

UBC Chem-E-Car: Cascadia

The University of British Columbia | Chem-E-Car Engineering Design Team

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Interactive Poster
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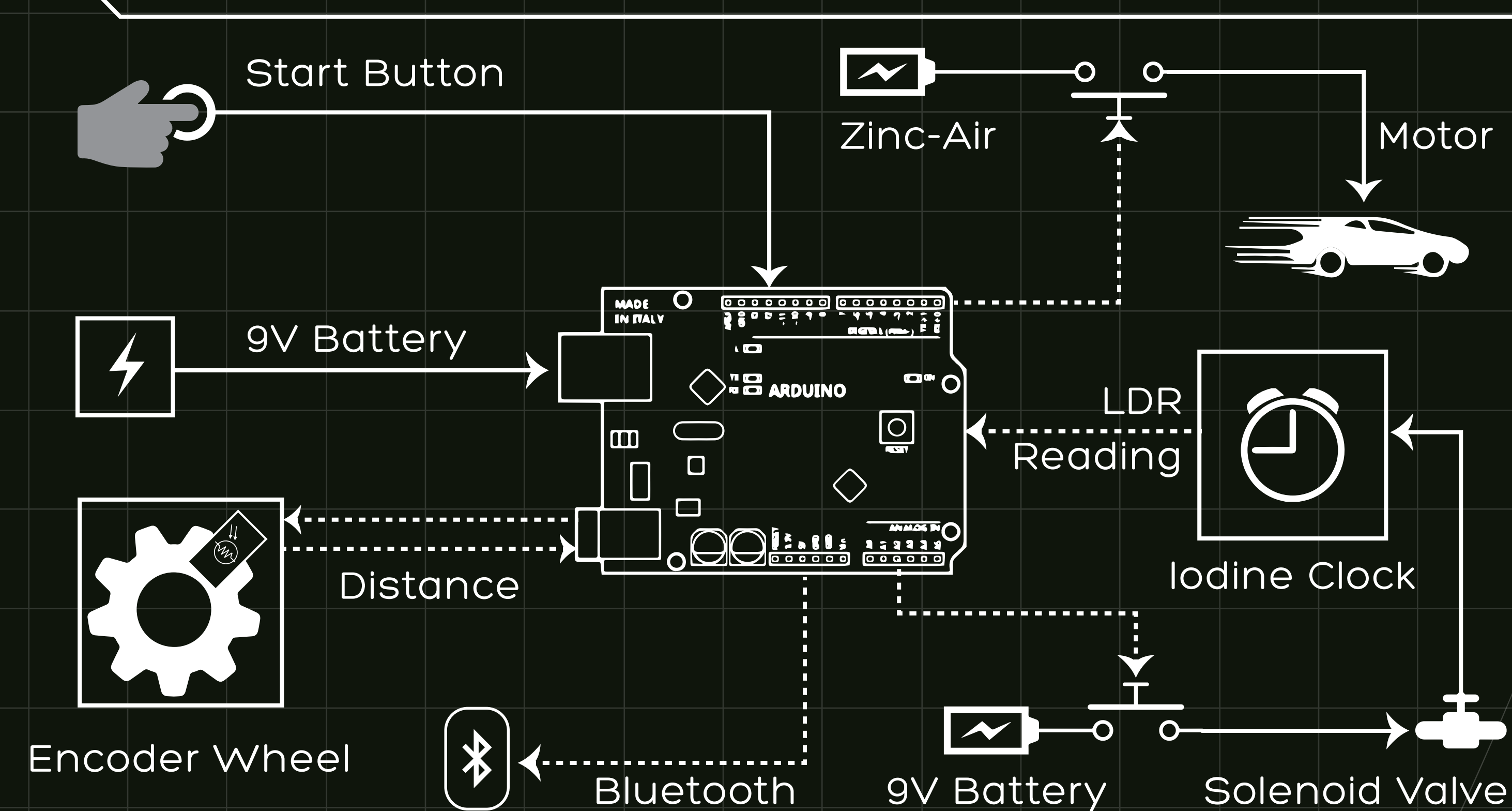
Introduction

- > Our zinc-air powered vehicle uses an iodine clock timing reaction. Our vehicle is actuated with an Arduino controller that has custom electronics and an algorithm designed to reduce operational errors. **Safe operation** is emphasized in the design features.

