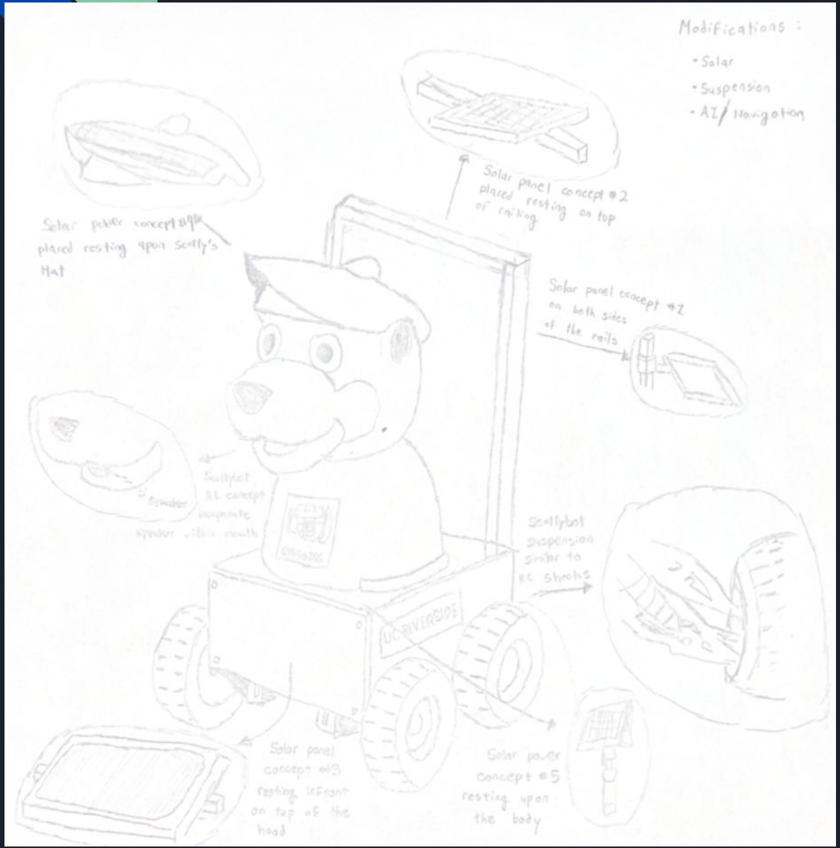
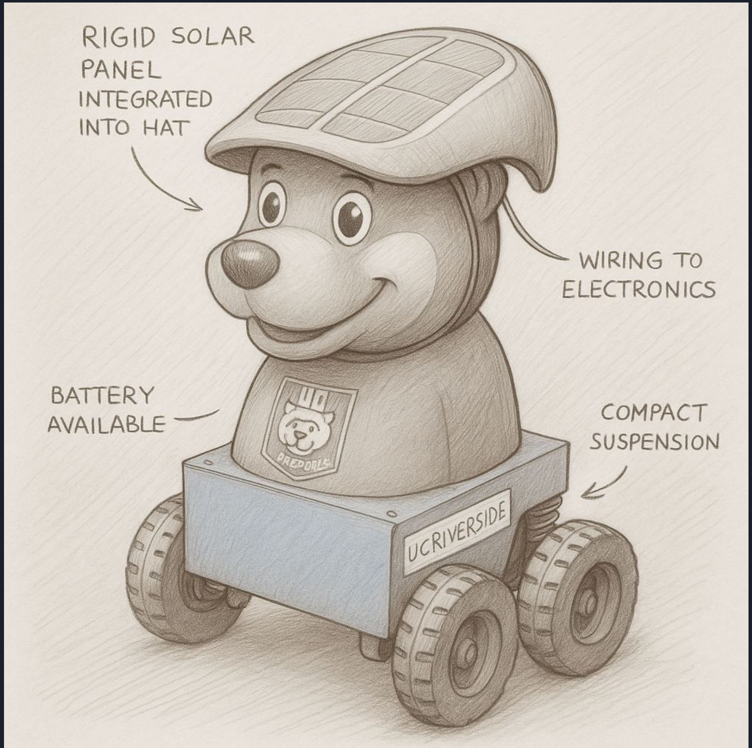
Concept designs

