



Hira Ambreen

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● ABOUT ME

Electrical engineering student with expertise in electronics, communication systems, digital logic design, and embedded systems. My projects taught me signal processing, control systems, sensor technology, analog circuits, communication protocols, and microcontroller programming. I know circuit design, troubleshooting, MATLAB, proteus, Multisim, and Python. I'm a creative problem-solver who's always looking for fresh ideas. I am the Best Circuit Designer. I have exhibited inventive hardware real-time projects and am skilled in hands-on programming. I recently attended a workshop on Ubuntu installation and ROS in this window. I want to stay in electrical engineering and work on cutting-edge projects. I like trying new technologies and taking on new challenges to improve as an engineer.

● EDUCATION AND TRAINING

25/09/2020 – CURRENT Islamabad, Pakistan

BE (BACHELORS OF ELECTRICAL ENGINEERING) Sir Syed CASE Institute of Technology

Minor: Linear Circuit Analysis, Electric Machines, Embedded Systems, Digital Logic Design, C++ Programming.

Major: Power Electronics, Communication Systems, Signal Systems, Control Systems and Electromagnetic Field Theory.

Address Street 33, B-17, Islamabad, 45600, Islamabad, Pakistan | **Website** <https://www.case.edu.pk/>

13/08/2018 – 12/06/2020 Rawalpindi, Pakistan

HSSC (PRE-ENGINEERING) Global College System, Islamabad

Address Lane 2 Harley, Street, 68-B Lane 2, Harley Street Rawalpindi, 46000, Rawalpindi, Pakistan

13/08/2016 – 12/06/2018 Rawalpindi, Pakistan

SSC (SCIENCE) New Jinnah Public School

Address Street Number 11, Dhoke Syedan Road, Rawalpindi Cantt, 46000, Rawalpindi, Pakistan

● LANGUAGE SKILLS

Mother tongue(s): **URDU**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	B2	B2	B2	B2	B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

● **DIGITAL SKILLS**

Microsoft Office | Google Docs | Zoom | Skype | MATLAB | Proteus | Multisim | ISIS | Arduino | AutoCAD | Python | Simulink | C++ | LaTeX | Raspberry Pi | Visual Studio | VHDL | Verilog

● **ADDITIONAL INFORMATION**

PUBLICATIONS

Development of stability-preserving time-limited model reduction framework for 2-D and 1-D models with error bound

– 2022

2-D models are complex, making simulation, analysis, design, and control difficult. Gawronski and Juang's time-limited model reduction approaches yield an unstable reduced-order model for the 2-D and 1-D models at certain times. Researchers found stability preservation solutions that maintain 1-D reduced-order system stability, but they cause substantial approximation errors. The authors need more research on the stability-preserving time-limited interval Gramian-based model reduction approach for 2-D discrete-time systems. Minimal rank-decomposition is used to decompose 2-D models into two cascaded 1-D models. Limited-time Gramian reduces these two 1-D sub-models. The method works for 2-D and 1-D models. The proposed method also provides reduced model stability and a priori error-bound expressions for 2-D and 1-D models. Numerical findings and comparisons between existing and recommended approaches show the methodology's efficacy.

Ambreen, S. H., et al. (2022). Control Theory and Technology, 20(3), 371-381.

Improving Computational Efficiency in Power Systems: Development of Model Reduction Framework with Error-Bound for Wind Turbines-Based on DFIG, accepted in 20th IBCAST International Conference, to be appeared in Dec 2023.

– 2023

Modern wind turbines are steady, controlled, and observable because of the analytical and modeling precision used in their design. In the context of a varying speed-based wind turbine powered by a double-fed induction generator, this article offers a state-of-the-art technique for reducing model order. The proposed method leverages state-space representations to establish a comprehensive and systematic framework to analyze wind turbine performance and ensure conformity to grid requirements. Dimension reduction in the large state space model is accomplished using time-constrained Gramians and a unique, balanced realization procedure. The reduced order system is stable and offers less approximation error. As an additional perk, the proposed method gives researchers an a priori formula for the error-bound, which is easier to compute. Using extensive simulation data, we prove that our approach best optimizes models incorporating wind turbines with varying rotational speeds in the context of stability and error calculation compared to other approaches. To improve the efficacy and accuracy of their modeling procedures, wind turbine analysis academics and researchers should consider this new methodology seriously.

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Smart Shopping Cart for Self-Service Checkout Based on IoT Technologies accepted in 20th IBCAST International Conference, to be appeared in Dec 2023.