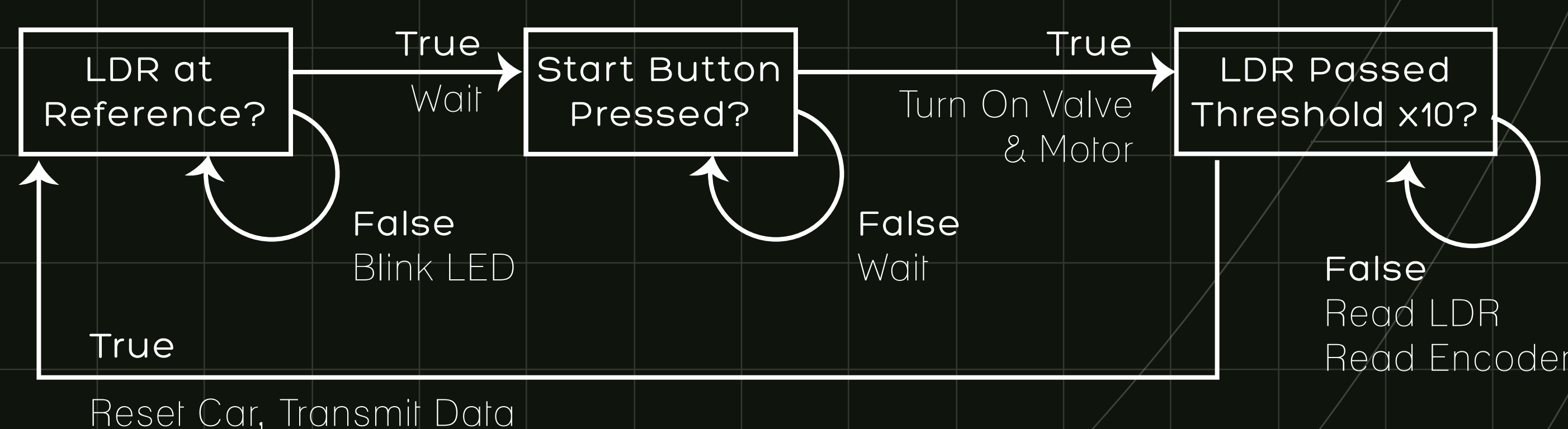
Unique Features

- > Isolated casing for electronic components protects against **chemical spills** and **fires**.
- > Secure connectors and insulating wires **prevent fires**.
- > Secure suspension **ensure consistent steering**.
- > High-traction wheels **prevent slipping**.
- > Lockable iodine clock secured to base **contains any spills**.
- > Low centre of gravity **prevents tipping**.

