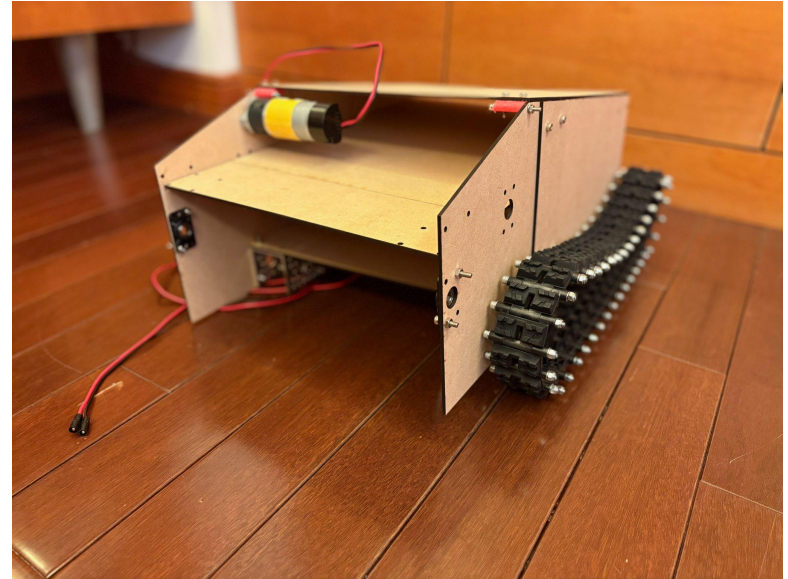


Formosa 2: AI Trash Cleaning Robot

By Nari C. and Eric H.

Formosa Blue

Essential Question: How can technology and AI be implemented in our daily lives to solve real world problems?



The Reality of Overflowing Cities.

Trash accumulates faster than we can clean it.

- Overflow spreads into public areas, impacting community health.
- Low public incentive to perform manual cleanup.
- Current manual labor models cannot scale to meet waste volume.

Our Solution

To build a fully autonomous, AI solar powered trash cleaning robot designed to reduce litter in high traffic public areas.





All of the city's residents are affected
by this issue

So, we want to make a change with
our skills in engineering!



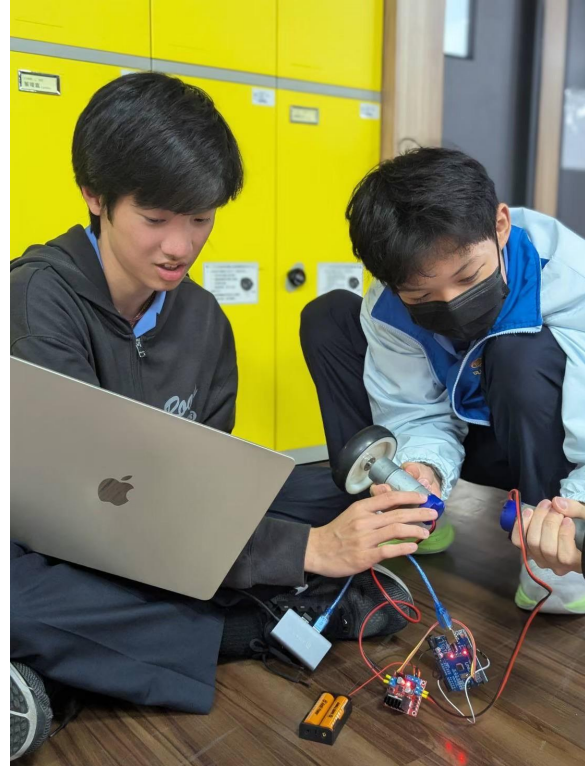
How Formosa Blue Was Founded

Therefore, **2 high school students** who share the same passion for engineering decided to create a solution that could make a tangible impact on our community.

Nari (figure on the right) is in charge of the **structural design** due to his adept skills in **3D CAD modeling**, as well as designing the **electrical systems** of the robot.

Eric (figure on the left), on the other hand, is proficient in several programming languages (Python, Java, C++, and much more), therefore making him in charge of the **software system of AI detection** and **robotic movements**.

