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SHARAD INSTITUTE OF TECHNOLOGY, COLLEGE OF ENGINEERING

Yadrav (Ichalkaranji), Dist-Kolhapur (Maharashtra)

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MECHTRON

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DEPARTMENT OF MECHATRONICS ENGINEERING

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COLLEGE VISION

- To be a center of excellence in technical education by using cutting-edge technology that produces competent engineers of today and tomorrow to serve society.

COLLEGE MISSION

- To impart quality education by implementing state-of-the-art teaching-learning methods to enrich the academic competency, credibility and integrity of the students.
- To facilitate a conducive ambience and infrastructure to develop professional skills and nurture innovation in students.
- To inculcate sensitivity towards society, respect for environment and promote high standards of ethics.

DEPARTMENT VISION

- To be a centre of excellence in Mechatronics Engineering education to prepare professionally competent engineers with lifelong learning attitude for the accomplishment of ever-growing needs of society.

DEPARTMENT MISSION

- To prepare technically and professionally competent engineers by imparting quality education through effective teaching learning methodologies and providing stimulating environment for research and innovation.
- To develop professional skills and right attitude in students that will help them to succeed and progress in their personal and professional career.
- To imbibe moral and ethical values in students with concern to society and environment.

From HOD's Desk



Dr. P.A. Bajakke (Assistant Professor, & HOD)

It gives me immense pleasure to present the first issue of **MECHTRON** for the academic year 2024–25. This magazine is a reflection of the creativity, technical aptitude, and collaborative spirit of our students and faculty from the Department of Mechatronics Engineering.

At our department, we strive to cultivate a strong foundation in interdisciplinary engineering through industry-aligned curriculum, research-driven initiatives, and active collaboration with academia and research organizations. **MECHTRON** serves as a platform for students to express their technical knowledge, share innovations, and explore emerging trends in Mechatronics.

I congratulate the entire editorial team for their sincere efforts in bringing out this issue and encourage all students to actively engage with such platforms to enrich their learning experience.

Wishing you all continued growth, success, and innovation.

From Faculty Editor's Desk



Dr. Abhijit Banik (Assistant Professor)

Dear reader,

It is a great honor to serve as the editor of **MECHTRON**, the official technical magazine of the Department of Mechatronics Engineering, SITCOE. I am delighted to present this to you for the academic year 2024–25. This magazine marks a significant step forward in documenting and celebrating the technical creativity, academic achievements, and innovative spirit of our department. Our vision with **MECHTRON** is to publish insightful editions each academic year, highlighting the collaborative efforts of our students and faculty. The articles featured in this issue reflect the depth of knowledge, passion for engineering, and

curiosity that define our community. A heartfelt thank you goes out to all the faculty members and students whose valuable contributions and technical insights made this edition possible. Without their active participation and commitment, *MECHTRON* would not have taken shape. I also take this opportunity to express my sincere gratitude to our Honorable Executive Director, our respected Principal, the Head of the Department, and all the faculty members for their continuous support, motivation, and encouragement throughout this journey. It is with their guidance that this magazine has emerged as a platform for learning, expression, and inspiration for future engineers.

Student Editors



**Kininge Shubhangi
Mahavir.
(SY MTRX)**



**Pruthviraj Prakash
Mane.
(TY MTRX)**

Student Coordinators

<u>Student Coordinators</u>	
Name	Year
Bhosale Aditi Amar	Second Year
Damate Komal Subhash	Third Year
Towar Diksha Deepak	Third Year
Mullani Sohel Shamshuddin	Third Year
Biranje Soham Tanaji	Second Year

It is with great pride and enthusiasm that we present to you the **MECHTRON**, the official technical magazine of the Department of Mechatronics Engineering for the academic session 2024–25. This magazine is a reflection of the creativity, technical insight, and collaborative spirit that thrive within our department. With contributions from both students and faculty members, **MECHTRON** brings together a diverse collection of technical articles, project summaries, innovative ideas, and thought-provoking perspectives that span across the rapidly evolving landscape of mechatronics engineering. The magazine serves as a platform for showcasing the talent, innovation, and academic strength of our department, while also encouraging readers to engage with the interdisciplinary nature of mechatronics—merging mechanics, electronics, control systems, and computing technologies. In an era where automation, robotics, artificial intelligence, and Industry 4.0 are transforming the world around us, it becomes essential for engineering minds to not only stay informed but also to contribute with original thought and applied skills. As a student editorial team, we have strived to ensure quality, clarity, and relevance in every article included.

Title: Automated Paper Cutting Machine

Author: Muskan Momin, Namrata Patil, Pragati Patil, Vishakha Patil, Dr. S.K. Shikalgar

Abstract: This project presents the design and fabrication of an automated paper cutting machine using the ATmega32 microcontroller to achieve precise, efficient, and customizable cutting of A4 paper sheets. The system integrates stepper motors, A4988 drivers, an HMI display, and a robust mechanical frame for fully automated operation. Users can set paper dimensions and cutting quantities, enabling minimal manual intervention. Designed as a low-cost alternative to expensive market options, the machine holds significant application potential in printing, packaging, and stationery industries, with scope for future adaptive and autonomous enhancements.

1. Objective: Objective of this project is to design, fabricate and automate the paper cutting machine in such a way that the required length of paper of size A4 can be cut. The paper cutting machines generally available in the market are generally manual and if automatic then it is very costly. Objective is to develop, the kind of paper cutting machine which is automatic and less costly.

2. Design and Methodology

The system integrated:

Microcontroller: ATmega32 control unit for managing all operations of the system, including motor control and interfacing with the HMI display.

