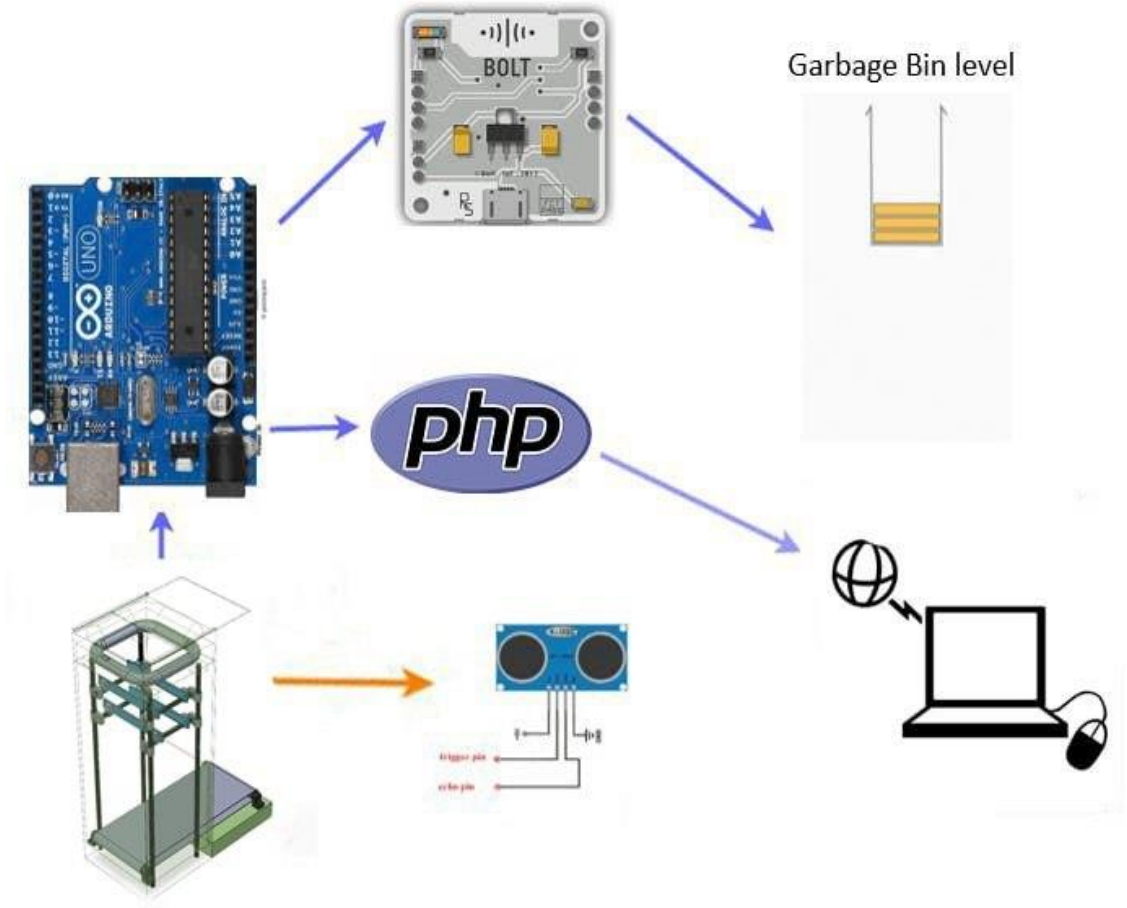
SMART WASTE MANAGEMENT SYSTEM



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Problem Definition

Not collecting garbage systematically is one of the major problems that can cause so many health, social and environmental issues. On some occasions, we have observed that the lid of the garbage bin has not even been closed due to the excessive amount of trash which led these sites to become fly breeding grounds.

Purpose Statement (Goals)

If we can control the quantity and detach the garbage bag at the proper time and reduce human interaction in the garbage collecting process we can avoid these complications.

- Opening the garbage bin only when someone needs to use it.
- Identifying when the garbage reaches its threshold level.
- Sealing the garbage bag and removing it from the trash can.
- Automatically replacing a new garbage bag in the can.
- Developing a **waste management system** using cloud computing.
- Updating the **waste management system** about the current status of the trash bin.
- Sending a message to the **waste management system** indicating the location of the trash can when a trash bag is ready to be collected.

Objectives

- Reducing the interaction between the user and the garbage bin.
- Reducing the interaction between garbage collectors and garbage.
- Controlling the quantity of garbage and properly changing the trash bags on time.
- Maintaining a healthy environment around the trash cans.

Methods/Approach

The following methods will be implemented to achieve our requirements.

- Detects the presence of a user, using an ultrasonic sensor and opens the garbage can using actuators.
- We need to check two parameters to decide whether to seal the garbage bag.
    1. Weight of the garbage - we can measure this using a load cell
    2. Level/height of the garbage - we can measure this using an ultrasonic sensor.

    When one of these parameters reaches its limit, the garbage bag will be automatically sealed and removed from the garbage bin.