Thus, due to our interest in engineering, robotics, and technology, it inspired us to transform our passion into practical innovation, leading to the development of an AI-driven trash-cleaning robot.



Initial Prototype: Formosa 1

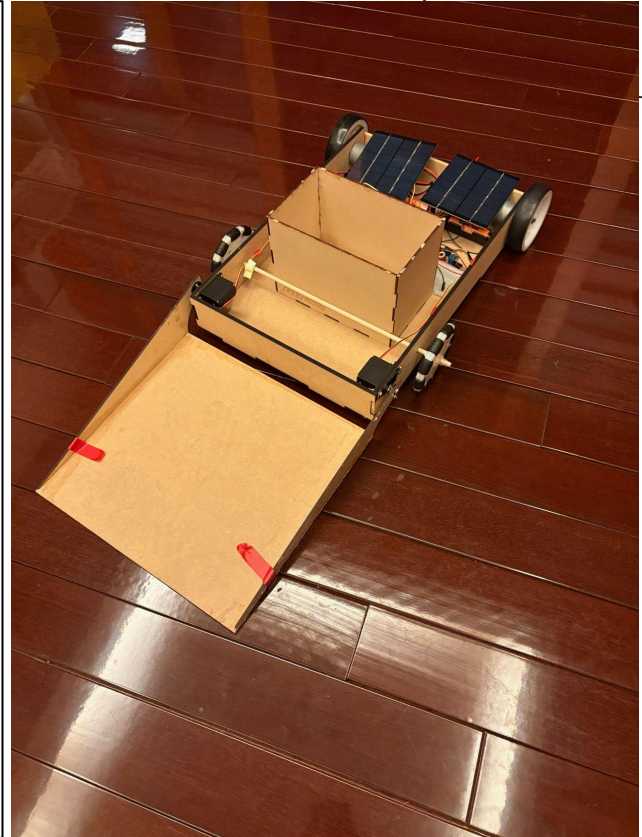
Built with amateur engineering skills

Structure:

- Was somewhat capable of picking up the trash with the shovel like mechanism at the front of the robot, but still of
- Simple wooden box chassis design that lacked sufficient clearance for the vehicle to locomote
- Wheels that often could not orientate to the correct direction

Software:

- Low accuracy of detecting the object as the correct type of trash
- Large latency between signal transfer from the microcontroller chip to the motors and servos



Improved Formosa 2

Built for All Terrain

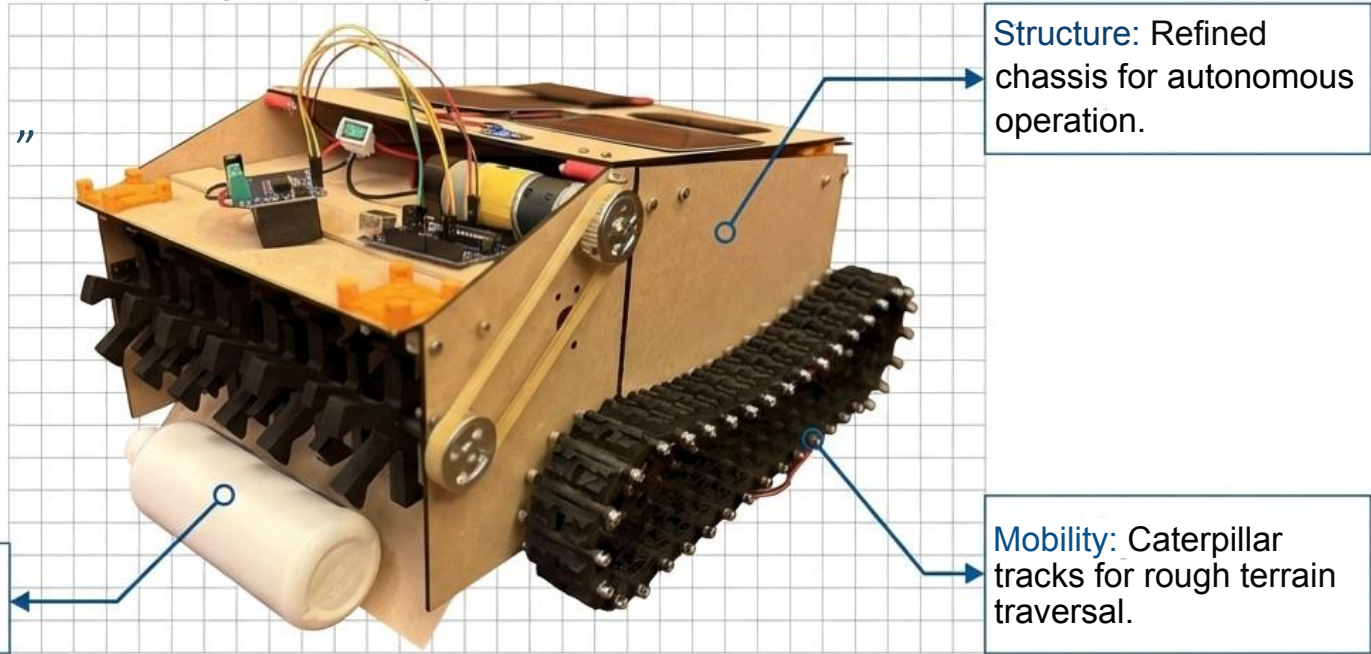
A fully autonomous, AI-driven, solar-powered trash cleaning robot designed for high-traffic public areas.