Stepper Motors (2 units): Stepper Motor 1: Controls the movement of the paper forward/backward to the desired cutting length.

Stepper Motor 2: Controls the cutting blade's up and down motion to perform the cutting operation.

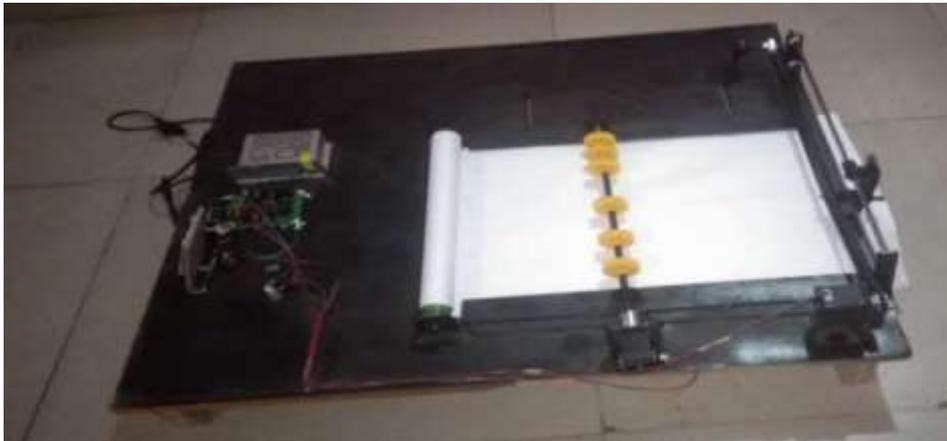
Stepper Motor Drivers: Used to drive the stepper motors with precise control signals from the ATmega32. A4988 motor drivers can be used for controlling the speed and direction of the motors.

HMI Display: Provides an interactive interface for setting parameters like paper length, cutting speed, and the number of cuts. Displays real-time status and feedback during operation.

Power Supply Unit: Provides regulated power to the ATmega32, stepper motors, and other electronic components.

Mechanical Frame: A robust structure that holds the paper feed mechanism and the cutting blade in place

3. Working Principle: Input Settings: User sets dimensions and quantity via keypad or touch screen. Paper is fed into the machine using rollers controlled by motors. The blade cuts the paper to the desired size as per user setting. Cut paper pieces are collected in an output tray.



4. Key Features: Precision Cutting: Controlled by the microcontroller to ensure accurate lengths and widths

Automation: Fully automated cutting process with minimal user intervention.

Customization: Paper dimensions and cutting count can be set as per requirements.

5. Applications: Suitable for industries where paper cutting is required, such as printing, packaging, and stationery manufacturing

6. Future Scope:

Adaptive capabilities

Remote monitoring and control

Autonomous systems

Large-scale implementation

7. Conclusion: The development of an automated paper cutting machine using the ATmega32 microcontroller successfully demonstrates the integration of microcontroller technology in automation. The system provides a precise, efficient, and customizable solution for cutting paper, making it suitable for applications in industries such as printing, packaging, and stationery manufacturing.

Title: Wireless Charging of EVs

Author: Atharav Desai , Vaibhav Patil , Tejas Narade , Chinamy kore, Dr. Abhijit Banik

Abstract: This project presents the design and development of a modular wireless charging system for electric vehicles (EVs), aimed at enhancing flexibility, scalability, and efficiency. The system integrates an AC-to-DC converter, ESP32 microcontroller, electromagnetic transmission coils, a charge controller, and monitoring tools. Key features include cable-free convenience, safety, durability, and low maintenance. Applications range from residential to small commercial use. Future advancements may include dynamic and smart charging, expanded infrastructure, and multi-vehicle charging capabilities.

1. Objective: The primary objective was to develop a wireless charging system for electric vehicles (EVs) that utilizes a modular design and advanced Technology. This system aims to enhance the flexibility, scalability, and efficiency of charging operations for EVs in both industrial and commercial Application.

2. Design and Methodology

The system integrated:

- AC to DC Converter: To transform alternating current (AC) from a power source into direct current (DC).
- ESP32 Microcontroller: For control the EV movement , and command to the wheels motor of EV .
- Transmission & Receiving coil : using electromagnetic coils to transmit electrical energy from the charging pad (transmitter) to the device (receiver) without any physical wires.
- Charge Controller: To charge a battery without permitting overcharge and at the same time, preventing reverse current flow when there is no sun.
- Display & Multi-meter : For summarize about charging condition of battery & to check the voltage transfer between the coil.
- Battery: To store the electricity and provide a power to the vehicle when it is required.

3. Working Principle: The system uses an AC-to-DC converter to rectify the input AC power. An ESP32 microcontroller controls the EV's movement by managing the wheel motors. Wireless power transfer is achieved using transmitting and receiving coils. A charge

controller regulates battery charging, preventing overcharge and reverse current flow. A display and multimeter monitor charging status and coil power transfer, while the battery stores energy for the vehicle's operation.



4. Key Features:

Convenience: No cables to plug in.

Safety: Reduced risk of electrical shock and tripping hazards.

Durability: No wear and tear on cables and connectors.

Lower Maintenance: Fewer parts to replace compared to wired system .

5. Applications:

1. Residential Charging: Home charging pads for personal vehicles.

2. Small Business Charging: Charging stations for customers.

3. Robotics and AGVs: Charging for small autonomous guided vehicles (AGVs)

4. Commercial Fleet Charging (Small Scale): Charging for small fleets of delivery vehicles

6. Future Scope:

a. Dynamic Charging.

b. Smart Charging Integration.

c. Expanded Infrastructure

d. Multi-Vehicle Charging

7. Conclusion: Small-scale wireless charging for EVs offers convenient, safe, and potentially automated charging solutions for homes, small businesses, and niche applications like e-scooter sharing. While challenges remain in terms of efficiency and cost, continued development promises wider adoption of this technology in the future.

