atomQUEST

2024

COMPETITION STRUCTURE

Round 1: Abstract Submission

- Participants must submit a one/two page abstract (not exceeding 600 words) of their proposed solution in PDF format.
- They need to follow the same structure as provided
- The **last date to submit entries is 8th December 2024.**
- Submissions can be edited and uploaded until the deadline. Early submissions are advised to avoid technical issues.

Round 2: Proposal and Prototype Plan Submission

- Participants will submit a detailed project report along with a video prototype of their solution.
- The project report must cover the scope of the problem, the proposed solution, the technology used, and its feasibility.
- The video prototype should demonstrate the functionality and innovation of the proposed solution.
- The **last date to submit** the video prototype and report will be in **last week of December.** The date will be announced after the abstract submission round.

Round 3: Semi-Final Prototype Presentation

- Selected teams will work on a functional prototype or a detailed simulation of their solution. Please note, we are not expecting a final model but a well-thought-out prototype that demonstrates the feasibility of your idea.
- Teams will present their models to an Atomberg jury panel comprising senior leaders and technical experts.
- Finalists will be announced based on creativity, technical soundness, and feasibility.:
- Teams will have the opportunity to present their prototype/idea at Shaastra, IIT Madras Fest, scheduled from 3rd-7th January 2024

Mentorship

- Shortlisted teams will be paired with Atomberg mentors, who will guide them through the development phase, providing insights, feedback, and technical support.
- Teams can use these mentorship sessions to refine their solutions and overcome challenges.

COMPETITION STRUCTURE

Round 4: Grand Finale

The Grand Finale will be an exclusive **in-person event** at the prestigious **Atomberg Innovation Center (AIC)**. Finalists will showcase their fully developed solutions to Atomberg's visionary leadership team and a jury of esteemed industry leaders.

What to Expect:

- **Spotlight Presentation**: Teams will have 10 minutes to present their innovative solutions, followed by an engaging 10-minute Q&A session.
- **Exclusive Opportunity:** Interact with Atomberg's founders – the dynamic duo of engineering brilliance, who turned their innovative ideas into a transformative success story. Gain insights and inspiration directly from these trailblazing minds!

Rewards

- Winner – Cash prize INR 1,00,000
- 1st Runner-Up – Cash prize INR 60,000
- 2nd Runner-Up – Cash prize INR 40,000
- Placement or Internship opportunities with Atomberg
- Certificate of Excellence for finalists
- Participation Certificates for all shortlisted teams

Seize this opportunity to create impactful solutions, enhance your technical expertise, and shape the future of Mech-Electronics innovation with AtomQuest 2024!

PROBLEM STATEMENTS

There are 3 problem statements . You are free to choose ***ANY ONE*** *of them for this competition.*

Problem Statement 1- Knob Interface

Background: Most small household appliances place a lot of emphasis on the user interface. Knobs are a popular interface element that has passed the test of times. From old radios to modern cooktops, you see knobs everywhere. Thus, there is an inherent resilience and universality to the design that keeps finding applications even as times change. This problem statement intends to step up the universality even further.

Problem: Create a universal smart knob that can be used across multiple Kitchen/Home appliances like Mixer Grinder, Cooktop, Air Fryer, Slow Juicer, Air Purifier, etc. The wider the applicability of the knob, the better the submission will be rated.

Examples of System Features

- Futureproofing (Firmware updates? Digital displays? Why not?)
- Contemporary design (textured designs, haptic feedback)
- Multi-functionality (touch, press, rotate, press-and-rotate, etc.)
- Attractive interface (LED placement, light guides)
- Motion smoothness
- Gesture recognition (rotation can also have patterns)
- Embedded sensors (the knob lighting up when a user is nearby)
- App connectivity (knob options being configured using an app)

Constraints

- The entire design (Electronics / Mechanical) must be created from scratch, additions on top of an existing knob will not be considered

Evaluation Metrics

- Touch and feel
- Smartness (firmware update, touch, display, etc.)
- Universality
- Adaptability
- Aesthetics
- Practicality (size, ease of use)
- Multi-functionality
- Cost considerations

Problem Statement 2- Motorized System Design

Background: In modern households, automation and motorized systems are becoming increasingly integral to everyday life. From robotic vacuum cleaners to automated blinds and smart kitchen appliances, motorized systems offer convenience, efficiency, and enhanced user experience. College students studying engineering, robotics, and automation have the opportunity to explore real-world applications by designing motorized systems that can solve everyday problems in the home. The challenge is to create systems that are practical, cost-effective, energy-efficient, and easy to use, while integrating various engineering principles like mechanical design, electronics, and software control.

Problem: Design and build a motorized system intended for household use that solves a common problem or improves daily living. The system should incorporate mechanical actuation (using motors or servos), sensor integration, and automated control. It should be practical, reliable, and easy to operate, with an emphasis on energy efficiency and user safety.

