ATMADIYA DEBNATH

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EDUCATION

Purdue University, West Lafayette, IN, USA — Aug 2021 - May 2023
- MS Mechanical Engineering
  Specialization in Automation and Robotics

Manipal University Jaipur, India — Jul 2016 - Jun 2020
- B.Tech. Mechanical Engineering
  Specialization in Hardware and Mechanical Design

TECHNICAL SKILLS

Domain of Experience : Robotics, Automation, Industrial Robotics, Mechanical Design, Control Systems, Machine Learning, Material Analysis
Languages & Softwares : Catia, Ansys, SolidWorks, Fusion 360, Creo Parametric, MATLAB, C, C++, Python, TinkerCad, Fritzing, V-REP
Tools & Technologies : Lean Six Sigma Yellow Belt, Robot Operating System, Arduino, Raspberry Pi, Finite State Machine, Testing & Calibration, Computer Integrated Machining
Relevant Courses : Analysis of Robotic Manipulators, Mechatronics, Autonomous systems and Mobile robots, Industrial Robotics & Flexible Assembly, Project Management - Assistive Technology, Operations Management, Numerical Methods for Engineers

RESEARCH PROJECTS

University Rover Challenge (URC 2020), Team Antriksh, Manipal University Jaipur — Aug 2019 - Apr 2020
- Spearheaded the mechanical design and fabrication of an autonomous rover for biotechnical research on Mars using CATIA, SOLIDWORKS and ANSYS to achieve the functionality and resilience to Mar's conditions, efficient movement completing all functional tasks
- Headed the mechanical team to solve the rover assembly challenges and complex design issues which accelerated the project timeline by 6 weeks
- Implemented strategic material selection and design optimization, delivering the cheapest project on budget (2300$) without compromising on quality

Whack-a-Mole PID-Controlled Robotic System — Jan 2022 - May 2022
- Led the development of an autonomous, PID-controlled robot, utilizing CATIA CAD and Arduino FSM, ensuring performance (>96%) through strategic assembly and integration of complex circuitry and sensor subsystems
- Demonstrated the robot's exceptional functionality and reliability by securing a finalist position in a Whack-a-mole competition held at Purdue University

Autonomous Waste Classification System — Jan 2023 - May 2023
- Developed an automated trash-sorting robot by employing advanced computer vision, machine learning and V-REP simulation for sustainable waste management improving the sorting over 40%, compared to the initial benchmarks achieved through meticulous testing and iterative enhancements in the robot's design and sorting algorithms contributing to sustainable waste management system
- Utilized a Convolutional Neural Network (CNN) model with a limited dataset of under 5000 entries, achieved an impressive accuracy rate exceeding 80 percent underscoring the efficacy and robustness of the design

HOUSEWARES 2000, Purdue University <-> Bangkok, Thailand — Jan 2023- May 2023
- To perform an operational analysis on a company called Housewares 2000, a leading manufacturer and designer of wooden houseware items based in Bangkok, Thailand
- Identifying the challenges related to maintaining consistent quality standards across multiple locations or suppliers during the pandemic and evaluating the effectiveness of the measures taken to address these challenges
- Introduction to automation in the warehouse and the production line to increase efficiency and decrease in the cycle time.
- Extensive Wait-time analysis and customer demand was done to pinpoint the operational issues and the decreased efficiency
- Quality analysis was done for the Grades of the products and dividing them for the mass production for the customers

Autonomous Exploration and Navigation, Purdue University — Jan 2022- May 2022
- To make a robot autonomously map an unknown environment and move the robot to its goal position by avoiding both static and dynamic obstacles using Robot Operating System (ROS)
- Implemented autonomous exploration code using RRT* algorithm for path planning and LIDAR scanner for creating the map of an unknown world
- Developed an algorithm to make the robot move using A* path planner approach and used OpenCv image processing techniques to avoid the dynamic obstacles in the extracted map

Wearable device for Visually Impaired, Purdue University — Aug 2022- Dec 2022
- Designed a wearable eyewear for people with disabilities using sensors, applying autonomous algorithms for making smart decisions while choosing the route that can helps a blind person to move easily
- Interviewed the healthcare providers and client in person and customized the device according to the needs
- Implemented a five-point project management plan to come up with this proposal of this new assistive technology

Trauma Induced Hypothermia Life Support, Purdue University — Aug 2021 - Dec 2021
- Quantitative feasibility evaluation of the newly proposed support device for the severe trauma induced hypothermic patients in war zones. To be an effective warming device must be able to transmit energy to body core at a rate of 60W over a 5-hour period
- Calculated the heat transfer and blood circulation effect in patients with shockingly low body temperature and pressure
- Designed a robust and lightweight shockproof exterior with its own warming device to transmit energy to the body by considering the patient's heart as the pumping source through a small heat exchanger
- Developed an algorithm in MATLAB to simulate the feasibility of the proposed device