Solar powered designs, original thoughts



A quick sketch of where we could put the solar panels including other modifications that would be tackled



Ai does not integrate into the hat . but this is generally how concept 1 would look like with the original hat design

Pros

- Cleanest look: panel blends naturally into the character design
- Zero added footprint — doesn't increase robot width or height
- Wiring path is the shortest of all concepts (hat → torso → electronics)
- Safest from collisions since panel sits inside Scotty's silhouette
- No moving parts or brackets needed

Cons

- Worst sun-facing angle — hat tilt limits solar efficiency
- Very small panel area due to shape constraints
- Requires custom curved panel (more expensive)
- Heat build-up near head electronics could reduce efficiency

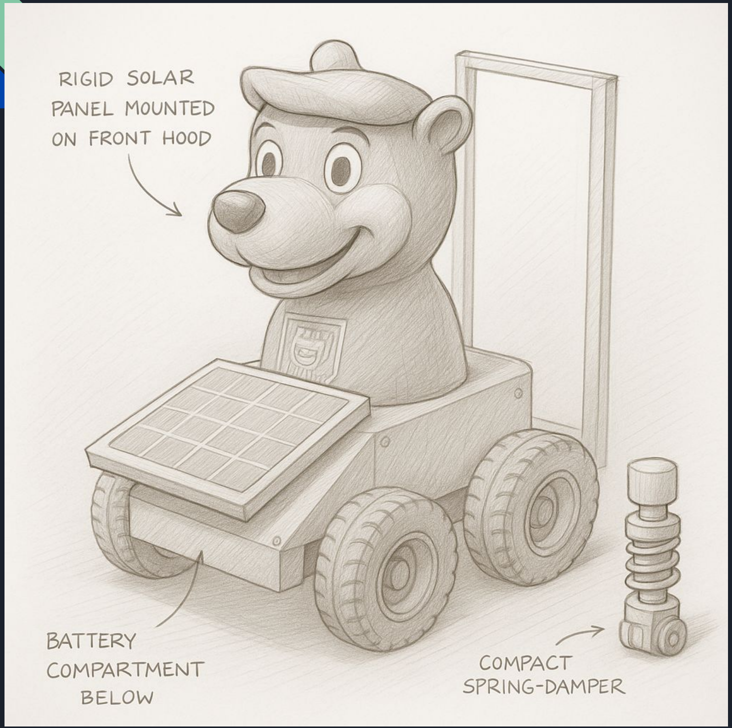
The solar panel will be able to adjust its angle

Pros

- Best overall sunlight exposure due to tallest placement
- Can support the **largest** solar panel out of all concepts
- Uses existing aluminum rails for easy, stable mounting
- Frees all body surfaces for sensors or branding
- Wiring can be neatly routed down the rails

Cons

- Significantly increases height → potential clearance issues indoors
- Creates top-heavy center of gravity, slightly reducing stability
- More drag outdoors (wind sensitivity)
- Could block access to the back of Scotty’s head for AI sensors