Title:Material Handling Using Modular Soft Robotic Arm

Author: Aditya Kadam, Aditya Desai, Soham Chavan , Swaroop Kakade

Abstract: This project presents the development of a modular soft robotic arm designed for efficient material handling in industrial and commercial settings. The system integrates silicone balloon actuators, an ESP32 microcontroller, stepper motors, pneumatic components, and 3D-printed parts. Its soft, adaptive end-effector ensures safe handling of delicate objects with precision. Applications include food processing, lab handling, and logistics. Future enhancements may involve AI integration, advanced modularity, and improved materials, positioning soft robotics as a key player in next-generation automation.

1. Objective: The primary goal was to develop a soft robotic arm utilizing modular design and advanced actuators to enhance flexibility, scalability, and efficiency in material handling operations across industrial and commercial settings.

2. Design and Methodology:

The system integrated:

Silicone Balloon Actuators: Flexible components made of liquid silicone rubber for handling delicate objects.

ESP32 Microcontroller: For precise control and coordination of robotic movements.

Stepper Motors and Gearboxes: To ensure smooth motion and torque control for the robotic joints.

Pneumatic System: Including solenoid valves and air pumps for actuation of the grippers.

3D Printed Components: Custom moulds and holders were designed using Autodesk Fusion 360 and fabricated using a Creality CR-10 SE 3D Printer.

Working Principle: The robotic arm operates by detecting objects with infrared sensors and initiating movement via the microcontroller. The silicone-based soft end-effector is actuated pneumatically, adapting to the object's shape. Once the object is grasped, it is transported to a designated location and released with controlled pressure adjustments.



3. Key Features:

- Modular design for scalability and customization.
- Use of soft actuators for enhanced adaptability and safety.
- Integration of cost-effective components ensuring affordability.
- High precision and efficiency in material handling tasks.

4. Applications:

- Food processing and packaging.
- Laboratory sample handling.
- Warehousing and logistics.
- Automotive assembly.
- Future Scope
- AI and Machine Learning for adaptive control.
- Enhanced modularity for broader industrial applications.
- Exploration of new materials for improved durability and

5. Conclusion: This project showcases the transformative potential of modular soft robotics in modern material handling. Continued innovation in this field can pave the way for more efficient, versatile, and sustainable automation solutions.

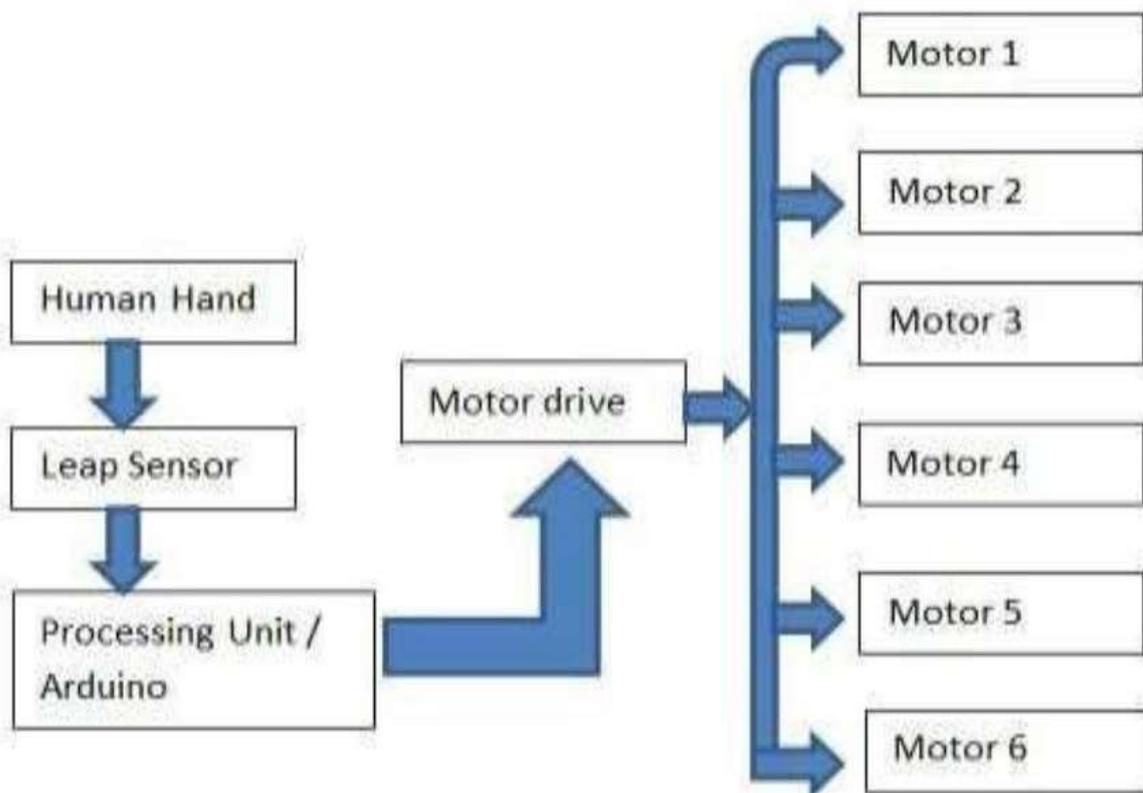
Title: Gesture Controlled Robotic Arm Using Leap Motion

Author: Digvijay Magdum, Pratik Kambale, Swapnil Bhuyekar, Shreyas Parit ,Tejas Jain.

