AACC Low-Cost Robot Design

We're building small, affordable robots that can be used to learn and experiment with new technology. These robots will include basic sensors and tools like cameras and LIDAR (a sensor that maps the environment with lasers) to detect their surroundings. We'll build 2–3 robots so our team can work on them at home and learn new skills together.

We'll program the robots using **Python** (a beginner-friendly coding language) and control them with **Raspberry Pi** computers (small, affordable devices great for learning). Over time, we'll make these robots more intelligent and capable. Here's the plan:

Step 1: Build a Line-Following Robot

- **What it is**: The robot will follow a line on the floor using special sensors underneath. For example, it could follow a black line on white paper.
- **Why it's important**: This is a great way to learn how to make the robot sense its surroundings and move on its own.

Step 2: Add Encoders for Precise Movement

- **What encoders do**: These devices measure how far each motor turns, helping the robot move in straight lines or make accurate turns.
- **Why it matters**: It teaches us how to control the robot's movement with precision, which is important for more advanced tasks later.

Step 3: Experiment with LIDAR to Map Surroundings

- **What LIDAR does**: LIDAR uses lasers to measure the distance to objects and create a map of the robot's surroundings. Think of it like how bats "see" with sound, but using light instead.
- **Goal**: Learn to identify objects and understand the layout of the environment. For example, we might map a room and figure out where walls, furniture, or obstacles are.

Step 4: Plan Paths and Avoid Obstacles

- **How it works**: The robot will use its map (from LIDAR) to figure out how to move from one point to another while avoiding obstacles.
- **Example**: If the robot needs to go from one side of the room to the other but there's a chair in the way, it will plan a route around the chair.
- **Why it's useful**: This teaches us how to combine mapping with logic so the robot can move intelligently.

Step 5: Use a Camera for Object Detection

- **What this means**: The robot will use a camera and a tool called OpenCV (a library for image processing) to recognize objects in front of it.
- **Example**: It could detect people, chairs, or other robots and decide how to respond.
- **Why it's exciting**: Cameras give the robot a whole new way to sense the world, adding more information to help it make decisions.

Step 6: Add Artificial Intelligence (AI)

- **How it works**: We'll send all the robot's sensor information (LIDAR, camera, etc.) to an AI program like OpenAI. The AI will analyze the data and suggest what the robot should do next.
- **Example**: If the robot sees a chair and a person, the AI might tell it to move around the chair and stop near the person.
- **Why it's important**: This step shows how AI can work with robots to make decisions, like navigating a room or completing tasks.

Final Goal: A Smarter Robot

By following these steps, we'll gradually make the robot more capable. It will start with simple tasks like following a line and end up using AI to navigate complex environments and make decisions.

This project is perfect for learning about robotics, programming, and artificial intelligence in a hands-on way. We're excited to see what we can achieve together!

