Proposal for Building the Feugo-15 Buggy

Table of Contents

1. Executive Summary

The **Feugo 15** project is an innovative initiative to design and build a buggy that serves as both a technical challenge and a platform to impress our college community. Powered by a 150cc Hero CBZ petrol engine, the buggy features an open chassis constructed from rectangular steel pipes with integrated suspension and designated measurement provisions. The system incorporates modern electronics—including an Arduino/ESP-based control system with optional LoRa/GSM communication—and a mobile-controlled interface, offering functions such as engine start/stop, key activation, and an emergency kill switch. In addition, F15 is designed to support workshops, technical talks, webinars, driving events, and competitive races.

2. Introduction

The F15 buggy represents a true interdisciplinary challenge that bridges theoretical learning with hands-on application. By combining principles of mechanical design, electronics, control systems, and computer science, the project aims to create a fully functional and impressive vehicle. Developed by a team of 15 equally contributing members, F15 not only demonstrates technical prowess but also serves as a platform for community engagement through live events and collaborations with clubs such as IEEE, SAE, and IEDC.

Key Features Include:

- **Engine:** 150cc Hero CBZ petrol engine.
- **Chassis:** Open design using rectangular steel pipes with integrated suspension and measurement provisions.
- **Electronics:** Arduino/ESP boards with sensor integration (e.g., RPM meter) and potential LoRa/GSM communication.
- **Control:** Mobile app management for engine control, key activation, and emergency safety functions.
- **Events:** Hosting of workshops, technical talks, webinars, driving events, and best-time races.

3. Project Objectives and Scope

Objectives:

- **Design & Build:** Fabricate a fully functional buggy that serves as both a hobby project and a demonstration of interdisciplinary engineering.
- **Innovation:** Integrate advanced mobile-controlled features and safety systems (including an emergency kill switch) for performance and reliability.
- **Equal Collaboration:** Maintain equal contributions across the 15-member team from EEE, ECE, and CSE.
- **Community Engagement & Revenue:** Create a platform for hosting live technical events and generating income through diverse revenue streams like workshops and collaborative sessions.

Scope:

- **Design Phase:** Develop conceptual sketches, detailed CAD models (with precise dimensions), and finalize materials.
- **Development & Integration:** Construct the chassis, integrate the Hero CBZ engine and suspension, and assemble the electronics and control systems.
- **Control System:** Implement an Arduino/ESP-based control system paired with a dedicated mobile app for various control functions.
- **Testing & Demonstration:** Establish comprehensive testing protocols on college grounds using a modular track, followed by live events that showcase the buggy.

4. Team Structure

Our flat team of 15 members contributes equally across every aspect of the project. The team members are:

- Pranay K Pradeep (S4 EEE)
- Renvin C J (S4 ECE)
- Mohammed Shamil S (S4 ECE)
- Nidhin Sudhakaran (S4 ECE)
- Arjun N Binu (S4 EEE)
- Josh Danial S (S4 EEE)
- Asif Ali S (S4 ECE)
- Alan S (S4 ECE)
- Dheeraj A G (S4 CSE)
- Ebin Mathews John (SE CSE)
- Joel Joseph (S2 EEE)
- Athul Krishnan B (S2 EEE)
- Vinayak Sabu (S2 EEE)
- Sarang V R (S2 EEE)
- Amal Dev T S (S4 CSE)

Each member is involved in brainstorming, design development, fabrication, testing, and event coordination, ensuring a balanced contribution across all disciplines.

5. Department Contributions

Although all team members contribute equally overall, our interdisciplinary approach leverages specific strengths from various departments:

- **Mechanical & Electrical:** Responsible for the chassis design, engine integration, suspension system, and incorporating precise measurement provisions. Expertise from the EEE and ECE domains ensures robust material selection and effective fabrication techniques.
- **Electronics & Electrical:** Focused on developing control algorithms, firmware on Arduino/ESP boards, sensor interfacing (including an RPM meter), and managing power distribution. Contributions from ECE (with support from EEE) ensure seamless integration between hardware and control software.
- **Computer Science:** The CSE group leads the design, development, and maintenance of the project's digital aspects, including the dedicated website and mobile application that manages engine control, safety functions, and overall cybersecurity.

6. Technical Approach and Methodology

6.1 Mechanical Design

Overview: The mechanical design focuses on constructing a lightweight yet durable chassis using rectangular steel pipes and integrating a robust suspension system to enhance ride quality. The design is flexible, allowing ample space for detailed measurement integration and future modifications.

6.1.1 Detailed Dimensions & Specifications

The following table serves as a template. Finalized dimensions, including tire sizes and other parameters, can be filled in as the design is refined:

Parameter	Measurement	Comments/Notes
Chassis Length	2 meters	Overall length of the buggy
Front Width	60 cm	Measured at the front axle
Rear Width	80 cm	Measured at the rear axle
Tyre Size (Front)	120/R10/80	Specify diameter and width
Tyre Size (Rear)	145/R12/80	Typically may differ from front tires
Ground Clearance	15 cm	Distance from the lowest body point to the ground

Note: Further parameters (such as axle dimensions, suspension travel, etc.) can be added as the design is finalized.

6.2 Electrical & Electronics

- **Components:**
  - **Control Hardware:** Implementation using Arduino and ESP boards for real-time control.
  - **Sensors:** Integration of performance-monitoring sensors including an RPM meter.
  - **Communication Modules:** Evaluation and selection between LoRa or GSM modules for remote control functionality (to be confirmed).

