

# Muhammad Usman Khalid

ROBOTICS - CONTROL SYSTEMS - ELECTRONICS ENGINEER



## Professional Summary

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Diligent engineer with over a decade of experience designing, developing, and maintaining embedded, automation, PLC, and control systems. I have a consistent track record of completing various research and development projects from the concept and details of the design through to implementation.

## Work Experience

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**Organization:** Stingray Technologies Pvt. Ltd.

Dec 2016 – 2022

**Designation:** Manager

### Key Responsibilities:

- Worked as a Project Manager. Leading a team comprising eleven engineers & six technicians.
- I was responsible for the complete project i.e. design, procurement, tasking, documentation, prototype development & testing, development of final system, installation of final system & carrying out trials.
- I've spearheaded several notable projects. As a System Integrator for Corvette Class Ships, I adeptly coordinated the interfacing and integration of onboard suites, ensuring seamless functionality across 16 systems. My expertise extends to projects such as the Pilotage Panel for Underwater Vehicles, where I implemented PID control for precise navigation, and the development of the Ship Data Distribution Unit for seamless sensor data integration. Additionally, I led the functional replacement of the propulsion control panel in underwater vehicles.

### Projects:

- System Integrator  
Interfacing and integration of the components of onboard suites, including sensors, systems, and navigation equipment (16 Systems) on corvette class ships. Collaborated with cross-functional teams to ensure seamless execution of the project. The project involved working on various Embedded PCs, Siemens PLC, multi-layer switches, and embedded interface boards.
- Pilotage Panel for underwater vehicles  
Interfacing of Gyro, Rudder, Bow–Stern planes, and Log sensor using PLC (ABB AC500) and DCS (ABB Freelance). PID control was implemented to achieve the desired setpoints of depth and heading. PCBs were developed to interface with existing interface protocols.
- Ship Data Distribution Unit  
Design and development of sensor data integration, distribution, and GPS clock synchronization system for onboard ship equipment.
- Propulsion control panel for underwater vehicles  
Functional replacement of the monitoring panel in the propulsion system using a PLC (ABB AC500).
- Depth Display System for underwater vehicles  
Analog synchronizer/resolver-based retro system replacement with a customized circuit where PLC (ABB AC500) was used as the main controller along with an HMI (Weintek) interface.

### Freelance Work:

Aug 2016 – 2021

### Projects:

- Design of a Graphical User Interface monitoring part assembly for Kia Motors  
C# with Windows Forms GUI Framework used to design an interface for monitoring parts being assembled with different components representing different parts and their status on the assembly line.
- Wireless Sensor Network solution for Feroze Mills  
Long Range (LoRa) Wireless ISM band wireless network interfaced with liquid level and pump flow rate sensors for tank level monitoring and control of pumps in the control room.
- PLC based Live-monitoring system of skewing machines with SCADA integration at Gul Ahmed  
PLC (FATEK) based control room monitoring solution for machines distributed on four floors. LEDs with HMI controllers (Weintek) installed on each floor as well as a control room for monitoring and integration with the SCADA system.
- Electrical wiring distribution testing and schematic design for Supreme Court Karachi  
This job required complete schematic design for electrical distribution, checks for bad wiring and faulty electrical distribution panels along with required replacements for Supreme Court Karachi.

**Organization:** Stingray Technologies Pvt. Ltd.

Jul 2012 – Nov 2016

**Designation:** Assistant Manager

### Key Responsibilities:

- Designing, development, installation & maintenance of embedded & PLC based systems.
- Preparation of acceptance procedures for installation, testing & commissioning.
- Formulate project documentation.

## Projects:

- Depth Indication & Measuring System (Immersion meter) used in underwater vehicles  
PLC (FATEK FBs Series)/ HMI (Weintek) based system interface with pressure transmitters. Developed for depth measurement and indication of depth in underwater vehicles.
- Steering Station Control System for Surface Ships  
Designing a microcontroller-based system to maneuver the position of electro-hydraulic Servo valves.
- Video Data Logging System of Surface Ships  
The system was designed and developed for maintaining the video database of the Ships multifunction console.
- Floating Sensor real-time water flow rate and salinity readings on GSM  
A microcontroller-based floating system that can be deployed at any selected location and is capable of providing real-time information on salinity and water flow.

**Organization:** Airah Engineering

August 2010 – Jun 2012

**Designation:** Project Engineer

### Key Responsibilities:

- Responsible for complete installation and commissioning of automation projects at a given period.
- Managing project budgets and keeping costs down.
- Overseeing the maintenance of projects after completion.
- Producing test procedures and reports.
- Carrying out effective client liaison for all projects undertaken.
- Liaising with customers regularly to ensure the successful design and implementation of projects to agreed budgets and time frames.

## Education

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**PhD in Robotics and Mechatronics**

University of Genova, Italy

2022-2024

(In Progress)

**MS in Control Engineering**

CGPA 3.55/4.00

National University of Sciences and Technology (NUST),  
Pakistan Navy Engineering College (PNEC), Karachi

2010-2013

**BS in Electronics Engineering**

CGPA: 3.37/4.00

Sir Syed University of Engineering & Technology (SSUET), Karachi

2006-2010

## Research Theme (PhD)

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The research aims at the development, sensorization, actuation, and control of the Universal Industrial Gripper. This collaborative effort with Stellantis-CRF is oriented towards optimizing grasping capabilities for various tasks within their industrial powerline assembly and warehouses. This project spans multiple disciplines, requiring expertise in actuation utilizing LabView and Python, sensor integration facilitated by Computer Vision, and GUI development through MATLAB.