✓ Autonomous
AI Navigation

✓ Eco-friendly
Recycled
Materials

✓ Cost-Effective
for Public
Budgets

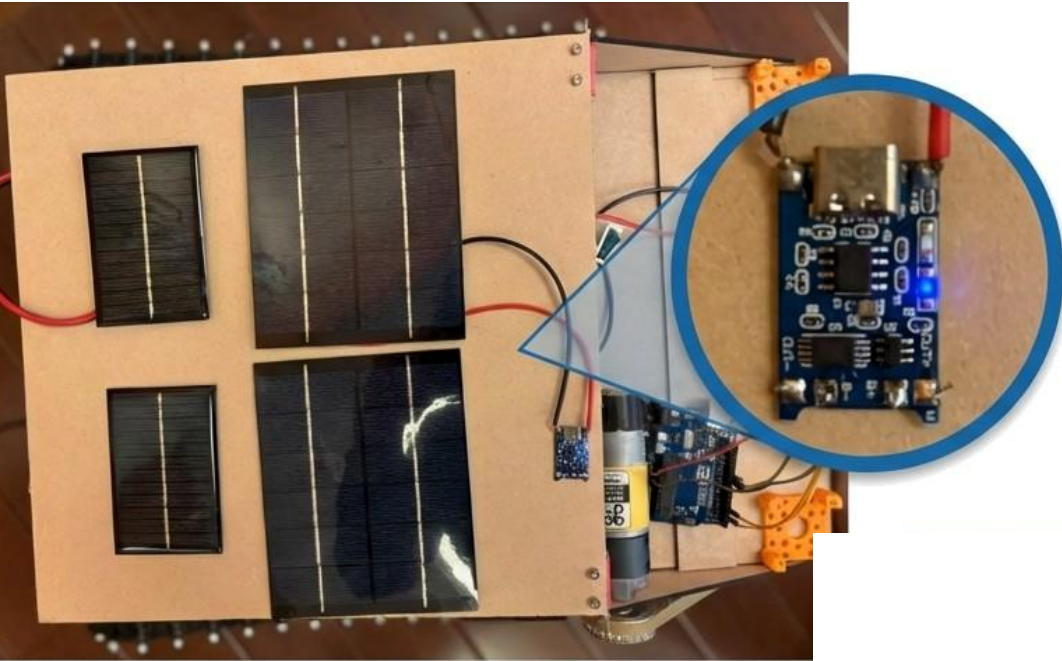
Collection: Rotating
active intake system.



Structure: Refined
chassis for autonomous
operation.

Mobility: Caterpillar
tracks for rough terrain
traversal.