Control Mechanism

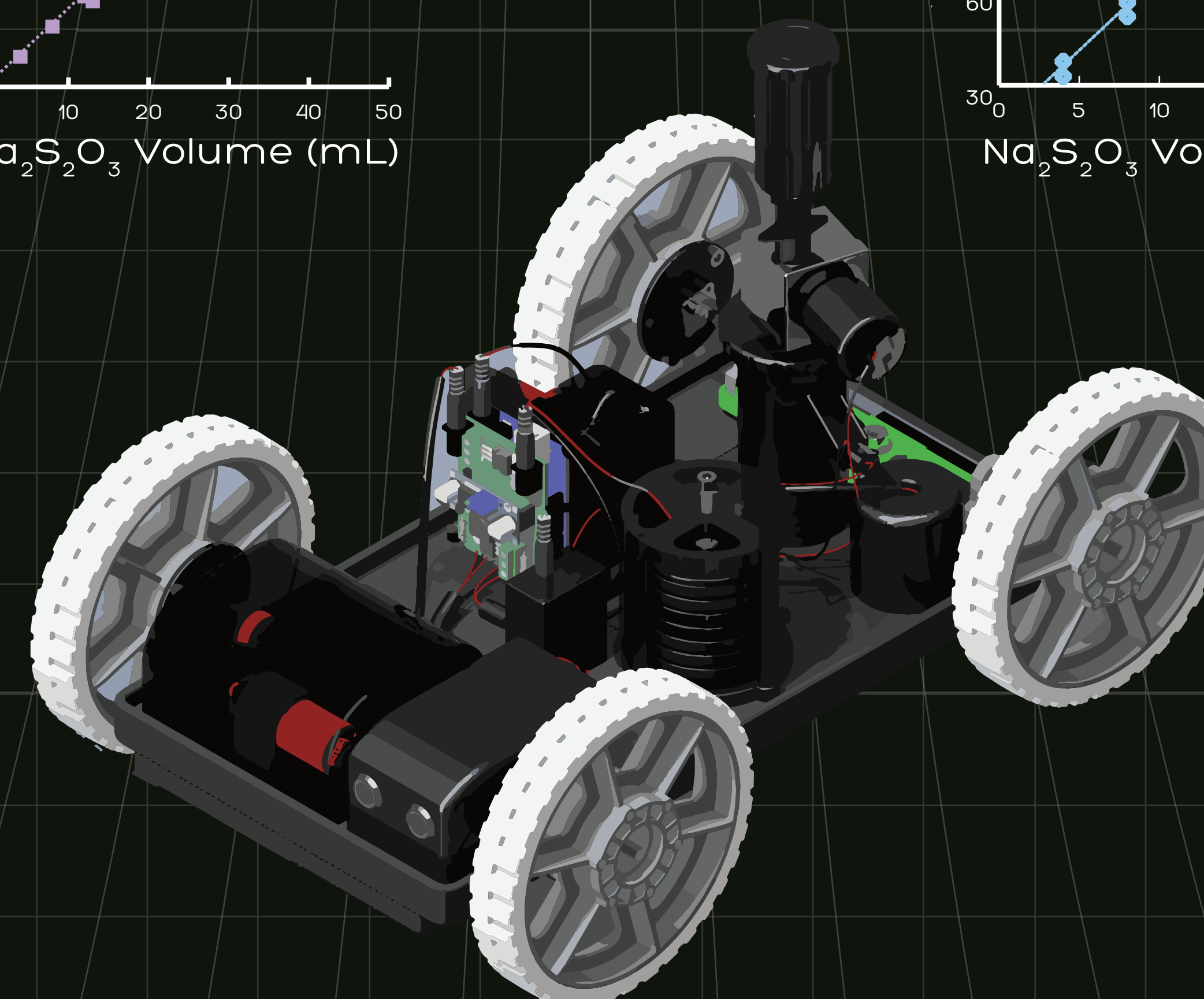
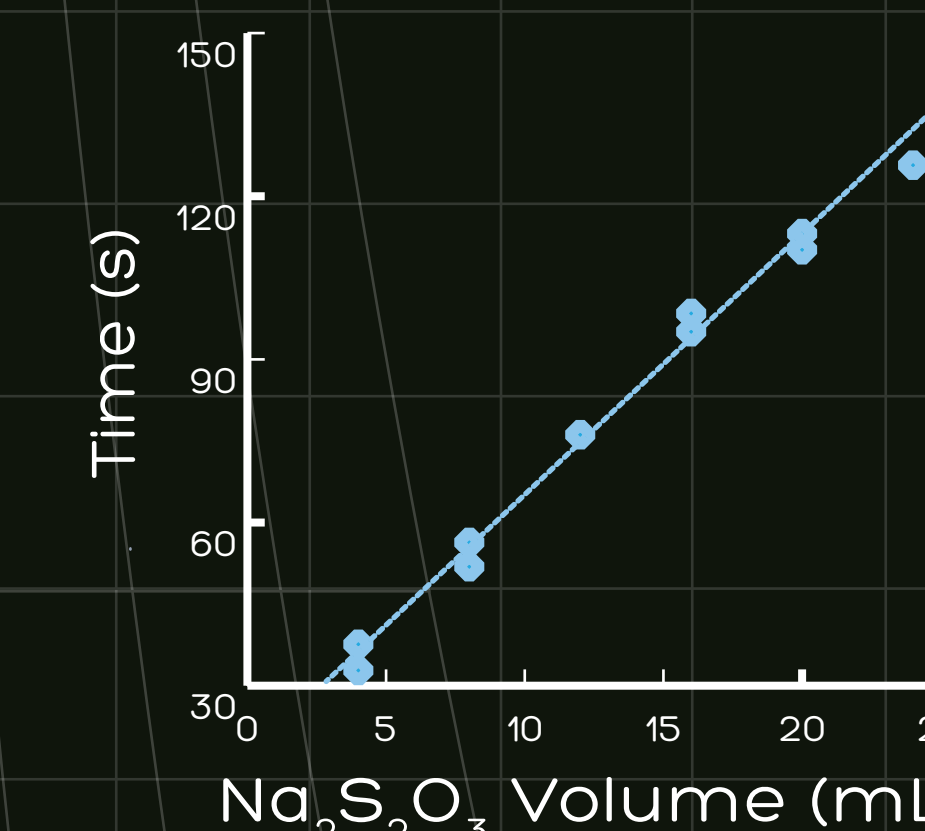