Modifying the Chapati/Tortilla Making machine in Dining Court, Manipal University Jaipur Aug 2019- Dec 2019

- Using Lean manufacturing method, modify the chapati making machine to get the desired efficiency and reduce the cycle time
- Used DMAIC method to create a project charter to plan out the problems, progresses and goals
- Introduced controlled heating method to keep the chapatis warm after a longer period to reduce the wastage and prevent it from overcooking
- Induced time dependency method during the rush hours of the dining court by determining the takt time of each of the processes and calculated VA and NVA time to reduce the overall cycle time.
- Created a survey to get the statistical consumer count and preferences for the charter and implemented the proposed method for 3 weeks to check the progress

EXPERIENCE

Purdue University Jun 2023 - Present

- **Automated Sprinkler System:** Deployed a network of sensors and ML driven analytics to optimize irrigation practices. Achieved up to 20% reduction in water usage while enhancing crop health signifying improvements in resource efficiency (working on possibilities to optimize water usage)
- Conducting extensive field trials to validate system performance under various weather conditions, leading to iterative improvements in sensor accuracy, predictive models (ongoing)

MK Works, Jaipur, India Jan 2021 - July 2021

- **3D Printed Housewares and Gift Items:** Oversaw design and printing processes, implementing stringent quality control measures and process optimizations, resulted in enhanced product quality and accelerated product completion for customer satisfaction which increased the demand by 70% than the usual orders
- Utilized CAD and slicing software (FUSION 360) to design and produce bespoke 3D printed items efficiently. Focused on optimizing print settings for better results, balancing quality with production speed

Indian Institute of Technology Delhi, New Delhi, India Jul 2020 - Dec 2020

- **Autonomous Mobile Utility Vehicle:** Implemented ROS for navigation and control, integrating solar power and battery management to enhance efficiency by ~ 25% and utilized SLAM for accurate environment mapping and navigation, which significantly increased precision in varied terrains
- Incorporated Machine Learning Framework using Convolutional Neural Networks (CNN) for real time object detection and classification and Recurrent Neural Networks (RNN) for predictive modeling of vehicle dynamics which helped in ~ 40% increase in operational efficiency

Semi-Conductor Laboratory, Indian Space Research Organization (ISRO), India Jan 2020 - Jun 2020

- **High-Performance IC Packaging for Space Environments:** Utilized high-thermal-conductivity ceramic substrates and pioneered compatibility studies of novel, high-temperature-resistance alloys
- Employed ANSYS AIM for detailed finite element analysis, ensuring optimal heat dissipation and structural integrity under space-grade conditions. The enhancements led to a substantial improvement ~ 51% in IC performance and reliability, withstanding the rigors of extreme space environments

National Physical Laboratory, CSIR, India Jun 2019 - Jul 2019

- **Calibration and Fringe Metrology:** Procured weights and precision liquid standards, subsequently calibrating them through a rigorous protocol benchmarked against France NPL's reference standards. Implemented systematic methodologies, including differential weighing and pycnometric techniques
- Aimed to ascertain and uphold the stringent flatness standards of metal sheets, utilizing specialized instrumentation such as optical flats, laser interferometers, and autocollimators

College of Aviation Technology (CATECH), Dhaka, Bangladesh Jun 2018 - Aug 2018

Selected By: International Association for the Exchange of Students for Technical Experience (IAESTE)

- **Human Space Colonization at L1 Libration Point 10,000 habitants**
- Designed Airlock and structure of layered Spacesuits for visitors
- Innovate methods for Food supply and agriculture on infertile land
- Created a mechanism for Day and Night Provision and assisted in producing external and internal communications
- College Teaching Assistant: Mathematics for Engineers for 1st level bachelor's at CATECH

Solid State Physics Laboratory, Defence Research and Development Organization, India Jun 2017 - Jul 2017

- **Leak Analysis Using Helium Mass Spectrometry:** Utilized helium mass spectrometry for precise leak detection in vital system components. This technique encompassed charging DEWAR, vacuum tubes, and pumps with helium, conducting comprehensive scans using a sophisticated spectrometer, accurately identifying leak sources, and facilitating specific repairs to maintain optimal component integrity
- Defined safety threshold algorithms in tandem with optimizing leak detection protocols using helium mass spectrometry. This pivotal enhancement in the modification process led to a marked reduction in defects ~ 80% for essential system components