Improvement of the Outreach Buggy

Project Brief

Our outreach activity, *Robot Bowling*, involves students sending movement commands to a small buggy to knock over pins. The current setup includes a pre-designed robot chassis and an onboard microcontroller, but it relies on a long wire for communication.
This project aims to upgrade the buggy by making it wireless, enhancing its control interface, and improving both mechanical and electronic design elements to increase functionality, appeal, and ease of use during outreach events.

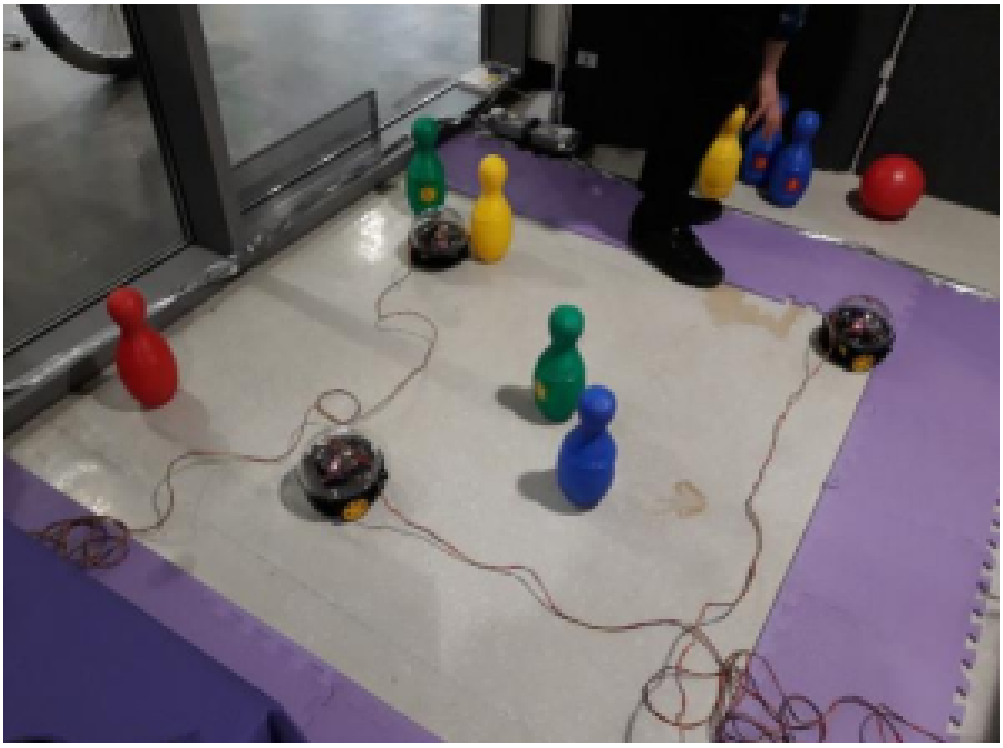

Figure 1: *
Figure: Image of the Existing Outreach Buggy

Summary of Objectives

The key goals are to:

- Eliminate the wired connection by implementing wireless communication (Bluetooth or Wi-Fi)
- Develop an intuitive user interface, likely web-based, for control via PC or mobile devices
- Enhance mechanical and electronic design for better performance, robustness, and engagement
- Incorporate user feedback features such as LED indicators or a display screen

Initial Research & Design Considerations

Electronics

Power

- Battery-powered system with onboard charging via USB-C or Micro-USB
- Include battery monitoring for user awareness

Communication

- Must support wireless operation (Bluetooth or Wi-Fi)
- Option to host a web server on the microcontroller or use an external device (e.g., Raspberry Pi)

Microcontroller Requirements

- Sufficient flash memory for web interface and control logic
- Motor drivers integrated or easily interfaced
- Support for programming/debugging (e.g., SWD, USB)

Feedback

- Onboard LED indicators or a small screen to show connection status, power, and system state

Mechanical Design

- Robust and easily serviceable
- Attractive design that showcases internal components

Drive System

- Two rear motors (e.g., N20 gear motors) for good torque and acceleration
- A roller or ramp at the front for knocking over pins effectively

Safety

- Motors should be powerful but not dangerously fast

Materials

- Use of multi-material 3D printing:
  - Rigid parts for structure
  - TPU for tyres and bump protection

Software and Interface

User Interface

- Web-based and intuitive, accessible from any modern device
- Easy to pair/connect with minimal user setup

Connectivity

- Bluetooth or Wi-Fi, depending on platform and performance needs

Feedback

- The buggy should visually indicate connection and readiness using LEDs or a screen

Design Challenges to Consider

- Designing the battery charging mechanism
- Compact layout for two motors, battery, and control electronics
- Stable balancing with a ball caster and two-wheel drive system
- Ensuring proper motor driver selection to safely handle current and direction control

Next Steps

What you plan to do next:

- Finalise component selection (batteries, battery chargers, motor driver, microcontroller)
- Start schematic design for the motor driver and power supply circuit
- Begin mechanical design using Fusion 360, with consideration for wheel and caster placement

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Contact and Resources GitHub Repository: https://github.com/yourusername/outreach-buggy
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