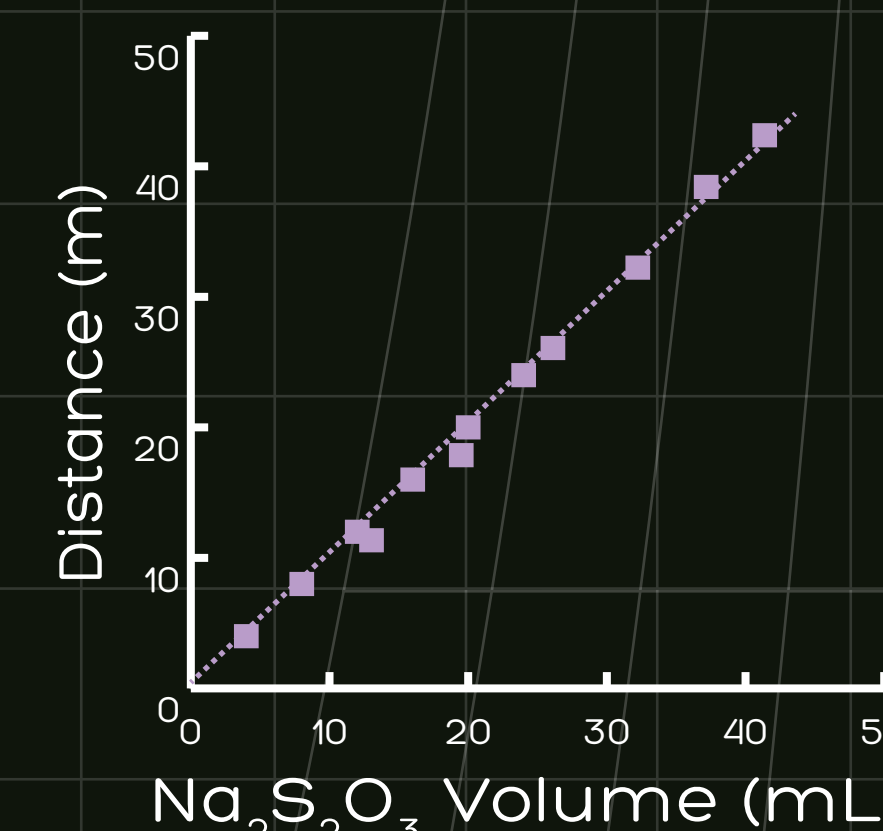
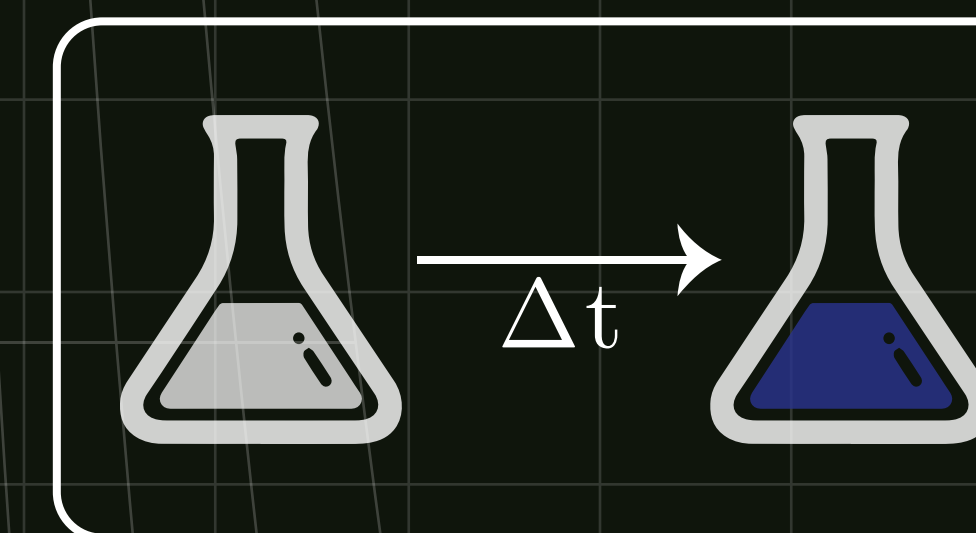