- **Wiring & Power Management:** Detailed wiring diagrams will be drafted to ensure optimal power distribution from the engine and battery systems to all electronic circuits.

6.3 Control Systems & Software

- **Mobile Application:**
    - **Core Functions:** Key activation, engine start/stop, and emergency kill switch.
    - **User Interface:** Designed to be user-friendly, allowing rapid intervention if needed.
- **Firmware Development:**
    - Development on Arduino/ESP platforms to process commands from the mobile app in real time.
    - **CS Team Involvement:** Team members (Dheeraj, Ebin, Amal) will develop and maintain the project website and mobile app, ensuring robust cybersecurity and seamless user experience.

6.4 Prototyping and Testing

Concept & Design

▼

Component Selection & Materials

▼

Prototype Fabrication & Assembly

▼

Testing & Calibration

▼

Refinement & Finalization

- **Testing Environment:** Field tests will be performed on the college grounds utilizing a modular, removable track.
- **Safety Trials:** All tests adhere to strict safety protocols including PPE usage. An emergency kill switch is available both on the buggy and via the mobile app to ensure immediate shutdown if necessary.

7. Timeline and Milestones

Overall Duration: Approximately 1 month (post-class project work)

Phase	Duration	Key Milestones
Concept & Initial Design	1 week	Finalize sketches and produce basic CAD models.
Detailed Design & Component Sourcing	1 week	Confirm detailed dimensions, secure vendor approvals, and select materials.
Prototype Fabrication	1–2 weeks	Fabricate chassis, install suspension, and mount the Hero CBZ engine.
Electronics & Control Integration	1 week	Develop firmware, integrate sensors, and implement mobile app controls.
Testing & Final Adjustments	1 week	Conduct field testing on college grounds and refine design as needed.

8. Budget and Resource Requirements

A preliminary budget is estimated as follows :

Component Category	**Estimated Cost**	**Details**
(a) Chassis & Structural Components	₹15,000	Includes rectangular steel pipes, suspension components, fasteners, and measurement fixtures.
(b) Engine & Drive System	₹15,000	150cc Hero CBZ petrol engine and associated mounting hardware.
(c) Electronics & Power Systems	₹5,000	Arduino/ESP boards, sensor integration (including RPM meter), and wiring.
(d) Control Systems & Modules	₹5,000	GSM/LoRa modules (to be confirmed) and support for mobile app development.
Total Estimated Cost:	**₹40,000**	*Excludes additional funds for testing, prototyping tools, and contingencies.*

Final funding will be secured through college grants, potential corporate sponsorships, and departmental resources.

9. Risk Management and Safety Considerations

Risk Areas:

- **Technical Delays:** Delays in component integration or procurement.
- **Budget Overruns:** Unforeseen costs due to market fluctuations.
- **Safety Hazards:** Mechanical or electrical risks during fabrication and testing phases.

Mitigation Strategies:

- Reserve a 10–15% contingency fund for unforeseen expenses.
- Hold regular (weekly) progress meetings to identify and address issues promptly.
- Enforce strict safety protocols, including mandatory use of PPE during fabrication/testing.
- Incorporate an emergency kill switch (physically on the buggy and via the mobile app) for immediate shutdown if issues arise.
- Conduct all tests in controlled environments (using modular tracks on college grounds).

10. Revenue Generation Strategy

To support the project's sustainability and maximize its impact, F15 will explore several revenue-generating measures:

- **Workshops, Technical Talks & Webinars:** Host events and sessions where project development, design challenges, and interdisciplinary solutions are showcased. These events may attract sponsorship from industry experts and faculty.
- **Driving Events & Best Time Races:** Organize competitive driving events on a modular track, attracting sponsorships and community participation.
- **Collaborative Events with College Clubs:** Partner with clubs such as IEEE, SAE, and IEDC to host joint demonstrations, panel discussions, and product exhibitions.
- **Digital Outreach:** Develop and maintain a project website and mobile app (handled by the CS team) for live updates, tutorials, and event streaming. Monetization avenues include ad revenues, registration fees, and sponsorship packages.

11. Expected Outcomes and Impact

Technical Deliverables:

- A fully operational F15 buggy with advanced remote-control functionality.
- A robust mechanical design featuring an integrated suspension system and precise measurement accommodations.
- A comprehensive control system ensuring secure and reliable operation.
- A dedicated online presence (web and mobile) that serves as a hub for event information and project updates.

Academic and Practical Impact:

- Hands-on interdisciplinary experience for all 15 team members, fostering technical and collaborative skills.
- Enhanced college visibility through live demonstrations, workshops, and joint events with industry and college clubs.
- A platform for further research, product development, and potential commercialization.
- Sustainable revenue streams supporting continuous innovation and outreach.

12. Conclusion

The F15 project embodies a forward-thinking, collaborative approach to interdisciplinary engineering. With a flat team of 15 equally contributing members from EEE, ECE, and CSE, the project not only produces a high-performance buggy but also creates a platform for community engagement and educational events. Our integrated revenue strategy, combined with a robust design and comprehensive testing, positions F15 as an influential and sustainable initiative for our college and beyond.

Final Note

This proposal is a dynamic document that will evolve as the F15 project progresses. We welcome feedback and suggestions as we refine our design and prepare for upcoming college events.