Abstract: A gesture-controlled robotic arm using Leap Motion allows users to control the arm with natural hand movements, providing precise and intuitive operation. This technology has applications in healthcare (prosthetics, surgery), manufacturing, virtual reality, tele-operation, and assistive devices, enhancing efficiency and accessibility across various industries.

1. Introduction: A gesture-controlled robotic arm using Leap Motion technology revolutionizes human-robot interaction by allowing users to control robotic systems through natural hand gestures. The Leap Motion controller captures and translates these gestures into commands, enabling precise and intuitive control. This innovative approach has wide-ranging applications, from healthcare and manufacturing to virtual reality and assistive technologies, making robotics more accessible and adaptable to various tasks and environments.

2. Working Diagram:



3. Project Model:



4. Application:



5. Conclusion: Gesture-controlled robotic arms that use Leap Motion allow people to control them easily with hand movements. As technology improves, these arms will become even better and more common, changing how we work with robots.

Title: Design and Development of a Solar Tracking System Using LDR Sensor

Author: Khawate Shreyash, Roje Sandip, Om Vhanwade, Rajat Udgave

Abstract: The aim of this study is to design a low-cost, energy-efficient solar tracking system using Light Dependent Resistors (LDRs) to optimize solar panel orientation. Fixed solar panels often suffer from suboptimal angles, reducing energy yield. This project implements a dual-axis solar tracker using LDRs, 555 Timer ICs, and an L293D motor driver to maximize energy capture throughout the day. The developed system demonstrated improved energy efficiency, accuracy, and reliability under varied environmental conditions.

1. Introduction: Solar energy is an abundant, eco-friendly alternative to fossil fuels, widely adopted in residential, commercial, and industrial settings. However, fixed solar panels do not always receive direct sunlight, which limits their power generation. Solar tracking systems solve this by adjusting panel orientation to follow the sun. This project focuses on a dual-axis tracking system utilizing LDR sensors and simple electronic components to improve solar panel efficiency by up to 25% compared to fixed panels.

2. Literature Review : Previous studies (Rao et al., Kumar et al., Sumathi et al.) affirm that solar tracking systems—especially active trackers—can boost panel output by 30-40%. Dual-axis trackers that rely on LDRs and microcontrollers offer accurate and automatic alignment with solar movement. This project builds on such systems, using basic electronic components to design a cost-effective yet efficient tracker.

3. Methodology:

Objective: To track the sun using a dual-axis system and adjust the panel orientation automatically.

Components Used:

- 5W Solar Panel
- 7805 Voltage Regulator
- LDR Sensors (2 units)
- 555 Timer IC
- L293D Motor Driver
- DC Gear Motors (2 units)
- Potentiometers (50k Ω)
- 9W Battery

Working Principle: Two LDRs detect sunlight intensity from different directions. Based on light difference, the 555 ICs generate pulses fed into the L293D motor driver, which rotates DC gear motors to reposition the solar panel toward the brighter side. This allows the panel to continually align with the sun's movement.

4. Results

- **Accuracy:** $\pm 3^\circ$ in panel adjustment
- **Efficiency Gain:** ~25% increase in power output compared to static systems
- **Power Consumption:** 5W
- **Reliability:** Stable operation in varied weather conditions
- **Cost:** Estimated at ₹15,000 (approx. \$200)

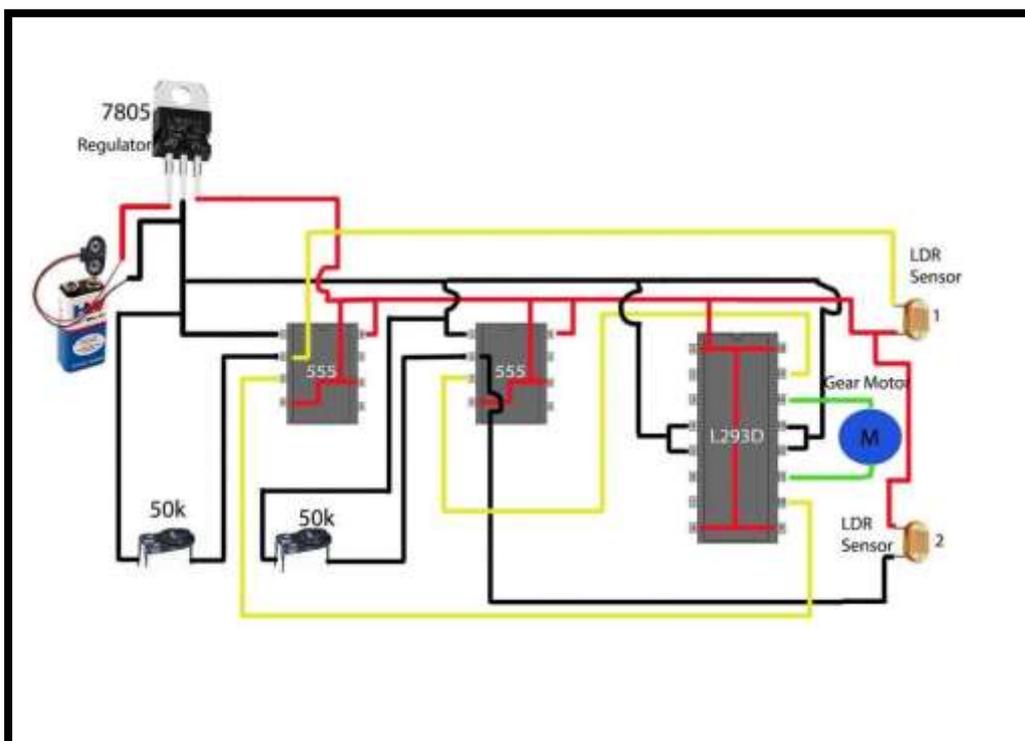


Figure: Circuit Diagram

5. Applications:

- **Residential:** Rooftop solar systems, water pumps
- **Commercial:** Solar farms, off-grid solar stations
- **Industrial:** Water treatment, solar-driven automation
- **Agricultural:** Greenhouses, irrigation setups