## Thesis (MS)

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Discrete-time linear Model Predictive Control (MPC) was used to control nonlinear SISO and MIMO-coupled tanks systems. Three MPC approaches were used, a basic MPC scheme based on Generalized Predictive Control (GPC), a modified form of the basic MPC approach, and MPC based on Laguerre functions. Constraints were included in the controller design process.

## Final Year Project (BS)

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Designing of Low-frequency RFID reader with Access Management System. Microcontroller-based system for security and access control using low-frequency RFID (Radio-Frequency Identification) tags. Implemented in Sir Syed University of Engineering & Technology, Karachi.

## Research Publications

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1. M.U.Khalid, M. Jilich, M. Frascio, B.Levesque, A.Zanella and M. Zoppi *"Design and Development of a Novel Universal Gripper having Rigid Mechanics with Self-Adaptable Fingers for Industrial Applications"* Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science. (Submitted Dec 2023)
2. M. U. Khalid, M. Ahsan, O. Kamal, and U. Najeeb, *"Modeling and Trajectory Tracking of Remotely Operated Underwater Vehicle using Higher Order Sliding Mode Control,"* 2019 16th International Bhurban Conference on Applied Sciences and Technology (IBCAST), Islamabad, Pakistan, 2019, pp. 855-860
3. M. U. Khalid, M. Ahsan, O. Kamal, *"Stabilization of an Inertia Wheel Inverted Pendulum using Model Based Predictive Control"*, The 14th IEEE International Bhurban Conference on Applied Sciences and Technology (IBCAST 2017), 10th -14th January 2017, Islamabad, Pakistan.
4. M. U. Khalid, M. Ahsan, *"Liquid Level Control of Nonlinear Coupled Tanks System using Fuzzy Logic Control"*, The 11<sup>th</sup> IEEE International Bhurban Conference on Applied Sciences and Technology (IBCAST 2014), 14<sup>th</sup> -18<sup>th</sup> January 2014, Islamabad, Pakistan.
5. M. U. Khalid, M. B. Kadri, *"Liquid Level Control of Nonlinear Coupled Tanks System using Linear Model Predictive Control"*, The 8th IEEE International Conference on Emerging Technologies (ICET- 2012), 8<sup>th</sup> -9<sup>th</sup> October 2012, Islamabad, Pakistan.

## Courses

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<b>Deep Learning and Computer Vision School (DLCV) 2023</b> University of Genova, Italy	05 – 09 Jun 2023
<b>Introduction to Embedded Machine Learning</b> Edge Impulse, Coursera	04 Feb 2023
<b>Supervised Machine Learning: Regression and Classification</b> DeepLearning.ai – Stanford, Coursera	27 Jan 2023
<b>C for Everyone</b> University of California, Coursera	23 Oct 2022
<b>Crash Course on Python</b> Google, Coursera	3 Apr 2022
<b>Control of Mobile Robots</b> Georgia Institute of Technology, Coursera	04 May – 20 Jun 2020
<b>Neural Networks and Deep Learning</b> Deeplearning.ai, Coursera	04 – 30 May 2020
<b>ABB PLC500 Automation Builder Integration with Freelance Digivis Training</b> ABB Pakistan	May 2017
<b>Industrial Automation and Process Control (Siemens PLC)</b> SkillTech International, Karachi	Apr 2016
<b>Cisco Certified Network Associate (CCNA) 7.0</b> CTTC (Pvt) Ltd., P.E.C.H.S, Karachi	Nov 2010 to Mar 2011
<b>NI LabVIEW Workshop</b> PNEC-NUST in collaboration with National Instruments (USA)	Nov 2010

## Skills

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<b>PLC</b>	-----	ABB PLC, FATEK PLC, Siemens S7-300 PLC
<b>HMI</b>	-----	ABB HMI, Weintek HMI, Weintek Machine TV Interface
<b>DCS</b>	-----	ABB Freelance DCS
<b>Microcontroller</b>	-----	AVR Microcontrollers, Arduino, ESP32, STM32
<b>Single-board Computers</b>	-----	Raspberry Pi, CubieBoard, Jetson Xavier
<b>Microcontroller, PLC, and HMI Software</b>	-----	ABB Automation Builder, CodeSys, ABB Panel Builder, STEP 7 TIA Portal, Winproladder, Easybuilder, Keil $\mu$ Vision, Microchip Studio
<b>Control Systems Software</b>	-----	MATLAB, LabVIEW, MAPLE, Mathematica
<b>Project Management Software</b>	-----	inFlow Inventory, Team Task Manager, Jira Software, MS Project
<b>Electronic Design and Simulation Software</b>	-----	OrCAD, Proteus, 123D circuits, NI Multisim
<b>Electrical Design Software</b>	-----	SolidWorks Electrical, ProfiCAD
<b>Programming Languages</b>	-----	Python, C Language, Embedded C, C#, Ladder, FBD, STL, Structured Text
<b>Tools, IDEs and Frameworks</b>	-----	OpenCV, WinForms, DevExpress, Visual Studio, Eclipse
<b>Networking</b>	-----	TCP/IP, UDP, VLANs
<b>Operating Systems, Office Tools, Editors</b>	-----	Windows, Linux, Office, Adobe Photoshop, Adobe Illustrator

## Academic Achievements

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<b>Winner of HEC Overseas Scholarship for PhD in Selected Fields</b> Issued by the Higher Education Commission (HEC), Pakistan	Dec 2021
<b>NUST Indigenous Merit Based Scholarship-MS</b> Pakistan Navy Engineering College	2010-2013
<b>Merit Scholarship-BS</b> Sir Syed University of Engineering and Technology Received the scholarship award throughout the bachelor's program	2006-2010