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Education

2018–2021 **Bachelor of Science in Electrical Engineering, Specialization in Electromagnetics**.
Amirkabir University of Technology, Tehran, Iran
– GPA : 3.88/4 (18.20/20)

2016–2021 **Bachelor of Science in Aerospace Engineering, Specialization in Aerodynamics**.
Amirkabir University of Technology, Tehran, Iran
– GPA : 3.89/4 (18.10/20)

2012–2016 **Diploma of Math and Physics in Theoretical Branch**, Tehran, Iran.

Research Experiences

2021–Present **Electrodynamic Analysis of Dielectric Barrier Discharge Actuators Based on The Properties of Low-Frequency Plasmons**, for completing the degree of B.Sc. in Electrical Engineering, Electromagnetics

- Conceptualized the dielectric barrier discharge actuators as a **two-layered medium**.
- Implemented the properties of **low-frequency plasmons** based on the **Lorentz Model** to simulate the plasma layer of the actuator's structure.
- Numerically discretized the integral equation relating the electric potential to the charge density on the actuator's electrodes based on the **Method of Moments**.
- Determined the closed-form spatial Green's Function based on the **Complex Images Method for electrostatic fields** and the **Generalized pencil-of-function** numerical algorithm.
- Implemented Finite Difference Approximation to post-process the fields for validation purposes.

2020–2021 **Computational Modelling of Dielectric Barrier Discharge Actuators Based on The Properties of Low Frequency Plasmons**, for completing the degree of B.Sc. in Aerospace Engineering, Aerodynamics

- Studied the dominant phenomenological models for the simulation of dielectric barrier discharge actuators.
- Developed a computational model by implementing the properties of **low-frequency plasmons** based on the **Lorentz Model** to incorporate the plasma generation.
- Formulated the energy transfer from the plasmonic region to the ambient flow in terms of body force components incorporated into the Navier Stokes equations as the source terms.
- Experimented the plasma actuation with the metric of maximum induced velocity proportional to the total body force and validated the performance of the presented model.

Selected Academic Projects

Numerical

2020-2021 **Derivation of The Closed-Form Electrostatic Green's Function for The Structure of a Dielectric Barrier Discharge Actuator | MATLAB, Mathematica**

- Implemented the numerical method for evaluating the highly oscillatory Bessel transform based on rewriting the Bessel function in terms of the **WhittakerW function**.
- Rewrote the Bessel transform as the sum of two integrals and then transformed one into the Fourier type, and computed by the **generalized Gauss–Laguerre quadrature and logarithmic Gauss–Laguerre quadrature**; computed the other integral based on the evaluation of special functions.

2020-2021 **Electrostatic Field Computation of a Dielectric Barrier Discharge Actuator | MATLAB, Mathematica**

- Polished and Programmed the method of analyzing arbitrarily oriented microstrip transmission lines in arbitrarily-shaped dielectric media
- Computed the electrostatic fields and the capacitance matrix for the structure of a dielectric barrier discharge actuator based on the programmed method.

2019-2020 **Three Dimensional Analysis of the Shock Patterns and Flow Interactions With Aerodynamic Shapes | COMSOL Multiphysics**

- Simulated the supersonic flow over two cone models with different shape angles and a spherical model in the 3D Domain to explore the flow field before and after the shock waves
- Collaborated with a team of 5 to conduct a visualization experiment using the **Schlieren photography** method to validate the numerical simulation results.

2019-2020 **Numerical Analysis of The Flow over an RAE Airfoil in Transonic Flow Regime | Ansys Meshing, Ansys Fluent**

- Simulated the flow over the RAE2822 airfoil in the 2D domain within the transonic regime with the domain and mesh study included.
- Accurately captured the delta shock in terms of the location and the power.
- Presented a comparison on three RANS methods, the k-omega SST, Spalart Allmaras, and the Transition SST. Found the latter as the most accurate with the most computational cost.

2018-2019 **Two Dimensional Heat Transfer Analysis of a Laptop Chip-set | MATLAB**

- Numerically computed the temperature distribution within a laptop chip-set with the battery as a heat source and boundary conditions of types Dirichlet and Neumann.
- Analyzed the heat transfer first for a steady case and then extended the study to transient analysis.