Control Algorithm

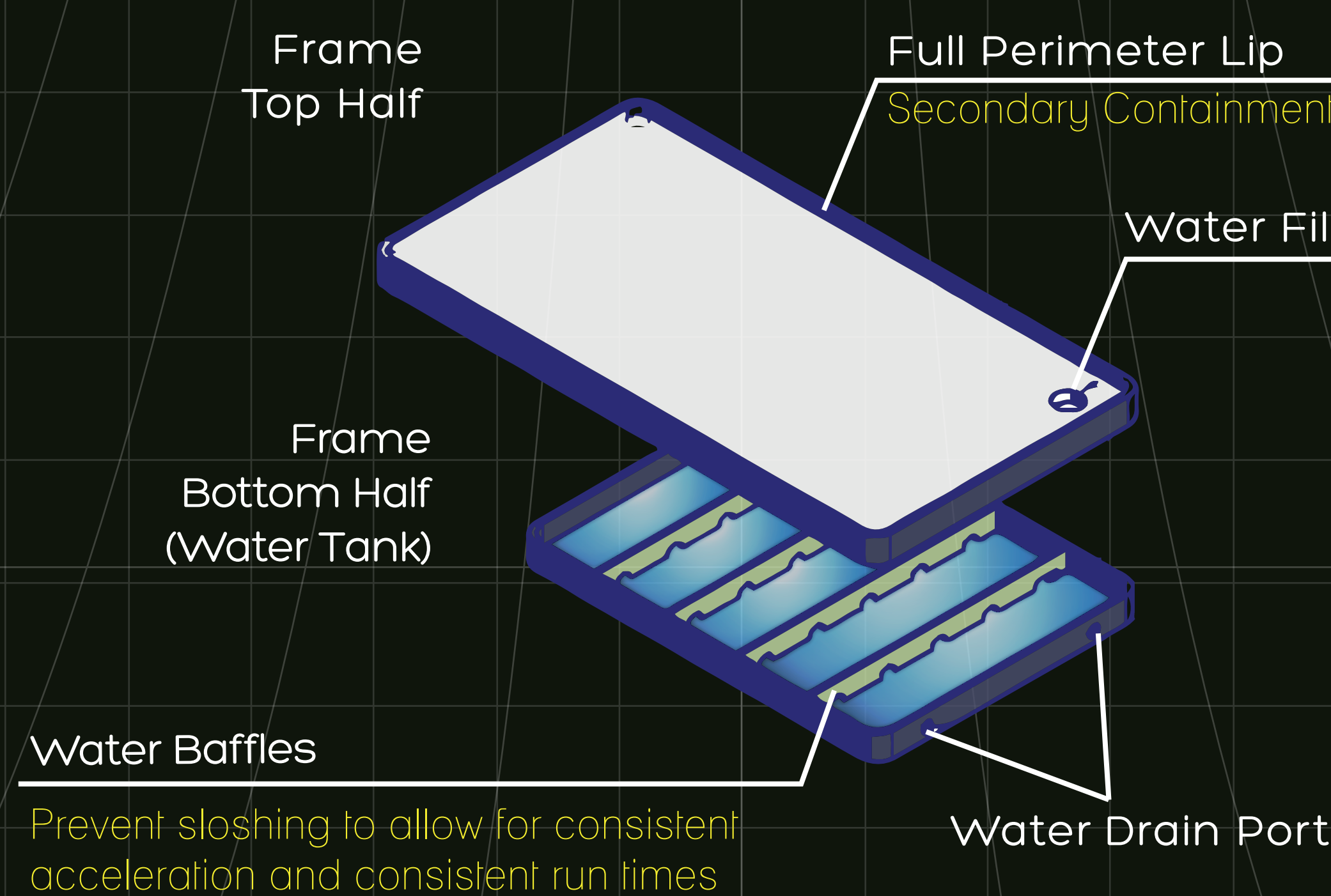


Stopping Mechanism & Calibration Curves

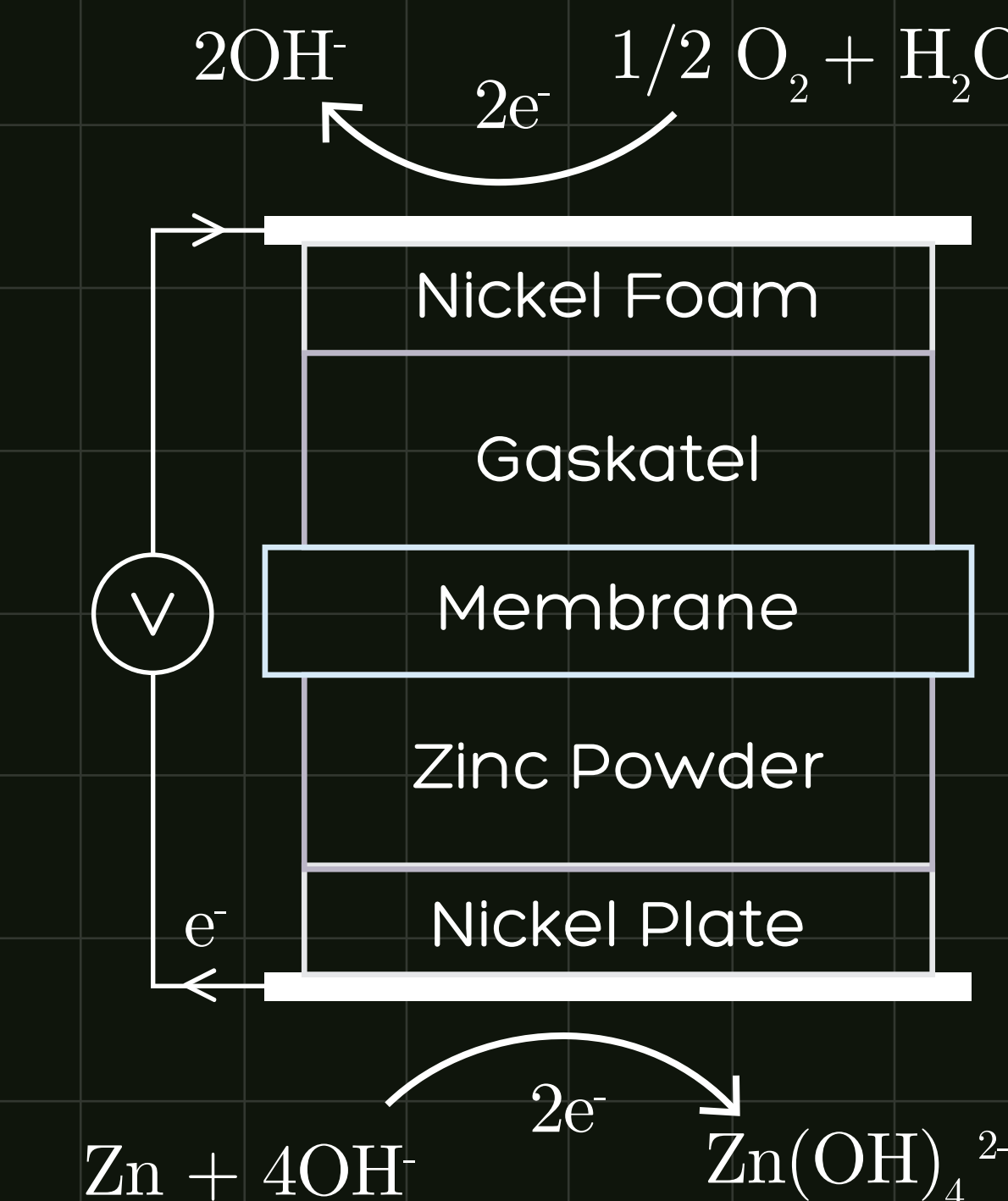
- > Slow Reaction
 $H_2O_2 + 2I^- + 2H^+ \rightarrow I_2 + 2H_2O$
- > Fast Reaction
 $2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$
- > A tri-iodide starch complex is formed and colored blue.