6. Future Scope:

- Integration with IoT for remote monitoring

- Use of AI for sun path prediction
- Energy storage coupling (batteries)
- Miniaturization and mass production for affordability

7. Conclusion: The LDR-based solar tracking system effectively improves solar panel performance by maintaining an optimal angle to the sun throughout the day. The system is simple, cost-effective, and suitable for broad implementation, particularly in developing areas where renewable energy access is critical.

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4. <https://www.researchgate.net/profile/Raj-Kumar-Mistri>
5. DOI: <http://dx.doi.org/10.14741/ijcet/4/5/2014/>

Title: Hybrid Bicycle with Pedal Assisted Sensor

Authors: Narendra Dipak Chavan, Mandar Sugandh Dongare, Abhishek Mahadev Patil, Sandesh Sandip Solankure.

Abstract:

As urbanization increases and fossil fuel dependency becomes a growing concern, the need for efficient, eco-friendly transportation is more urgent than ever. This paper presents a Hybrid Bicycle with Pedal Assisted Sensor (PAS), combining mechanical pedalling with electric motor assistance to improve rider efficiency and reduce effort. A torque-based pedal sensor detects rider input and activates the motor accordingly, offering a smooth, responsive, and energy-efficient cycling experience. The project aims to make e-biking accessible, sustainable, and suitable for daily commuting, particularly in congested or hilly urban areas.

1. Introduction: A hybrid bicycle, or pedal-assisted e-bike, is a two-wheeled vehicle that merges conventional cycling with electric assistance. Unlike throttle-driven electric bikes, which function without pedaling, pedal assist (PAS) systems only activate the motor when the rider is pedaling, making the experience more natural and interactive. Our project focuses on retrofitting a regular cycle with a 250W BLDC hub motor, 24V battery system, and a torque-based PAS sensor. The integration is done such that the motor responds proportionally to the force applied on the pedals. This not only enhances the riding comfort and capability over various terrains but also helps reduce carbon emissions and dependence on fossil fuel-based vehicles.

2. Methodology: The hybrid bicycle functions by blending manual input and electric propulsion through sensor-assisted control. The methodology involves:

- Installation of a **torque sensor** at the crankshaft to detect the pedaling force.
- Use of a **motor controller** to process sensor data and regulate the motor's power output.
- Power supplied by a pair of **12V rechargeable lead-acid batteries** wired in series (total 24V).
- Manual cycling capability is retained for battery-saving or exercise-oriented operation.

An electric motor assists the rider only when the sensor detects pedaling, thus ensuring efficient energy usage and maintaining battery longevity. The system is managed by a compact on-board controller that provides real-time torque matching and safety cut-off if needed.

3. Design and Key Components: The system includes both electrical and mechanical subsystems

- **Electric Motor (250W BLDC):** Drives the rear wheel hub for propulsion.
- **Torque Sensor:** Measures rider effort and signals the motor to engage.
- **Controller Unit:** Brain of the system, interpreting inputs and regulating power flow.
- **Battery (24V):** Provides electric power with easy plug-in charging capability.
- **Suspension System:** Includes telescopic front forks and coil-spring rear suspension for smoother rides.
- **Other Components:** Chain wheel, sprockets, handlebar-mounted throttle (for testing), wiring harness, and ignition system.

The mechanical frame was adapted to support the additional load of the electrical kit without compromising on balance and strength. CAD-based design helped finalize the mounting points and wiring paths before physical implementation.

4. Advantages and Applications:

- **Assisted Mobility:** Reduces physical fatigue, especially on long routes or hilly areas.
- **Energy Efficiency:** Pedal-based control ensures motor runs only when needed.
- **Eco-Friendly Travel:** Emission-free, low-noise mobility for cities and campuses.
- **Cost Saving:** Affordable alternative to scooters and cars (~₹14,810 total build cost).
- **Inclusive Design:** Enables elderly or physically challenged riders to enjoy cycling.
- **Dual Mode:** Operable in both electric-assist and full-manual modes.

5. Conclusion: The hybrid bicycle with pedal-assisted sensing represents a blend of conventional biking and modern electric transport. Its ability to dynamically support the rider's effort improves accessibility, reduces commuting strain, and promotes sustainable transportation practices. The developed prototype successfully demonstrated effective load sensing, energy optimization, and ease of use. Future developments may include solar charging, regenerative braking, IoT-based diagnostics, and lightweight frame materials for even better performance.

Glimpses of Articles published by the faculty in various reputed journals

Dr. Krishnakant Sahu

Performance analysis of ER fluid-lubricated two-lobe hole-entry hybrid journal bearings with bionic and spherical texture surfaces optimized by genetic algorithm

Chandra B. Khatri ^a  , Saurabh K. Yadav ^b  , Krishnakant Sahu ^c  ,
Satish C. Sharma ^d  

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Highlights

- FEM modelling of bionic/spherical texture hole-entry hybrid journal bearing system.
- Optimization of texture parameters with the help of Genetic Algorithm.
- Compared the performance parameters of GA optimized bionic/spherical textured and non-textured bearings.
- Computed the influence of ER lubricants on the GA optimized bioinic textured/spherical textured journal bearings.