Experimental

2020-2021 **Flow Visualisation Experiment For The Investigation of The Effects of Vortex Generators Over an Epler airfoil (E361) | Aerodynamics Research Laboratory**

- Partnered as a research assistant intern with a Ph.D. student in the low-speed, open-return wind tunnel.
- Conducted the experiment in two steps: First, visualized the flow over an E361 airfoil to track the occurrence of the separation bubble at different angles of attack and find out how its place varies to the leading edge. Second, visualized the flow to investigate the effects of vortex generators on the flow and the existence of the separation bubble.
- **My duties:** 1.Prepared the non-Newtonian and fluorescent visualization paint, 2.Set the wind tunnel and the test setup for each case, 3.Recorded and Documented the events during each test case.

2019-2020 **Investigating of The Effects of Winglets on The Aerodynamic Performance of a Wing With a NACA 64-412 Airfoil | Aerodynamics Research Laboratory**

- Collaborated with a team of 4 as the leader to investigate the aerodynamic performance a NACA 64-412 wing, with and without two types of winglets.
- Measured Lift, Drag, and Moment vectors as the performance metrics in the low-speed, open-return wind tunnel
- **My duties:** 1.Managed to have the test setup prepared for each test case. 2. Managed to document the measured data during each test and have the data to be preprocessed. 3. Presented conclusion of analyses and submitted a report for the Experimental Aerodynamics Course.

Research Interests

Scientific Computation

Numerical Algorithm Development

Computational Electromagnetics

Numerical Modeling of Hydrodynamical Systems

Machine Learning and Data Analysis in Scientific Computing

Computer Skills

Programming MATLAB, Python (NumPy, Pandas, Matplotlib| SciPy| AstroPy, GammaPy| ScaPy), Mathematica (xAct), C++, Julia, VHDL, (Familiar with PSO and Genetic Algorithm)

Computation Comsol Multiphysics, Ansys Fluent, Open Foam, CST Studio Suite

General Microsoft Office Collection, Git, LaTeX

Academic Experiences

2020-Present **Undergraduate Research Assistant**
Compressible Flow Laboratory, Amirkabir University of Technology, Tehran, Iran

2018-2020 **Research Intern**
Aerodynamics Research Laboratory, Amirkabir University of Technology, Tehran, Iran

2020-2021 **Teaching Assistant**
Engineering Dynamics, Amirkabir University of Technology, Tehran, Iran

Additional Experiences

Sep 2021 Fifth IPM Advanced School on Computing: Artificial Intelligence, IPM Institute for Research in Fundamental Sciences

Jun 2021 ESCAPE Summer School Participant on Data Science for Astronomy, Astroparticle and Particle Physics, Laboratoire d'Annecy de Physique des Particules, (LAPP - CNRS-IN2P3 - USMB)

Honors and Certificates

2020-2021 Direct Entry Elected for Masters in Aerospace Engineering since ranked among the top three students of the same entry year by Sharif University of Technology, (3rd of 120 entries).

2019-2020 Direct Entry Elected for Masters in Aerospace Engineering as an elite student by Amirkabir University of Technology.

2018-2019 Selected as an elite student, Allowed to take on a second major, Aerospace Engineering Department, Amirkabir University of Technology.

Publication

D.Soltani Tehrani, G.R.Abdizadeh, S.Noori, "Numerical modeling of dielectric barrier discharge actuators based on the properties of low-frequency plasmons", Scientific Reports Journal (to be submitted).

D.Soltani Tehrani, Gh.Esmaeili, S.Noori, M.Eetesami, "Numerical Study Of Shock Wave Patterns And Interactions With Aerodynamic Models Using Adaptive Grids", (in preparation).

Relevant Courses

Data Science Math Skills | **Coursera**

Julia Scientific Programming | **Coursera**

Computational Physics, Graduate Course, Audited | **Uof Tehran**

Numerical Analysis | 19.3/20

Introduction to Computational Fluid Dynamics | 19.8/20

Voluntary Experience

2018-2019 Aerodynamics Specialist, Main member of the team for CANSAT competition 2019, Amirkabir University of Technology, Tehran, Iran

2017-2018 Competition Strategist, National Aerup Competition, Amirkabir University of Technology, Tehran, Iran

Language Skills

English: Excellent command in spoken and written English
- Toefl IBT: Tested on 10/10/2020, 107/120
  Reading: 24, Listening: 28, Speaking: 29, Writing: 26.
- GRE General Test: Scheduled for Nov 10th.

Persian: Native