Renewable Power: Solar Integration



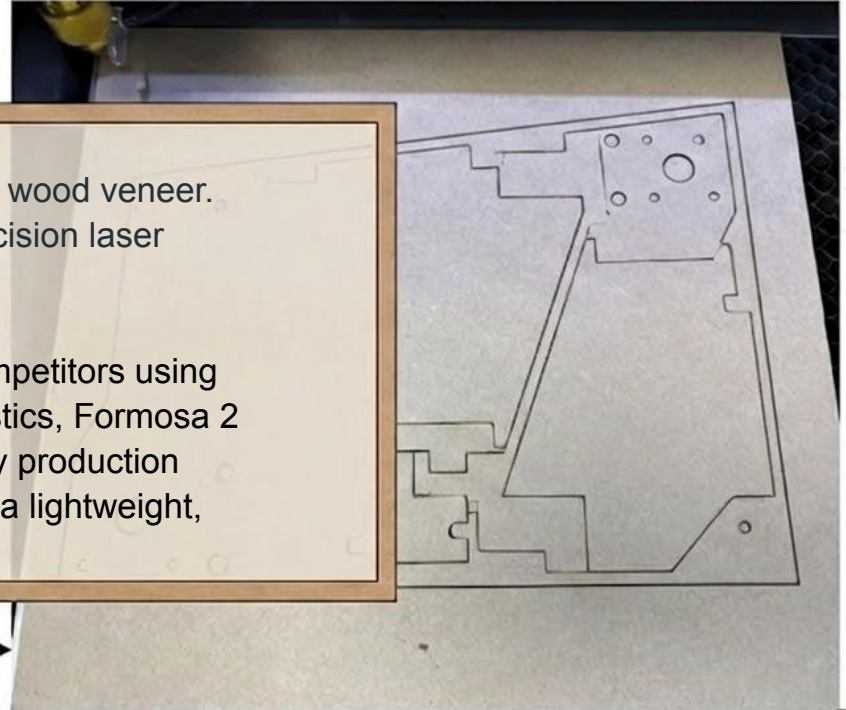
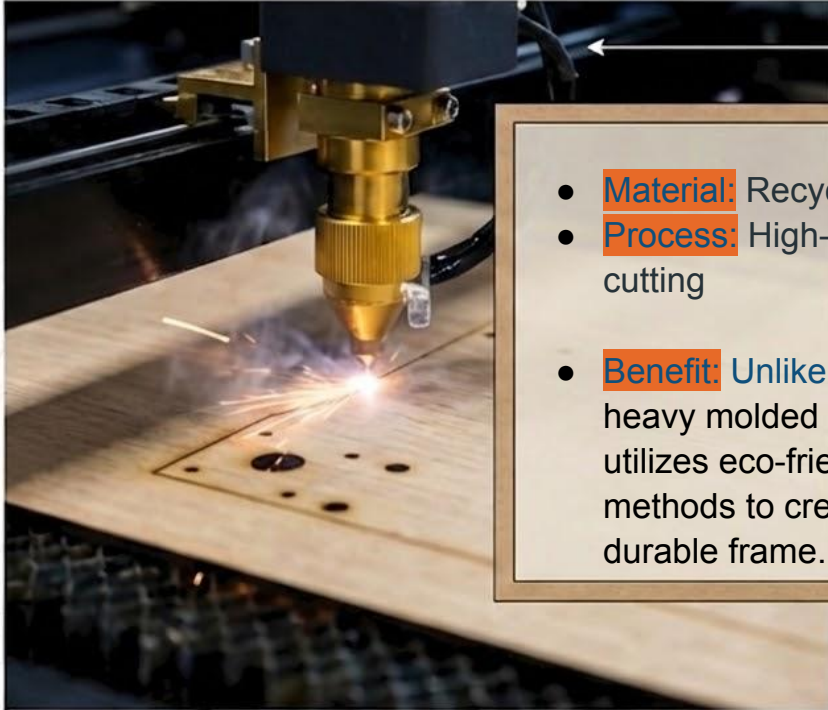
Solar Charging Module

- Power Management: Low-voltage trickle charging module.
- Objective: Extends run-time during daylight operations.

Design Goal

- Self-sustaining energy management for 'set and forget" deployment in parks and open spaces.