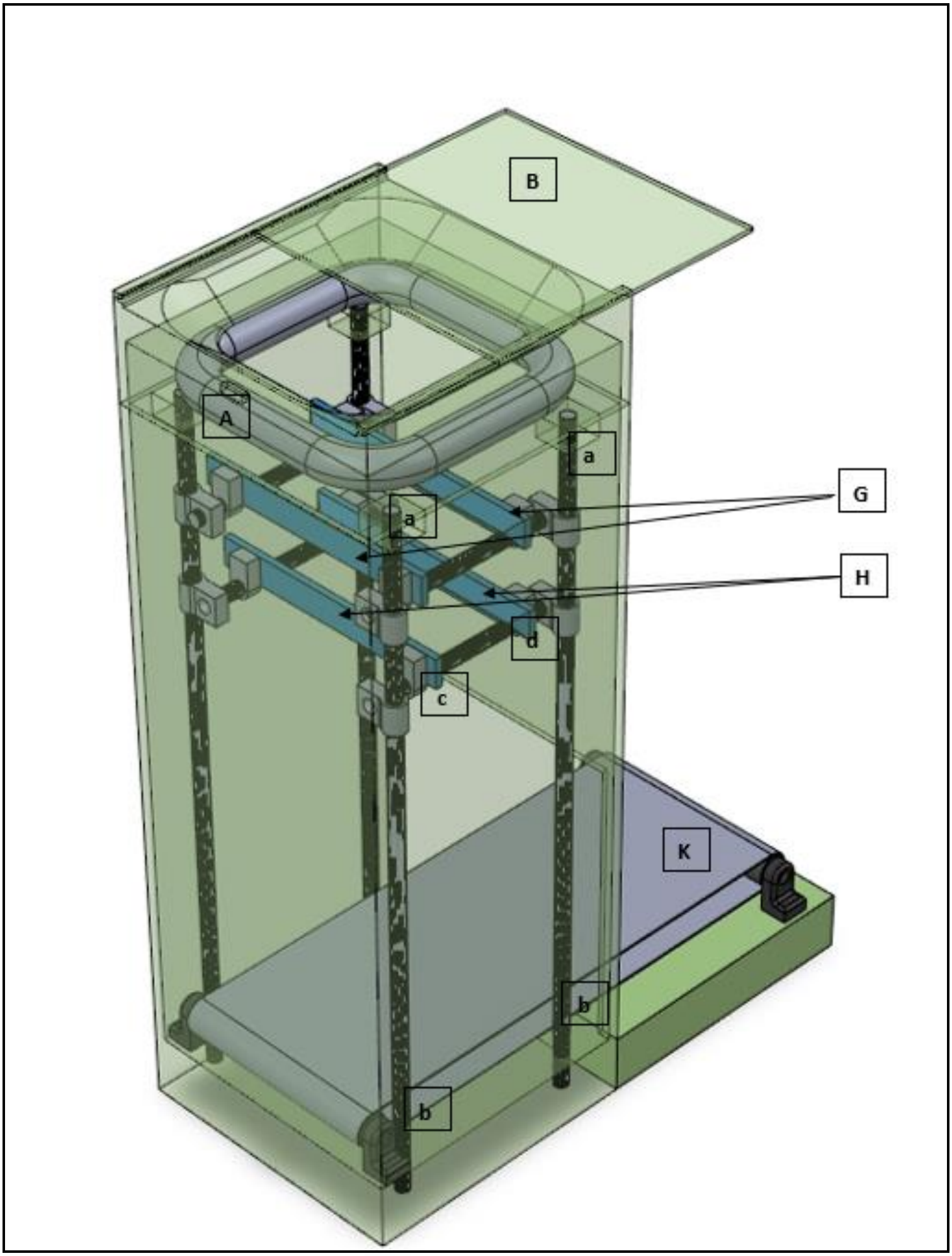
- The sealing process is done automatically by a sealer and a cutter to detach the garbage bag from the garbage roll.

- A garbage bag roll is used in this system and a new bag is automatically replaced by using one of the sealers.
- Develop a website regarding the waste management system and use cloud computing to get inputs and produce relevant messages and data as output.
- Use a wifi module (ESP8266) to send signals indicating the locations and mentioning the status of trash cans such as,
    - ❖ How many garbage bags are there to be collected?
    - ❖ Up to which level is the trash can filled?

Sketch of the Trash bin used in the Waste Management System

Components

A- Infrared Sensor
B- Sliding lid
C- Ultrasonic Sensor
D -Cylindrical tube (with a diameter around 30cm)
E- Tightening ring
F- Polythene/ Garbage bag roll
G,H- Pair of Sealer arms
I- Polythene cutter
J- Load cell (around 5kg)
K- Cylindrical Rollers
L- Hinged opening
ab- Vertical guides (to ensure the vertical movement of the sealer arms)
cd- Horizontal guides (to ensure the horizontal movement of the sealer arms)
ef- Horizontal guides (for the movement of the cutter)


B
A
a
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d
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Scope

First, we expect to implement this system inside the canteen areas of the university. Then we could expand it to the whole university premises.

Cost Analysis

1.	Garbage bin	-	Rs. 10,000
2.	Load cell with amplifier	-	Rs. 620
3.	2 Ultrasonic sensors	-	Rs. 680
4.	Arduino mega board	-	Rs. 9,560
5.	2 Servo motors	-	Rs. 1,080
6.	2 Stepper motors	-	Rs. 960
7.	2 Sealers	-	Rs. 4,000
8.	Cutter	-	Rs. 1,000
9.	12V power adaptor	-	Rs. 750
10.	Miscellaneous items	-	Rs. 5,000
			Rs. 33,650

Timeline

Week - W

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Proposal												
Presentation												
Collecting equipment												
Making trash bin												
Design Arduino program												
Creating website to manage trash bins												
Testing the bin and the website												
Project and the Final report												

Limitations

- Changing the garbage bag roll manually after the roll of bag is finished.
- After the receiving the alert from the computer system the working staff should collect the filled garbage bags.
- People should separate their garbage and dispose them into proper trash can.

Further developments

- We can develop a mobile application instead of a website to increase the user-friendly environment.
- We can introduce a garbage carrying robot to reduce human interaction furthermore.
- Add an Ultraviolet-C filter to disinfect the content in the bin.
- We can calculate the food waste per day and help to reduce the amount of food waste.
- Outdoors we can use a solar system or a rechargeable battery as the power supply.