Objectives:

1. Identify a common household challenge that can be addressed through a motorized system (e.g., an automated curtain opener, motorized plant watering system, or robotic kitchen assistant).
2. Design the motorized system to effectively perform the desired function (e.g., moving, lifting, rotating, or adjusting household objects).
3. Incorporate a motorized actuation system using electric motors, servos, or stepper motors to perform mechanical movements.
4. Develop a control system using microcontrollers (e.g., Arduino, Raspberry Pi) that enables the system to operate autonomously or through a simple user interface (e.g., button, app, or voice control).
5. Integrate sensors (e.g., motion, humidity, temperature, light) to automate or optimize system performance based on real-world inputs.
6. Ensure energy efficiency by selecting appropriate power sources (e.g., rechargeable batteries, solar panels) and optimizing system design to minimize energy consumption.
7. Ensure safety in both the system's design and operation, considering the household environment.

Expected Outcomes:

1. A fully operational motorized system that successfully addresses a household challenge and meets the functional requirements specified in the design.
2. A seamless integration of mechanical, electrical, and software components, demonstrating interdisciplinary knowledge.
3. Documentation that includes the system's design, wiring schematics, control logic, and performance evaluation.
4. A practical, user-friendly solution that can be demonstrated and tested in a real-world household setting.
5. A design report including system concept, schematics, material list, and code.

Constraints:

- The system should be safe for use in a household environment, with minimal risk to users.
- The project should be cost-effective, with a budget limit.
- The system should be user-friendly, requiring minimal setup or interaction.
- The system should be energy-efficient and, ideally, operate using a sustainable power source (e.g., solar power, rechargeable batteries).
- The project timeline is 6-8 weeks.
- The system should be novel. Minor modifications to an existing system will not count as an acceptable submission.
- Designed for a load of 2 kg if the motor drives a vertical load, or 4 kg otherwise
- Operational speed - maximum possible speed with minimum power

Evaluation Metrics:

- Energy efficiency
- Choice of motor
- Load calculations
- Smoothness of operation (UX)
- Drive algorithm
- Reliability
- Cost considerations

Problem Statement 3- Smart Fluid Container

In today's world, smart technologies are seamlessly embedded into everyday products, elevating their functionality and enriching the user experience. This problem statement focuses on designing, building, and demonstrating a prototype of a **Smart Fluid Container** - a technologically advanced container integrated with sensors to monitor fluid levels, quality, and other essential parameters.

The definition of "smartness" is open-ended, allowing you to determine which features and functionalities to include. The expectation is that your design will incorporate multiple sensors and provide users with actionable insights. The solution should be reliable, cost-effective, and user-friendly, highlighting creativity, engineering skill, and technical innovation. The container's size can vary. from a small glass to a large community tank, depending on the intended application. Feel free to explore imaginative possibilities, such as an AI-powered smart container!

Examples of System Features

- **Fluid Level Monitoring -** Level Sensors, Threshold Alerts, Usage Insights.
- **Quality Control Sensors -** Parameters Tracking (pH, temperature, turbidity etc.), Real-Time Quality Monitoring, Trend Analysis.
- **IoT and Cloud Connectivity** - Wireless Communication, Remote Access via App/Web Interface, Cloud-Based Storage.
- **Predictive Maintenance and Leak Detection** - Data Analytics and Machine Learning, Leak Sensors, Preventive Alerts.
- **User Interface and System Dashboard** - Centralized Dashboard, Customizable Notifications, Multi-User Access and Permissions.

Constraints

The Smart Fluid Container aims to solve these issues by incorporating features like level indication, quality measurement, IoT connectivity, and additional functionalities. The system should be designed with reliability, efficiency, and user-friendliness in mind.

Development Guidelines

1. **Showcase a Working Prototype:** Demonstrate selected core functions, such as fluid level indication, quality measurement, IoT integration or any other.
2. **Document Assumptions:** Clearly specify any assumptions made about fluid type, container size, environmental conditions, and power requirements.
3. **Design and Engineering Choices:** Document decisions regarding materials, sensors, and connectivity methods, providing rationale for each selection to support reliability, durability, and practicality.
4. **Ensure Reliability and Testability:** Outline measures to test sensor accuracy, battery life, and connectivity under varying conditions to illustrate real-world applicability
5. **Cost-Efficiency:** Describe efforts to keep the prototype affordable without compromising functionality.
6. **Identify Future Scope:** Present potential improvements and ideas for future development, including commercialization opportunities

Evaluation Metrics:

- **Creativity and Innovation**
  - Unique and valuable features added to the Smart Fluid Container.
  - Novel approaches to address the challenges of fluid monitoring, quality measurement, IoT connectivity, and other features.
- **Technical Decisions and Engineering Rationale**
  - Quality and relevance of engineering decisions.
  - Clear documentation of assumptions and justifications for selected materials, sensors, and connectivity solutions.
  - Consideration of environmental factors, reliability, and ease of maintenance.
- **Prototype Functionality**
  - Functioning prototype showcasing fluid level indication, quality monitoring, IoT connectivity or any other selected features.
  - User-friendly interface and practical functionality.
- **Reliability and Scalability**
  - Measures taken to ensure sensor accuracy, data reliability, and device longevity.
  - Considerations for scaling up the product for potential commercial applications.