framework of the EMI 2016 International Conference, Oct 25-28, Lorraine, France.
  - *Damage and failure of engineering materials under extreme loading conditions* (605), May 21-24, 2019, Madrid, Spain.
- **Industrial workshop**:
  - "*Extreme structural mechanics in Aerospace applications*", June 22-23, 2017, Getafe, Spain.
  - "*Extreme Structural Mechanics in defense applications*" held at Technion – IIT, Feb 6, 2018, Haifa, Israel.
- **Summer school**:
  - On fracture mechanics held at European Conference on Fracture (ECF 22), Aug 25-26, 2018, Belgrade.

Personal vitae

Date of birth	31 October 1991
Sex	Male
Nationality	Indian
Marital status	Married

References

On request.

Declaration

I hereby declare that all the information given above is true to the best of my knowledge.