Mohamed Sadiq IKBAL

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Research Interests

- Motion planning and control for robotic manipulators with objective and subjective constraints.
- Virtual reality system development for experiments with a human in the loop.

Education

- **Ph.D. Mechanics, Measurement and Robotics** — **Ph.D.***
  PMAR Robotics Group, University of Genoa, Genoa, Italy — *Nov, 2017 – Nov,2020*
  Supervisor: Prof. Matteo Zoppi
- **European Master on Advanced Robotics** — **Erasmus+ double degree masters**
  University of Genoa, Genoa Italy (2016–2017) — *2015–2017*
  Ecole Centrale de Nantes, Nantes France (2015–2016)
- **B.Tech Mechanical Engineering** — **Bachelors**
  Sri Manakula Vinayagar college of engineering, Puducherry India — *2010–2014*

* Defense scheduled for May 2021.

Work Experience

- **University of Genoa** — **Genoa, Italy**
  Research Assistant — *December 2020–Present*
  After submitting my Ph.D. thesis in December 2020, I am currently working on a research assistant contract with the University of Genoa to continue my research on effective parametric reduction for motion cueing algorithms for car driving motion simulator. This research is part of the Regione Liguria research grant (RLOF18ASSRIC/85/1) for "Virtual reality to increase awareness of driving risk".

- **Tata Consultancy Services** — **Chennai, India**
  Assistant System Engineer — *September 2014–June 2015*
  I received 3 months of intensive training in Java-based application development. Following the training, I played an active role in the support and maintenance of the Java-based applications and SQL databases for the supply chain management team of The Home Depot, USA.

Research Projects

- **Ph.D. Thesis Nov, 2017 - Nov, 2020:**
  'Motion Generation and Planning System for a Virtual Reality Motion Simulator: Development, Integration, and Analysis'
  The main objective of the thesis is to develop a motion generation and planning system for a virtual reality-based motion simulator. The simulator is constituted by a bespoke hybrid parallel robotic manipulator with an RSS configuration. The primary contribution is the algorithmic design, implementation, and analysis of a various motion cueing algorithm (MCA) for effectively generating motion and visual signals that enhance the user's immersion in the simulator. Additional contributions are related to experimental and

user evaluations of the system, motion compensation, and a system for motion tuning of MCA parameters. The thesis was funded by Singular perception s.r.l.

- **Masters Thesis Jan, 2017-Aug, 2017 :**
  'Generation of motion of a motion simulator for virtual reality experiences from real (measured) linear and rotational accelerations.'

  The classical motion cueing algorithm for the motion simulator was developed as part of my master thesis. Matlab and Simulink were used to develop and test the initial implementation. The final implementation was accomplished in C++ on a custom microcontroller. Singular perception s.r.l. funded the thesis.

- **1st year Master Project (2016):**
  'Determination of Interference Free Orientation Workspace for Cable Driven Parallel Robots.'

  In this work, an algorithm was developed in Matlab for determining the feasible orientation workspace in all axis for any cable driven parallel robot (CDPR).
  Presentation video: `https://youtu.be/6f9w3TDrNEU`

- **Final Year Bachelor Project (2013-2014):**
  'Design and Fabrication of Pomegranate Aril (pulp) Extractor.'

  The scope of the project was to design a system that can extract the arils (seeds) from the pomegranate fruit. The main focus was given to making the product commercially viable.
  Presentation video: `https://youtu.be/47D7fvRcHZM`

Publications

- **M.S. Ikbal**, V. Ramadoss and M. Zoppi, "Dynamic Pose Tracking Performance Evaluation of HTC Vive Virtual Reality System," in IEEE Access, vol. 9, pp. 3798-3815, 2021.
- A. Sharma, **M. S. Ikbal** and M. Zoppi, "Acausal Approach to Motion Cueing," in IEEE Robotics and Automation Letters, vol. 4, no. 2, pp. 1013-1020, April 2019.
- Sharma, A., **Ikbal, M.S.**, Cuong, D.T. et al. A sliding mode-based approach to motion cueing for virtual reality gaming using motion simulators. Virtual Reality 25, 95–106 (2021).
- Ramadoss V., **Ikbal M.S.**, Zlatanov D., Zoppi M. (2020) Design of Serial Link Structure-Parallel Wire System for Virtual Reality Rehabilitation and Assessment. In: Zeghloul S., Laribi M., Sandoval Arevalo J. (eds) Advances in Service and Industrial Robotics. RAAD 2020. Mechanisms and Machine Science, vol 84. Springer, Cham.
- V. Ramadoss, K. Sagar, **M.S. Ikbal**, D. Zlatanov and M. Zoppi, "Modeling and Stiffness Evaluation Of Tendon-Driven Robot For Collaborative Human-Robot Interaction," in IEEE International Conference on Intelligence and Safety for Robotics, 2021 (*Accepted for publication*)
- Immanvel, A., M. Manikandan, **I. Mohamed Sadiq**, R. Sridhar, and K. Velmurugan. "Design and Fabrication of Pomegranate Aril (PULP) Extractor." International Journal of Innovative Research in Science, Engineering and Technology 3 (2014): 1218-1221.

Skills

- **Programming:** C++, Python, Matlab.
- **Virtual reality/ game engine:** Unreal Engine,
- **Robot programming:** ROS, PDL2 and WinC4G for Comau.
- **Motion capture system:** Motive (Optitrack), Vive trackers.
- **Other softwares:** Simulink, Maple, Blender(basics)
- **CAD:** PTC Creo, CATIA.
- **Languages:** English (IELTS:7.0), French (A2), Italian (A1), Tamil (Mother tongue).

Awards and Achievements

- Awarded consortium scholarship during my Masters in EMARO (European Masters in Advance Robotics).
- Successfully completed my bachelor degree with high honors and was awarded with a gold medal.
- Won Best Innovation Award for my undergraduate project at TECHFLUENCE14 conducted by Confederation of Indian Industries(CII) at Sathybhama University on 7th March 2014
- Awarded the best project of the year 2014 by the Chairman and Principal of my undergraduate university.

Doctoral Thesis Video Supplementary

- Dynamic pose tracking performance of HTC Vive lighthouse tracking system using an industrial serial robot
  `https://youtu.be/_PXVfkDHIGw`
- SP7 flight simulator - Pilot Free Flight - MCA
  `https://youtu.be/HsL4DpKzB2M`
- SP7 flight simulator - Subjective evaluation of MCA - Experiment run through
  `https://youtu.be/CmOhWla3blo`
- SP7 Motion Simulator video presentation ACA and MCA
  `https://youtu.be/BHR2o6rgFPg`
- DT implementation of motion cueing algorithm for real time applications
  `https://youtu.be/xWKiMC3CiSQ`
- Experiment with SP7 flight simulator- Pilot 1 - MCA - ICRA Submission (1/4)
  `https://youtu.be/dg0VR5NCee8`
- Experiment with SP7 flight simulator- Pilot 1 - ACA - ICRA Submission (2/4)
  `https://youtu.be/PwQWUqqrfTY`
- Experiment with SP7 flight simulator- Pilot 2 - MCA - ICRA Submission (3/4)
  `https://youtu.be/GvnKVY8Jgkk`
- Experiment with SP7 flight simulator- Pilot 2 - ACA - ICRA Submission (4/4)
  `https://youtu.be/yMPb1553K5M`