– 2023

As the global population expands, resources like food, water, and shelter become increasingly scarce. The grocery store checkout line moves like clockwork, but it always appears to be too lengthy. This is an issue for customers and higher management, even at major stores like Hypermart. The Internet and data collection have facilitated novel methods for addressing long-standing issues. The advent of high-tech "Smart Carts" dramatically changes the standard shopping experience and is one innovative response to the difficulties currently facing the retail business. The Internet of Things technology embedded in these smart carts gives customers the convenience of self-checkout. Digital maps displayed in shopping carts are helpful for both the retailer and the customer. This approach uses cutting-edge methods and tools to enhance the customer's purchasing journey.

Hira Ambreen et al

IoT-Based Night Vision Robot Line Tracking: Enhancing Robotic Navigation and Perception in Low-Light Environments, Submitted in the IEEE Transactions on Circuits and systems-II: Express Brief

– 2023

In this research, an IoT-based line-tracking system is developed to enhance robots' night vision and line-tracking capabilities. The system incorporates cutting-edge sensor, imaging, and networking technologies, enabling accurate line-tracking in various lighting conditions. The system achieves improved accuracy and

reliability by integrating computer vision and machine learning. Extensive testing and comparisons with conventional approaches demonstrate the superiority of the proposed technology. This research contributes to the existing knowledge by evaluating the state-of-the-art and providing experimental data and insights into the architecture of IoT-based line-tracking systems. The results offer government agencies, non-profit organizations, and private companies a cost-effective and efficient choice for lowlight robotics systems.

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RECOMMENDATIONS

Associate Professor Dr. Muhammad Imran Mentor

Hira Ambreen is an outstanding student, and I am confident that she has the potential to excel in any academic or professional pursuit she undertakes. Her exceptional academic record, passion for electrical engineering, and leadership skills make her an ideal candidate for any academic or professional pursuit. I strongly recommend Hira for any opportunity that she may seek, and I am confident that she will make a significant contribution to any organization or academic program that she becomes a part of.

Please do not hesitate to contact me if you require any further information regarding Hira's academic or professional abilities.

Sincerely,

Dr. Muhammad Imran,

Associate Professor and Head of Department

Electrical Engineering Department Military College of Signals, National University of Sciences and Technology (NUST),
Islamabad, Pakistan.

Email m.imran@mcs.edu.pk | Phone (+92) 3218569914

HONOURS AND AWARDS

01/03/2023

Robot Operating System – Sir Syed Case Institute of Technology, Islamabad

1. Robot Operating System (ROS) is an open-source framework for building and operating robotic systems. ROS provides software libraries and tools for hardware abstraction, communication, visualization, and simulation. ROS supports a wide range of programming languages, including C++, Python, and Java. ROS uses a modular architecture with software components called "nodes" that can communicate with each other using a messaging system. ROS provides simulation and visualization tools, such as Gazebo and RViz, for testing and developing robotic systems.

05/01/2023

Robotics Project: Line Following and Obstacle Detecting Robot – Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology

1. As part of my interest in robotics, I designed and built a Line Following and Obstacle Detecting Robot using Arduino and sensors. The robot is capable of following a pre-determined path while detecting and avoiding any obstacles in its way. The robot has a 15cm distance sensor for obstacle identification and sensors to identify and follow a line on the ground for precision navigation. The robot adjusts its path based on real-time sensor information.
2. This project taught me engineering, problem-solving, and programming. I solved many technical problems by understanding hardware and software components for the project. The project was successful, and the robot shows my passion for robotics and ability to execute complex concepts.

06/03/2023

First Place, Speed Wiring Competition – COMSATS University, Wah Campus, Pakistan

1. I assembled an electronic circuit in a speed wiring competition. I won the competition because I knew circuits and wiring well. This tournament taught me problem-solving, time management, and detail. I showed my technical skills and worked with other opponents under duress.
2. I was proud to win the competition. I learned a lot about electronic circuitry and how to work under pressure.

17/03/2023

First Place, Circuit Troubleshooting Competition – COMSATS University, Wah Campus, Pakistan

1. I had to fix a broken electronic circuit in a Circuit Troubleshooting Competition. I placed second in the competition because I understood electronics and troubleshooting. This tournament taught me

problem-solving, critical thinking, and detail. I showed off my technical skills and worked with other opponents under duress.

2. I was honored to place first in the tournament. It showed my electronic circuitry knowledge and problem-solving skills.