Abstract

This study is done into the multifaceted world of ER (Electro-rheological) fluid-lubricated optimized textured hybrid hole-entry journal bearings to improve dynamic performance of the bearing and stability. These innovative techniques harness the dynamic properties of ER fluids in conjunction with optimized textured spherical and bionic textured surfaces to achieve enhanced performance and reliability. This study aims to explore the influence of ER fluid on the tribological behaviour and controllability of hybrid hole-entry journal bearings. Further it proposes the optimized design of bionic and spherical textured surfaces, capitalizing on their ability to influence fluid flow, load-carrying capacity, and friction reduction. The results demonstrate promising improvements in bearing performance metrics, including dynamic stability and fluid film damping, load-carrying capacity, friction reduction, and controllability, facilitated by the integration of ER fluid and the optimization of textured spherical and bionic textured surfaces. This study offers valuable insights into the potential applications of ER fluids and biomimicry-inspired textured surfaces in bearing system engineering. The inclusion of bionic textured hole-entry hybrid bearing lubricated with ER fluid improves the stability by up to 112.57% and decrease the friction coefficient up to 23.37%. The findings are expected to inform the design and development of high-performance hole-entry hybrid journal bearings with diverse industrial applications.

Dr. Abhijit Banik

Research Articles

Experimental investigation of tool geometries on Al/Cu dissimilar friction stir welded joint for varying rotational speed

Abhishek Mandal , Abhijit Banik, John Deb Barma & Gautam Majumdar

Pages 847-866 | Received 06 May 2024, Accepted 15 Nov 2024, Published online: 10 Dec 2024

 Cite this article  <https://doi.org/10.1080/09507116.2024.2436103>

 Check for updates

Abstract

The present study investigates the effect of geometrical alterations (straight cylindrical threaded and straight hexagonal) on the heat input and the resulting weld formation, microstructure, and mechanical properties of the tool for varying rotational speeds. A detailed SEM-EDS analysis is employed at Al-Cu interface to study the formation of various intermetallic compounds and their distributions. The line EDS results at Al-Cu interface show a clear junction at a very narrow region for 1200 rpm for both tools. The total heat input for a threaded cylindrical tool at 1200 rpm was the highest however the diffusion of Cu into Al was poor and attained the lowest tensile strength. At 1400 rpm besides the bulk movement of Cu at the top, fine distribution Cu particles with Al_2Cu , Al + Al_2Cu intermetallic compounds were also observed at stir zone for straight hexagonal tool and resulted in the highest tensile strength. It is found that straight hexagonal tool attains improved tensile strength than straight cylindrical threaded tool irrespective of tool rotational speeds. At 1400 rpm total heat input remains unaffected by the tool geometry and bead appearance also improves irrespective of tool geometry.

Dr. Ramesh Maloth

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Article | [Open access](#) | Published: 28 December 2024

A novel fuzzy assisted sliding mode control approach for frequency regulation of wind-supported autonomous microgrid

[Maloth Ramesh](#), [Anil Kumar Yadav](#), [Pawan Kumar Pathak](#) & [CH Hussaian Basha](#) 

Scientific Reports **14**, Article number: 31526 (2024) | [Cite this article](#)

1366 Accesses | **3** Citations | [Metrics](#)

Abstract

Autonomous microgrids (ATMG), with green power sources, like solar and wind, require an efficient control scheme to secure frequency stability. The weather and locationally dependent behavior of the green power sources impact the system frequency imperfectly. This paper develops an intelligent, i.e., fuzzy logic-based sliding mode control (F-SMC) utilizing a proportional-integral-derivative (PID) type sliding surface to regulate the frequency of a wind-diesel generator-based ATMG system. A dynamic structure of the wind generator is designed to participate in the frequency support of the considered plant. The mastery of the F-SMC is analyzed over the conventional SMC (C-SMC) under load perturbation. This study used the artificial gorilla troop optimization (GTO) technique to tune the F-SMC parameters. The effectiveness of the GTO-tuned F-SMC frequency regulation (FR) scheme is compared with well-established particle swarm optimization (PSO) and grey wolf optimization (GWO) approaches under various scenarios such as load perturbations, governor dead band (GDB), generation rate constraint (GRC), higher/lower dimensions of ATMG, and wind speed variations. Finally, the proposed GTO-based F-SMC approach has been validated upon a standard IEEE-14 bus system and compared with recent techniques.

Dr. Krishnakant Sahu

Research Article

Effect of textured shapes on slot entry hybrid conical journal bearing with ER lubricant behavior

Krishnakant Sahu , Adesh Kumar Tomar & Satish C. Sharma

Pages 615-642 | Received 28 May 2023, Accepted 07 May 2024, Published online: 01 Jul 2024

 Cite this article  <https://doi.org/10.1080/10402004.2024.2353608>



Abstract

This article investigates the influence of textured shapes and electrorheological fluid (ERF) behavior on slot entry hybrid conical journal bearing system (HCJBs). The slot entry restrictor is used as a compensating element to supply the lubricant in the clearance space. Spherical, rectangular, and triangular textured shapes over the surface of conical bearings have been employed. Furthermore, the intelligent properties of ERF on the behavior of textured slot entry HCJBs have been analyzed. The finite element method (FEM) and the successive iteration-based Gauss-Seidel method have been used to solve the modified Reynolds equation. The results drawn from this study show different influences on the bearing performance for different textured shapes. Using textured surfaces and ERF improves the minimum fluid film thickness, stability, and bearing stiffness compared to the non-textured bearing.