Smart, Sustainable Production



- **Material:** Recycled wood veneer.
- **Process:** High-precision laser cutting
- **Benefit:** Unlike competitors using heavy molded plastics, Formosa 2 utilizes eco-friendly production methods to create a lightweight, durable frame.

The Brain: Low-Cost, High-Efficiency AI



Input: Camera Feed



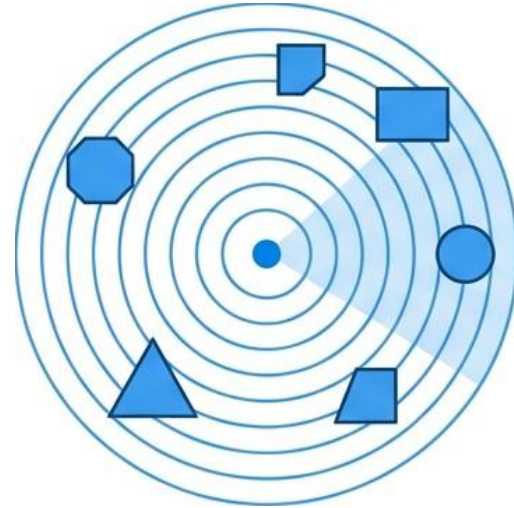
Processing: Raspberry Pi
(ran on python
scripted object
detection model)



Action: Trash Identified vs.
Obstacle Avoided

- **Hardware:** Raspberry Pi (Credit-card sized computer).
- **Software:** Object detection model written in python, trained with machine learning.
- **Benefit:** Optimized for low-voltage devices; no expensive onboard GPU required

360° Precision Navigation



- **Sensor:** 360-degree Lidar.
- **Performance:** Low-latency spatial mapping.
- **Safety:** Ensures 100% area coverage while actively avoiding pedestrians and infrastructure.

Breaking the Cost Barrier

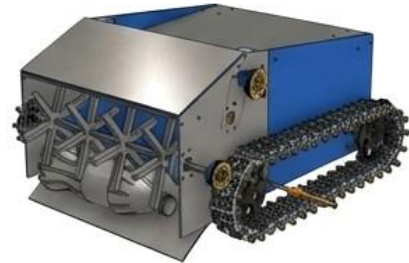
The Competitor



Pudu MT1 (35 L capacity)

\$21,000 USD

Our Product



Formosa 2 (11.2 L capacity)

~\$600 USD
(Est. 3% of competitor cost)

- Although smaller in capacity, the units that Formosa 2 could be deployed at the \$21,000 makes it the ultimate choice
- **Democratizing access to robotic sanitation by removing the price barrier.**

A Blue Ocean Strategy

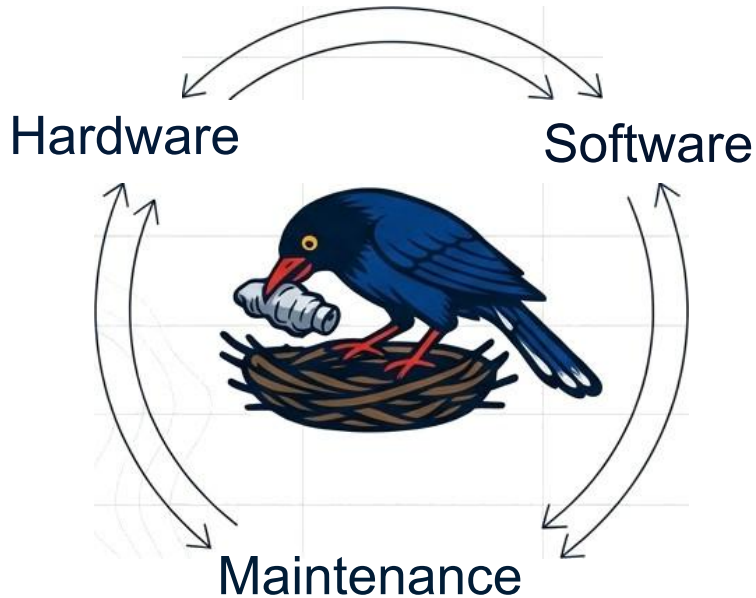
An entirely new industry
(our choice)

Existing Competitive
Markets



Core Concept:
Instead of battling
in the “Red
Ocean” (existing
expensive
markets), we are
creating
uncontested
market space.