Integrated Water Tank



Power Source: Zinc-Air Batteries



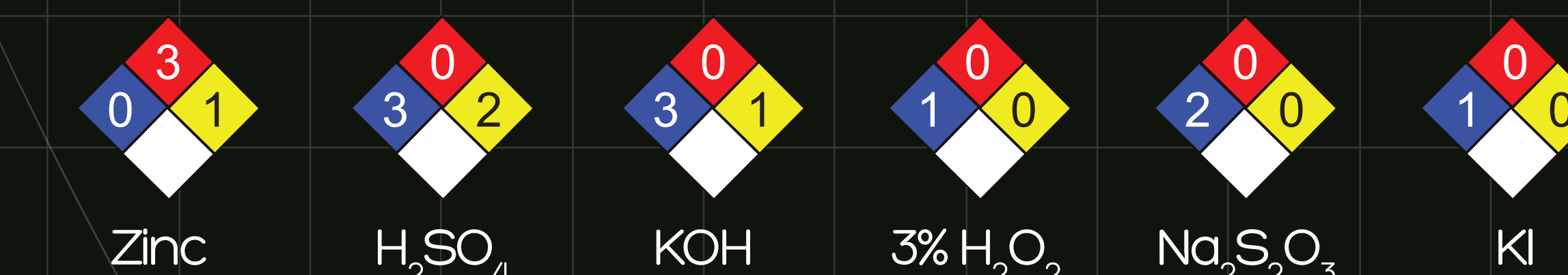
- > Oxidation of zinc on the anode releases electrons which pass through an external circuit and travel to the cathode where oxygen is reduced to hydroxide ions.

> Open Circuit Potential: 1.59V

- > Each individual cell is self-contained in a primary casing to **prevent leakage** of corrosive 6M KOH. A secondary containment tower keeps the cells **sealed and secured**.
- > **Corrosion-resistant** nickel electrodes increase the **lifetime of the battery**.

Safety and Environmental

- > Zinc is abundant and **easily recycled**.
- > Zinc is used in small amounts in primary and secondary casing to **minimize risk of fire**.
- > MnO₂ and ZnO are **non-toxic and inert**.
- > ZnO is used as baby powder and in ceramics.
- > Spent iodine clock solution is **harmless when neutralized**.



Sponsors