Keywords:

ER fluid

textured shapes

Reynolds equation

conical bearings

slot entry

Dr. Abhijit Banik

Analysis of Weld Quality in Dissimilar Friction Stir Welding of Aluminium and Copper Using Characterization of Force and Torque Signals

Original Research Article | Published: 27 May 2025

(2025) [Cite this article](#)

[Abhishek Mandal](#) , [Abhijit Banik](#), [Arpan Kumar Mondal](#), [John Deb Barma](#) & [Gautam Majumdar](#)

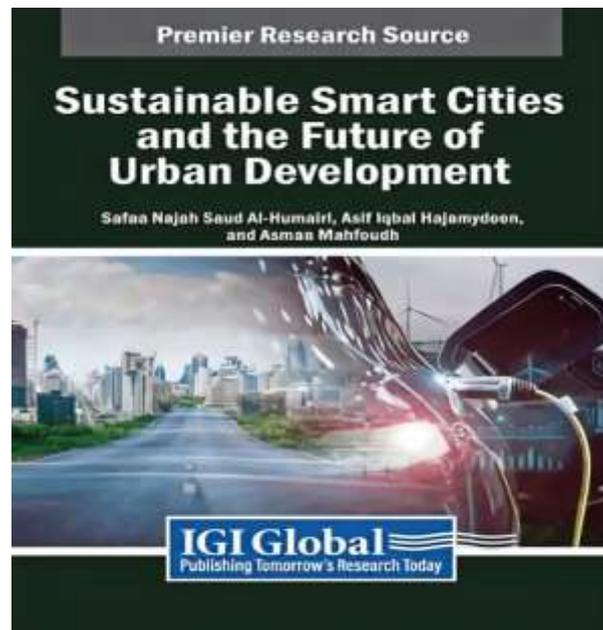
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Abstract

This study explores real-time force and torque signals for weld quality analysis in dissimilar Al/Cu friction stir welding. Straight hexagonal and straight cylindrical threaded tool geometries were used in this study, with varying traverse speeds (mm/s). Discrete wavelet transform decomposes the raw signals to reveal features linked to weld quality. The optimal mother wavelet function and corresponding decomposition level were chosen based on "maximum energy-to-entropy" ratio. Straight hexagonal tool exhibited less signal fluctuation compared to straight cylindrical tool. Detail signals are linked with bead surface texture, material state of uniformity, and instability during welding. In contrast, approximate signals signify deformation and material flow. Macrostructural observation reveals inadequate material mixing, resulting in a void in stir zone at 1.2 mm/s for straight cylindrical threaded tool. At 1.8 mm/s, both tools demonstrated effective material mixing in stir zone. During tensile strength analysis, straight cylindrical threaded tool showed a significant drop in tensile strength at a lower speed (1.2 mm/s), while both tools achieved their highest strength at the optimal speed (1.8 mm/s), with straight hexagonal tool exhibiting the best (93.4 MPa). Discrete wavelet transform analysis of friction stir welding signals has revealed significant observations in which poor weld quality shows defects in macrostructure.

Glimpses of book chapter published by the faculty of Mechatronics
Engineering Dept.

Mr. Swapnil Shivaji Sajane



Chapter 13

Energy-Efficient Building Design and Green Construction Practices for Smart Cities (pages 315-342)