Business Model: Robot as a Service (RaaS)



The Offer:

- Subscription-based model where customers pay to use rather than buy.

The Bundle:

- Hardware, Software, and Maintenance fees included.

Cost Efficiency:

- Predictable costs for medium-sized businesses and public institutions.

Target Consumers: Public Institutions



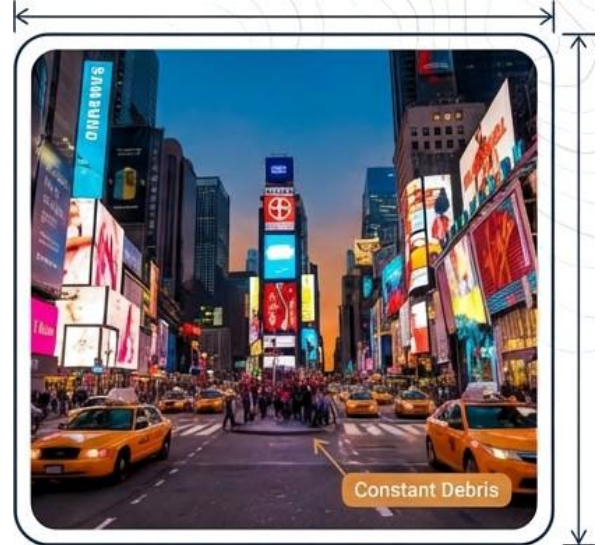
High Litter Density

Transit Corridors



Large-Scale Cleanup

Parks

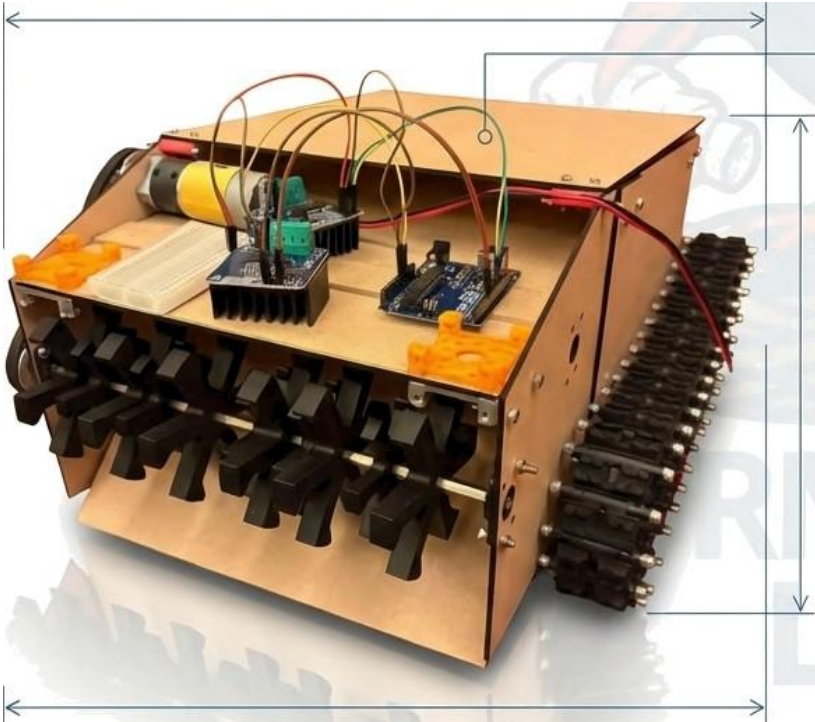


Constant Debris

High-Traffic Zones

Also serving Schools, Campuses, and Public Parking Lots.

Community Integration



The Stewardship Program

- **Educational Alignment:** We secure long-term viability by partnering with student engineering clubs.
- **The Mechanism:** Students learn to maintain the hardware, turning the robot into an educational tool.
- **The Benefit:** Drastically reduces central maintenance overhead and ensures the project persists as a community asset.