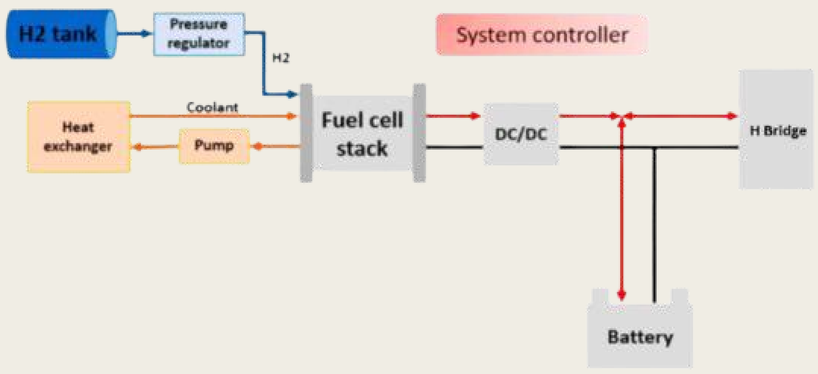
ECOBOT

Eco-Friendly Robotic Waste Management Solution

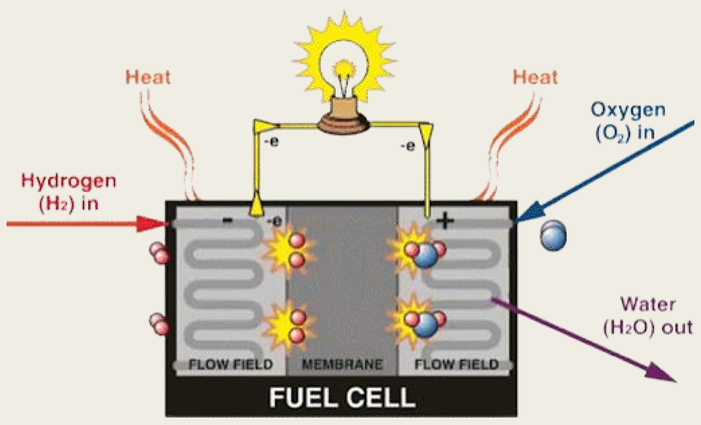
The **ECOBOT** is an **AI-powered smart robotic waste collection system**, designed for sustainable waste management and adapted to **Tunisia's ecosystem** and **lifestyle**.
It uses **hydrogen fuel cells** for **clean energy**, **advanced sensors** for **navigation**, and an **intelligent sorting system** to efficiently **classify** and **store waste**. This innovation aligns with the **SDGs**, demonstrating a global commitment to sustainability while addressing local environmental challenges.

ENERGY AND ENVIRONMENTAL IMPACT

SUSTAINABLE HYDROGEN-POWERED EFFICIENCY



his robot uses **clean hydrogen** as its energy source, where the only byproduct is **water**, ensuring **zero harmful emissions**. By integrating this **sustainable energy** with efficient waste management, it reduces **pollution**, promotes **recycling**

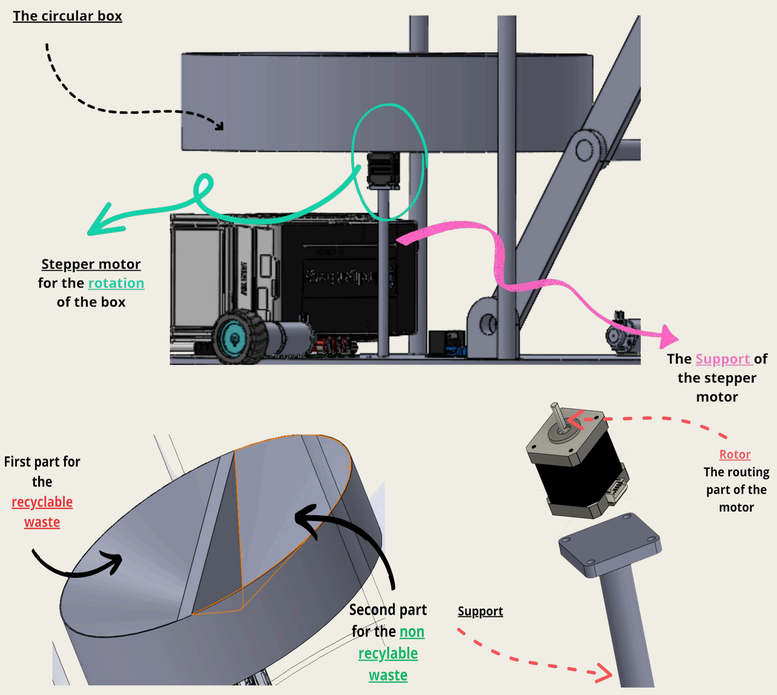


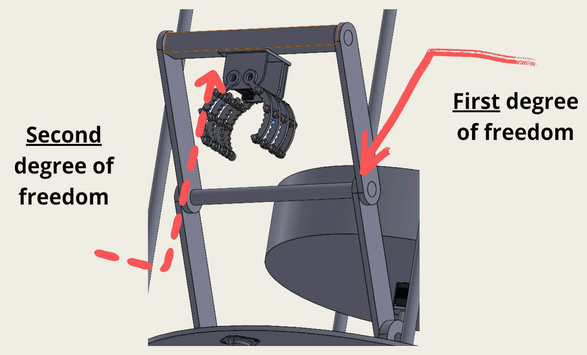
Hydrogen is used as a **fuel** to power the robot through **a clean and efficient process**. Stored in a **tank**, hydrogen is supplied to a **fuel cell** where it undergoes an **electrochemical reaction** with **oxygen** from the **air**.
This reaction generates **electricity** to run the robot's systems and components.

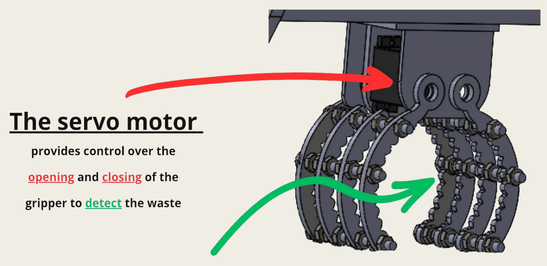
WASTE COLLECTION AND SORTING

SMART ARM AND SORTING MECHANISM

The **stepper motor**, controlled by the **stepper motor driver**, is responsible for **rotating** the **circular box** to the **recyclable section** or **non-recyclable section** For general waste that cannot be recycled based on the waste.







The **arm system** is responsible for **picking up waste** and placing it in the **correct section** of the **sorting box**.
When **waste is detected** by the **camera**, the **arm extends** to reach it, using the **gripper** to securely **lift** the waste.
After the **box rotates** to the appropriate section (recyclable or non-recyclable) , the arm **moves over the box** and puts the waste into the correct compartment.

NAVIGATION AND DETECTION

AI-POWERED VISION AND AUTONOMOUS MOBILITY

LiDAR generates real-time 3D maps of the environment, identifying obstacles and open **paths** to provide the robot with a clear understanding of its surroundings. Using these **maps**, the Lidar knows the **most efficient route** to its destination, minimizing travel time and conserving energy.

A high-resolution camera, combined with the **YOLOv8** algorithm, detects waste in real time and precisely marks its location. Once identified, it classify the waste into **recyclable** or **non-recyclable** categories, ensuring accurate sorting.

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