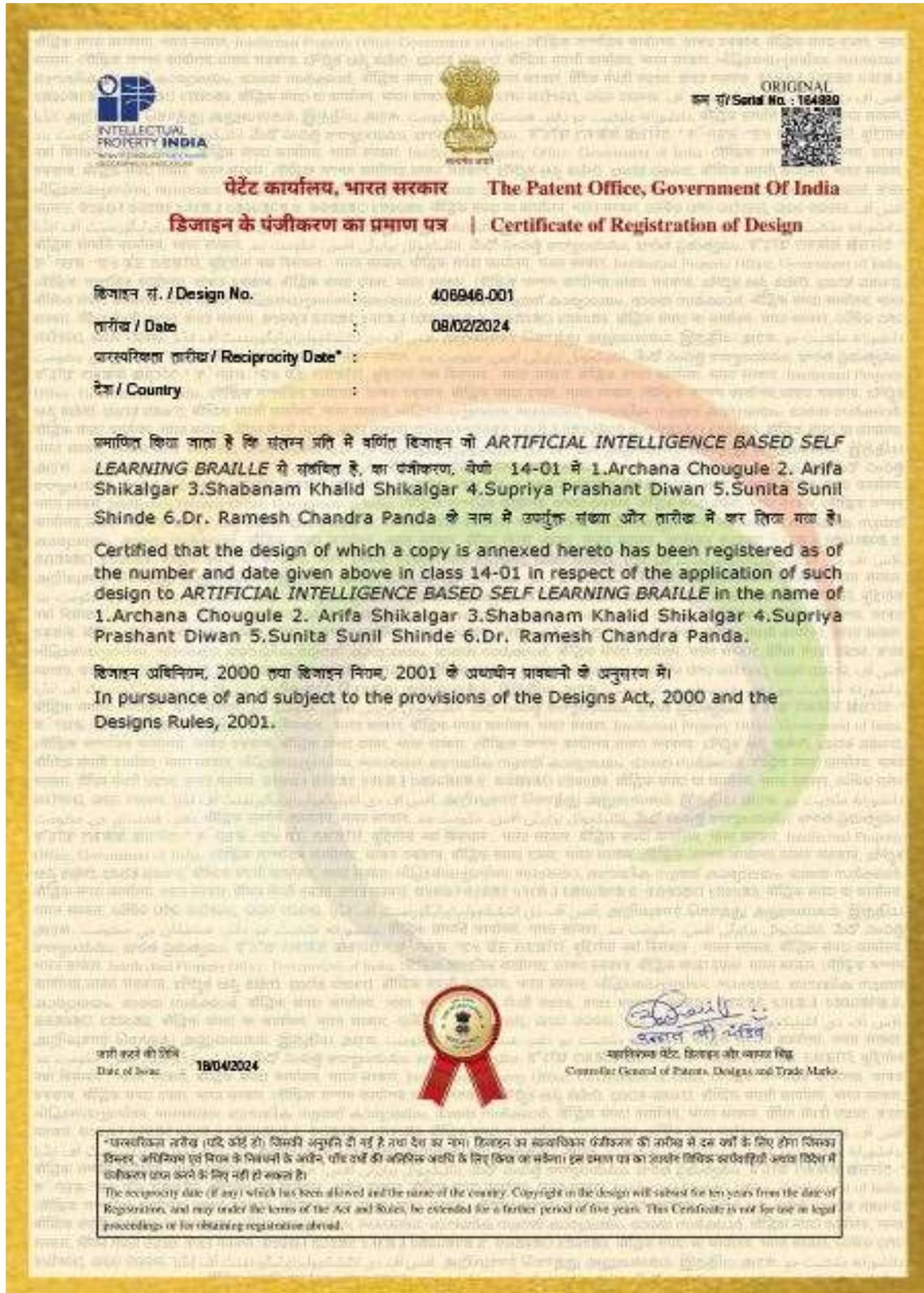
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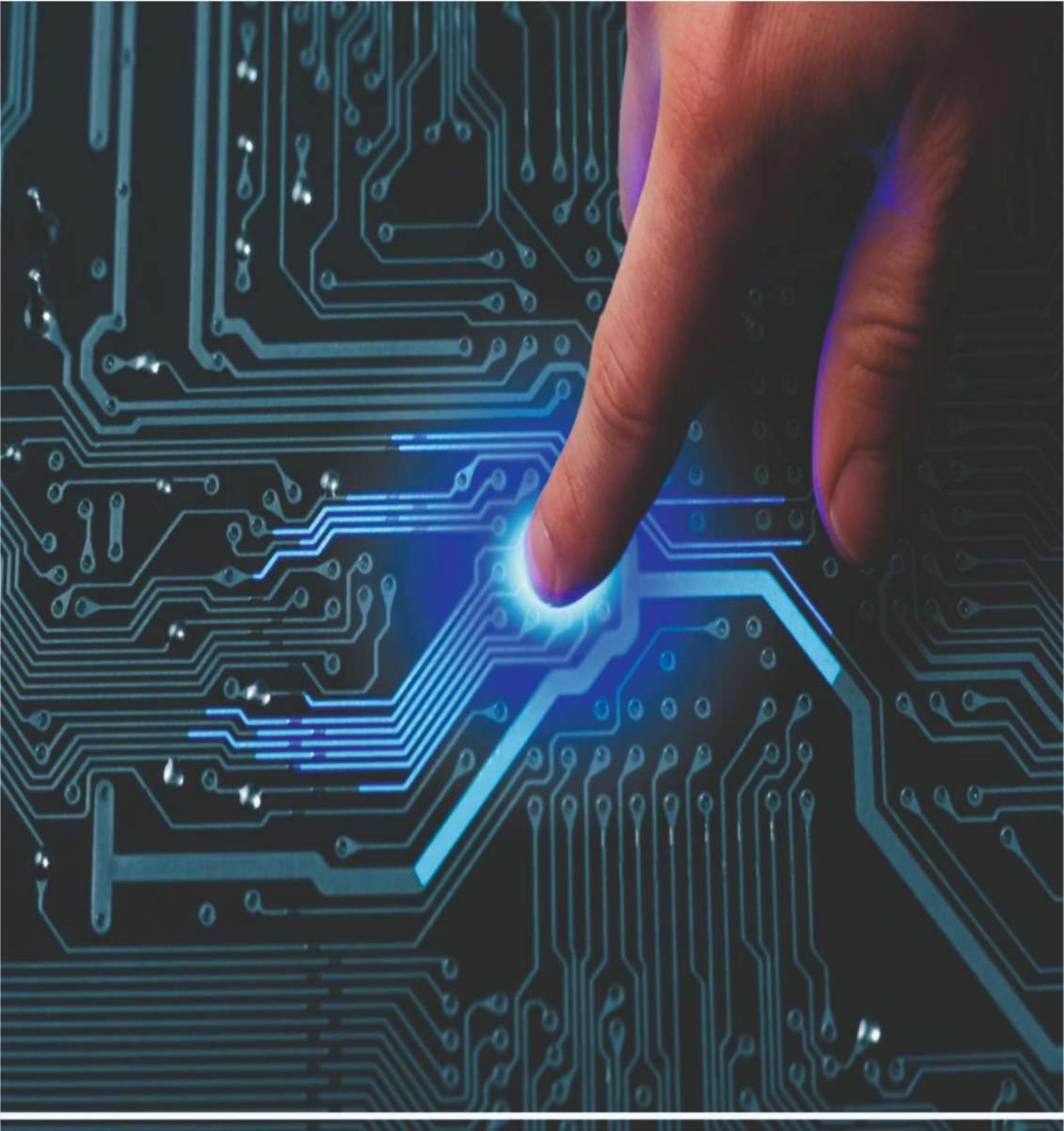
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Gat No.525,473/A Behind Onkareshwar Temple, Yadav (Ichalkaranji) - 416 121 Tal. Shirol, Dist. Kolhapur (M.S.) INDIA
Ph. : (02322) 253000, 253001 Fax. : (02322) 252897, E-mail : contact@sitcoe.org.in,

