DIVYA SHAH, PH.D.

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SUMMARY

Five years of hands-on research & development experience in design, optimization, modeling, simulation, rapid prototyping, testing and deployment of mechatronic subsystems for humanoid robots along with effective communication skills through documentations, collaborations and conferences. (Personal Webpage)

SKILLS

Analytical: System modeling, Control theory, Rigid body dynamics
Design: **PTC Creo Parametric**, **CATIA**, DELMIA, SolidWorks, AutoCAD
Simulation: **Simulink**, **Simmechanics**, ANSYS, ADAMS
Programming **MATLAB**, **Python**, Arduino, RaspberryPi, Yarp, ROS, Docker, C++
Documenting: **Latex**, **MS Office**, Inkscape, Markdown

EDUCATION

PhD in Bioengineering and Robotics – Advanced and Humanoid Robots
University of Genoa, Italy. Nov. 2017 – Jun. 2021

EMARO+ Erasmus+ European Masters on Advanced Robotics

- **Master in Robotics Engineering** (Avg. 92.41%)
  University of Genoa, Italy. Sep. 2015 – Aug. 2016
- **Master of Science in Control and Robotics** (Avg. 86.70%)
  École Centrale de Nantes, France. Sep. 2016 – Aug. 2017

Bachelor of Technology in Mechanical Engineering (GPA: 8.18/10)
Sardar Patel College of Engineering, University of Mumbai, India. Jun. 2011 – May 2015

CORE EXPERIENCE

Postdoc – *Design, testing & development of joint modules for ergoCub*, *iCubTech Facility, Italian Institute of Tecnology (IIT), Genoa, Italy.* Jul. 2021 – Present

- Designed the mechanical assembly using PTC Creo Parametric for a compact & high power humanoid joint module consisting of motor, speed reducer, encoders & electronics.
- Collaborated on M-CAD and E-CAD with other teams within an agile framework for designing and integrating electronic boards within joint modules.
- Contributed in creating a digital twin for simulations using Simulink.
- Defined and performed experiments involving the use of Yarp for characterizing motor and joint parameters.
- Analyzed the experimental results using MATLAB.
- Resulted in compact and high power joint modules to be deployed on the forthcoming versions of ergoCub and iCub humanoids.

Ph.D. Fellow – *Design, simulation & analysis of dexterous wrist mechanism for iCub*, *iCubTech Facility, Italian Institute of Technology (IIT), Genoa, Italy.* Nov. 2017 – Jun. 2021

- Researched state-of-the-art wrist mechanisms for humanoids.
- Designed and simulated several kinematic architectures using PTC Creo Parametric for behaviour comparison [3].

- Proposed a 2 degree of freedom parallel orientational mechanism modeled using rigid body closed-loop kinematics.
- Fabricated & assembled prototypes with additive manufacturing techniques.
- Defined and performed experiments involving use of Python with RaspberryPi to verify the range of motion and isotropy of the mechanism.
- Resulted in a promising candidate mechanism for a dextrous wrist producing hemispherical and singularity free motions [1].

Visiting Researcher — *Concept design & prototyping of forearm mechanism*, *IRIM Lab, Korea University of Technology and Education (KOREATECH), Cheonan, South Korea.* Jul. 2019 - Oct. 2019

- Researched state-of-the-art tendon driven mechanisms for humanoids.
- Conceptualized a novel tendon routing mechanism for forearm pronation supination and designed it using PTC Creo Parametric.
- Performed experiments and analysed data using Python.
- Resulted in a rotational mechanism allowing full circle rotation and decoupled routing for 4 tendons simultaneously [2].

Graduate Thesis Intern — *Simulation & optimization for productivity of fiber placement process*, *Centre Technique des Industries Mécaniques (CETIM), Nantes, France.* Feb. 2017 - Aug. 2017

- Designed a mechanism model of the industrial workcell and simulated the fiber placement process using DS CATIA and DELMIA.
- Collaborated on optimization of robot trajectories for increasing productivity using MATLAB.
- Resulted in a framework that produces optimal trajectories to reduce overall processing times by one-third [4].

ADDITIONAL EXPERIENCE

- **Leadership and Project Management** 2012-2014
  Lead a team of students and participated at the national level robotics competition (ABU ROBOCON India) at undergrad level.
- **Public Outreach** 2017-Present
  Presented scientific articles and posters for various conferences and workshops.

PUBLICATIONS

[1] **D. Shah**, *"Design of Wrist and Forearm Mechanisms for Enhanced Humanoid Dexterity"*; **Doctoral Thesis**. (DOI) Jun. 2021

[2] **D. Shah**, *et al.*, *"Constant Length Tendon Routing Mechanism through Axial Joint"*; **IEEE/ASME Conference AIM**. (DOI) Jul. 2020

[3] **D. Shah**, *et al.*, *"A Comparison of Robot Wrist Implementations for the iCub Humanoid"*; **MDPI Robotics Journal**. (DOI) Feb. 2019

[4] **D. Shah**, *et al.*, *"Computer-Aided Design & Optimization of a Redundant Robotic System for Automated Fiber Placement Process"*; **AIP Conference ICOME**. (DOI) Oct. 2017

For a full list of publications, click here.

LANGUAGES

Fluent: **English** | Intermediate: **Italian** | Beginner: **French** | Native: Gujarati, Hindi

EXTRA-CURRICULARS

Dance: Learning and practicing swing dancing since late 2018.