🦕 InnoDino Project Catalog

Educational Technology Development - Georgia Tech

Submission Date: July 27, 2025

Project Type: Development Track (Educational Tool)

Project Title: InnoDino - Low-Cost Modular Robotics Learning Kit for Underprivileged K-12 Learners

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📋 Executive Summary

InnoDino is a comprehensive educational robotics platform designed to make coding and robotics accessible to every child, regardless of economic background or technical infrastructure. The project addresses the critical gap in affordable, offline-capable STEM education tools by providing an ultra-low-cost modular robotics system with intuitive visual programming.

Key Innovation: Mobile-first, offline-capable robotics education that requires no computers, internet, or expensive equipment - just a basic Android device and affordable hardware modules.

📁 Archive Contents Overview

This submission contains a complete educational robotics platform consisting of:

🎯 Core Deliverables

- **Mobile Application** (Android APK + Source Code)
- **Hardware Firmware** (Arduino-compatible code)
- **Educational Curriculum** (Story-driven learning modules)
- **Product Website** (Angular SPA for community & resources)
- **Technical Documentation** (Protocol specs, setup guides)
- **Design Assets** (Branding, system architecture diagrams)

🌐 Online Components

- **Live Website:** https://breejesh.github.io/innodino
- **Demo Videos:**
- Product Trailer: https://youtu.be/7SP1aFBtbIY
- Technical Presentation: https://youtu.be/Pboqs_4Z1Ag

📂 Detailed File Structure

`/` (Root Directory)

- `README.md` - Main project documentation
- `design-diagram.png` - System architecture diagram
- `innodino-blocks.apk` - **Ready-to-install Android application**
- `LICENSE` - GNU AGPL v3.0 license file

`/innodino_blocks_android/` (Mobile Application)

Purpose: Core Android application with visual programming interface

Key Files:

- `app/src/main/` - Complete Android application source code
- `java/com/innodino/` - Application logic, block programming engine
- `res/` - UI layouts, strings, drawable resources
- `assets/missions/` - Educational content JSON files
- `missions_led.json` - LED module curriculum (5 progressive missions)
- `missions_robot.json` - DinoBot module curriculum (5 progressive missions)
- `build.gradle` - Project build configuration
- `README.md` - Android development setup and architecture documentation

Educational Documentation:

- `LED Module.md` - Complete curriculum guide for LED programming (Rex character storyline)
- `DinoBot Module.md` - Complete curriculum guide for robot programming (Zara character storyline)
- `DinoSerial Protocol.md` - Technical specification for hardware communication

Testing Instructions: Install the APK on any Android device (API 21+) to test the complete block programming interface.

`/innodino-firmware/` (Hardware Code)

Purpose: Arduino-compatible firmware for physical hardware modules

Contents:

- `InnoDinoFirmware/` - Complete firmware source code
- LED matrix control systems
- Motor control for DinoBot
- Ultrasonic sensor integration
- Serial communication protocol implementation

`/innodino-labs-spa/` (Product Website)

Purpose: Angular-based website for product information and community resources

Key Files:

- `src/app/` - Angular application source code
- `app.component.html` - Main product showcase page
- `app.component.css` - Responsive design and styling
- `package.json` - Build dependencies and scripts
- `README.md` - Website development and deployment guide

Built Website:

- `/docs/` - Compiled website ready for deployment
- Fully responsive design
- Module showcase cards
- Feature highlights
- Community resources

`/InnoDino Branding/` (Design Assets)

Purpose: Complete brand identity and visual design system

Contents:

- `Logo/` - Primary logo files
- `logo.png` - Primary brand logo
- `logo.afphoto` - Editable source file
- `Modules/` - Visual assets for educational modules

🎓 Educational Content Structure

Curriculum Design Philosophy

The educational content follows a **story-driven, mission-based learning approach** that transforms abstract programming concepts into engaging adventures:

LED Module - "Rex's Crystal Magic Adventure"

- **5 Progressive Missions** from basic LED control to complex sensor-responsive light shows
- **Programming Concepts:** Variables, loops, conditionals, sensor input, LED matrix control
- **Narrative Framework:** Rex the Robot Dino explores Digital Dinosaur Valley

DinoBot Module - "Zara's Navigation Quest"

- **5 Progressive Missions** from basic movement to autonomous navigation
- **Programming Concepts:** Movement control, sensor-based decisions, obstacle avoidance

- **Narrative Framework:** Zara the DinoBot saves the Digital Valley

Learning Progression

1. **Mission 1:** Basic control (LED on/off, forward/backward movement)
2. **Mission 2:** Advanced control (variables/turning)
3. **Mission 3:** Sensor integration (distance-based decisions)
4. **Mission 4:** Simple automation (patterns/basic obstacle detection)
5. **Mission 5:** Complex autonomous behavior (light shows/navigation)

🛠 Technical Architecture

System Components

1. **Mobile App (Android)** - Visual block programming interface
2. **Hardware Modules** - LED Matrix and DinoBot with Arduino-compatible microcontrollers
3. **Communication Protocol** - Custom DinoSerial protocol for USB connection
4. **Educational Framework** - JSON-based mission system with progressive difficulty

Key Technical Innovations

- **Offline-First Design:** Complete functionality without internet dependency
- **Visual Programming:** Drag-and-drop block interface accessible to young learners
- **Modular Hardware:** Expandable system starting from $15 LED module

- **Cross-Platform Protocol:** Arduino-compatible firmware for hardware flexibility

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🔧 Setup and Execution Instructions

Mobile Application

1. Install `innodino-blocks.apk` on Android device (API 21+ required)
2. Launch application and explore block programming interface

Website

1. Open https://breejesh.github.io/innodino/ in any modern web browser

📊 Impact and Educational Value

Target Audience

- **Primary:** K-12 students (ages 8-18)
- **Secondary:** Educators seeking affordable STEM tools
- **Geographic Focus:** Underserved communities with limited technology access

Learning Outcomes

- **Programming Concepts:** Variables, loops, conditionals, functions
- **Robotics Principles:** Sensors, actuators, autonomous behavior
- **Problem-Solving Skills:** Debugging, iterative design, logical thinking

- **STEM Integration:** Mathematics, physics, engineering concepts

Accessibility Features

- **No Internet Required:** Complete offline functionality
- **No Computer Required:** Mobile-only development environment
- **Affordable Hardware:** Starting at $15 per module
- **Multiple Languages:** Extensible localization framework

🚀 Future Development

Planned Enhancements

- **Additional Modules:** Sound, Camera, Environmental Sensors
- **Teacher Dashboard:** Progress tracking and classroom management
- **Community Platform:** Student project sharing and collaboration

Open Source Community

- **GitHub Repository:** Full source code available under AGPL v3.0
- **Educational License:** Free for all educational use
- **Commercial Partnerships:** Licensing available for manufacturers

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📞 Contact Information

Project Lead: Breejesh Rathod

Institution: Georgia Tech - Educational Technology Program

Email: brathod7@gatech.edu

Project Repository: https://github.com/breejesh/innodino

🦕 **Mission Statement:** Bringing real robotics and coding education to every child, everywhere, regardless of economic circumstances or technological infrastructure.

This catalog documents a complete educational technology solution designed to democratize STEM education through accessible, engaging, and effective robotics learning experiences.