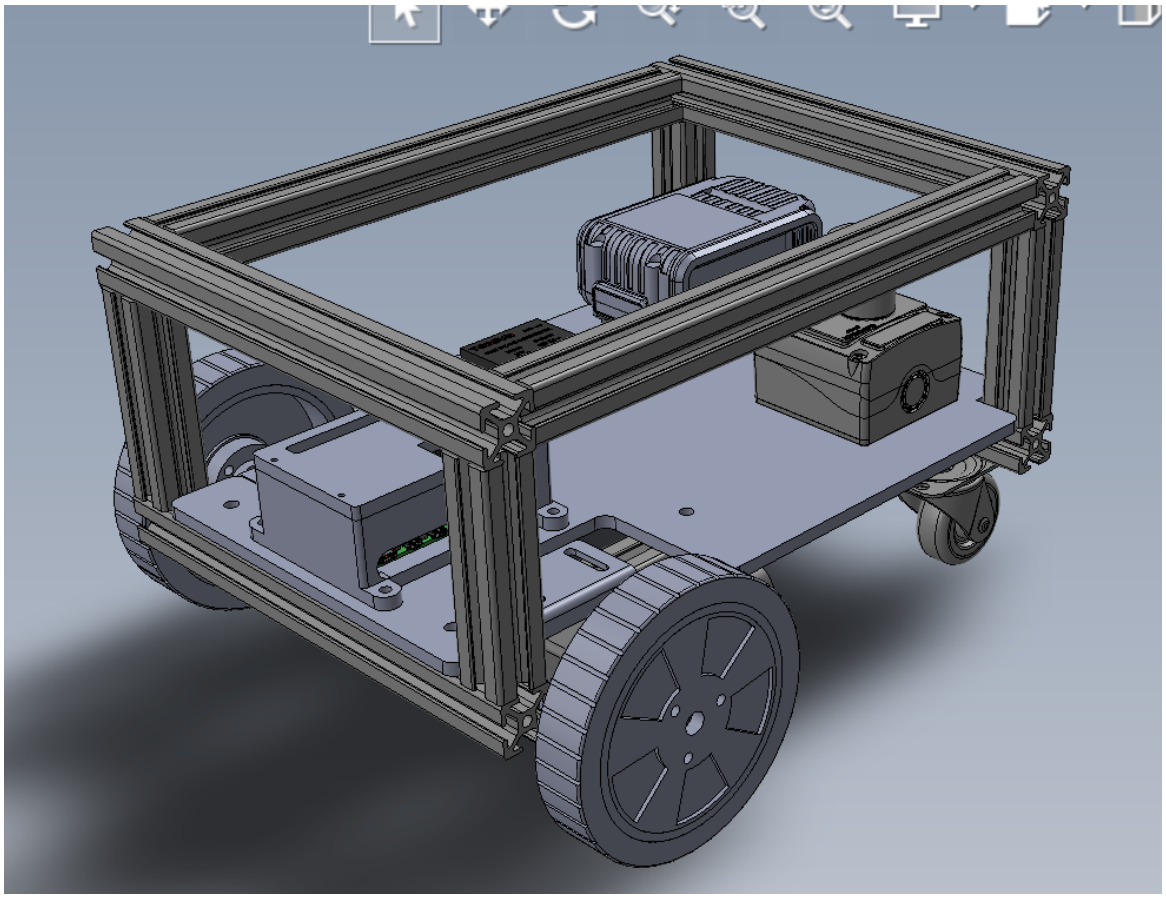

Figure 1: Solidworks Design of AACC Mobile Robot

ITEM	PART#	QUANTITY	PRICE	TOTAL COST	DESCRIPTION	LINK
1	WL-RBT-508	2	20	40	5" Robot Wheel w/ 8mm Key Hub	https://www.robotshop.com/
2	BRINGSMART	2	34.15	68.3	24V 40 RPM Geared Motor w Bracket	https://a.co/d/ilkBZNK
3	BRACKET1	2	8.99	17.98	GearMotor Bracket	https://a.co/d/gZDR22Z
4	8020RAIL	2	27.99	55.98	72" 8020 Rail 1"x1"	https://a.co/d/16kECSi
5	80203393	1	27.44	27.44	8020 Hardware 1/4-20	https://a.co/d/g0leeVv
6	RAILBRACKET KIT	1	22.88	22.88	20Set Bracket with Screw Nut	https://a.co/d/4VyY7WK
7	ACRYLIC SHEET	1	69.99	69.99	1/4" Acrylic	https://a.co/d/2G4sMqQ
8	ESTOP BUTTON	1	9.99	9.99	Baomain Red Sign Emergency Stop	https://a.co/d/bM1V5SU
9	78155T61	2	7.65	15.3	2.5" Cart-Smart Caster	https://www.mcmaster.com/catalog/1
10	3D PLA	4	14.79	59.16	SUNLU PLA 3D	https://a.co/d/dVzOKTF
11	STEPDOWN	1	10.98	10.98	DC 12V 24V to DC 5V	https://a.co/d/4U3cK5A
12	PI5	1	119.99	119.99	CanaKit Raspberry Pi 5 Basic Kit	https://a.co/d/6AqBp8C
13	MOTORDRIVER	1	24.99	24.99	DROK DC Motor Driver 2pcs, L298	https://a.co/d/5d3cKst
14	LIDAR	1	99.99	99.99	RPLIDAR A1M8 2D 360 Degree	https://a.co/d/eBsnOCq

TOTAL COST		642.97