HOBBIES AND INTERESTS

Circuit Designing

1. Circuit designing as a hobby can be interesting because it allows you to create and build various electronic devices and systems, such as sensors, robots, and gadgets. It requires problem-solving skills and creativity and can be a fun and fulfilling way to learn about electronics and technology. Additionally, circuit designing can be a practical skill that can be applied in various fields, from home automation to robotics and medical devices.

Programming

1. Programming as a hobby is interesting because it allows you to create something from scratch and bring your ideas to life. It can be a creative and challenging outlet that stimulates problem-solving skills and fosters a sense of accomplishment. Additionally, programming can have practical applications, such as automating repetitive tasks or developing useful software.

Exploring New Ideas

1. As a hobby, exploring new ideas in real time lets me use my creativity and imagination to solve difficulties. It lets me collaborate with like-minded people to gain new skills, knowledge, and connections. Such activities can help me keep up with my field's latest trends. Exploring new ideas in real time may also be rewarding as I see my thoughts come to life and improve the world.

Reading Books

1. Reading books as a hobby is interesting because it allows me to escape to different worlds, learn new things, and gain new perspectives. It can also improve my vocabulary, language skills, and overall knowledge. Plus, it's a low-cost and easily accessible entertainment that can be enjoyed anywhere and anytime.

CREATIVE WORKS

10/03/2023 – CURRENT

Project: Solar Power Bluetooth Speaker

1. I'm developing a Solar Power Bluetooth Speaker to explore sustainable energy and audio technology. A solar panel charges the speaker's battery, which plays Bluetooth music. I am designing the speaker with a rechargeable battery and a solar panel to play music all night and charge throughout the day. A Bluetooth module, audio amplifier, and custom speaker box enhance sound quality.
2. This project will teach me engineering, renewable energy, and audio technologies. I may solve many technical problems by understanding the hardware and software components of the project. The Solar Power Bluetooth Speaker will be a success, which may show my passion for sustainable technology and my ability to execute challenging concepts.

20/02/2023 – 27/03/2023

Project: MATLAB-GUI Based Temperature and Humidity Monitoring System with Arduino Interfacing

1. I designed a MATLAB-GUI-based Temperature and Humidity Monitoring System using Arduino Interfacing to test data collection and interface technologies. Arduino-connected DHT11 sensors measure temperature and humidity. Mobile phones get Bluetooth data. MATLAB created a GUI for real-time DHT11 sensor temperature and humidity data. The GUI allows system configuration, data log viewing, and setting changes. System alerts prevent overheating and dampness.
2. This project taught me interface, wireless data transmission, and MATLAB GUI design. Understanding project hardware and software alleviated numerous technical issues. Project success. I can execute complex ideas with the Temperature and Humidity Monitoring System.

10/03/2023 – CURRENT

Project: 100 Watt Power Inverter using Microcontroller

1. I'm developing a 100-Watt Power Inverter with a microcontroller because I like power electronics and microcontrollers. The inverter will convert battery DC power into AC power for electronics. A microcontroller could operate the inverter and ensure stable output power. Overload and over-temperature protection are common inverter protection circuits.
2. This project may teach me power electronics, microcontroller programming, and circuit design. I will solve technical problems and learn the hardware and software for the project. The project will succeed, and the 100-Watt Power Inverter will show my passion for power electronics and ability to execute challenging concepts.

01/10/2022 – 06/12/2022

Navigator System I designed and implemented a navigator system that utilized advanced electronics to guide users to their desired destination accurately. This required a deep understanding of signal processing, control systems, and sensor technology.

20/10/2022 – 12/11/2022

AM Transmitter and Receiver System I developed an AM transmitter and receiver system that utilized cutting-edge communication technologies to ensure data's reliable transmission and reception. This project involved extensive work on analog circuits, signal processing, and communication protocols.

Final Year Project: Intelligent Fruit Quality Monitoring: A Multi-Sensor Fusion Approach with AI and ML In the dynamic landscape of the food industry, ensuring the quality of fruits is paramount. Traditional methods of fruit quality assessment often fall short, necessitating an innovative solution. Our project, "Intelligent Fruit Quality Monitoring," leverages a multi-sensor fusion approach, integrating Sparkfun 726x IR-based sensors, RGB color sensors, and gas sensor arrays with advanced technologies like AI and ML. The system aims to provide a precise and real-time assessment of fruit ripeness. Drawing inspiration from pioneering studies in fruit quality assessment, our methodology incorporates insights from recent literature, including the development of freshness indices and sensor fusion designs. Through rigorous testing and calibration protocols, our project seeks to address inaccuracies in traditional assessments and contribute to both the improvement of fruit quality and the advancement of agricultural technology.