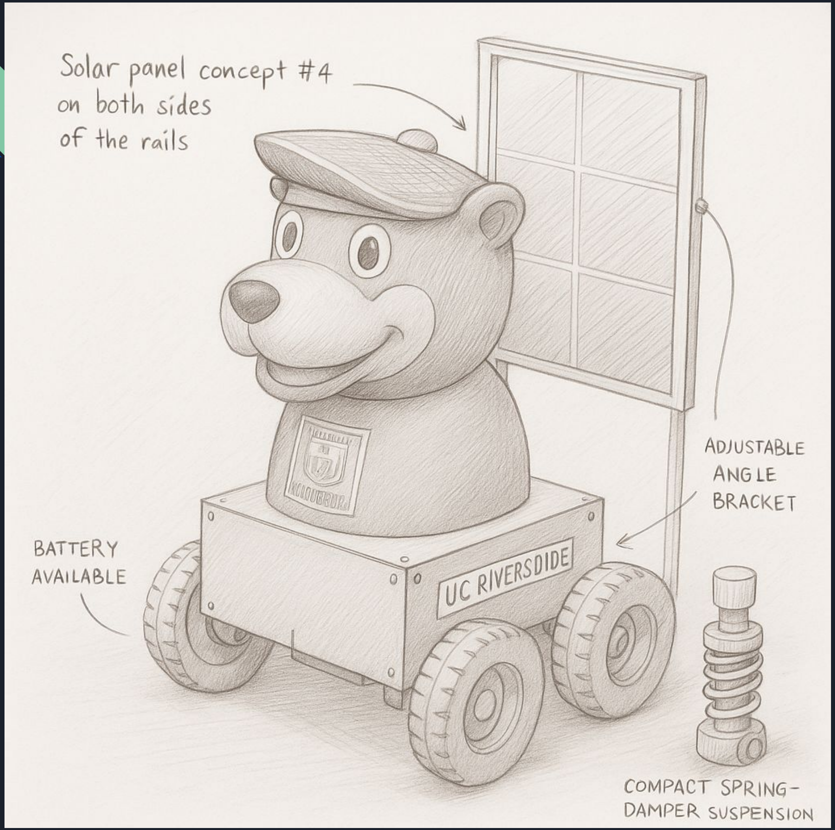
Solar panels in front on top of the hood

Pros

- Most secure mounting surface (flat, rigid, low vibration)
- Second-shortest wiring path (hood → front electronics box)
- Very easy to maintain/clean since panel is directly reachable
- Low profile – does NOT add height or width
- Safest for navigating tight indoor areas

Cons

- Sun exposure is heavily angle-dependent due to downward slope
- Front placement is more prone to debris or accidental bumps
- Panel reduces future space for front sensors or attachments
- Reflectivity could cause glare to front-facing cameras

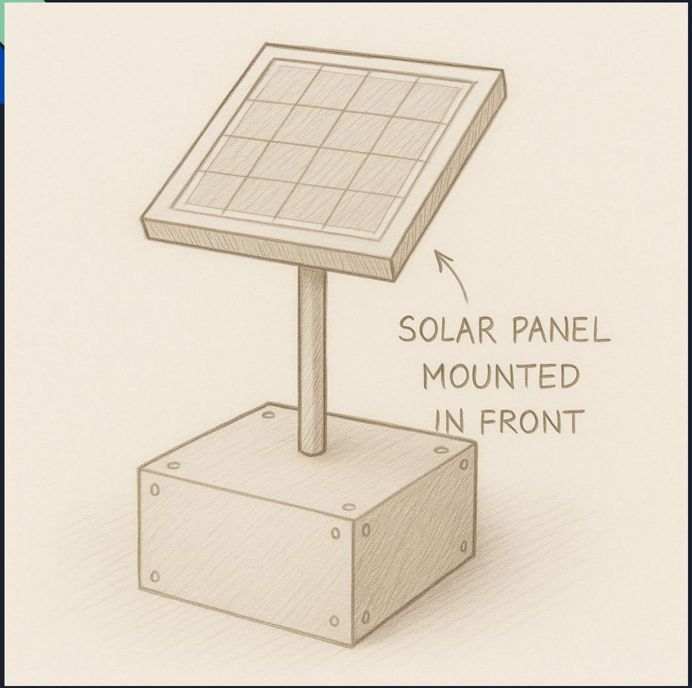


Pros

- Panels remain hidden during navigation → **zero interference**
- When deployed, can capture sunlight from both left and right
- Adjustable angle allows fine-tuning for different lighting conditions
- Uses very light hardware → low load on rail frame
- Balanced solar input from two sides of the robot

Cons

- Requires a moving hinge or sliding mechanism → more failure points
- More wiring needed (left + right panels)
- Panels are vulnerable when expanded outdoors (side impacts, pedestrians)
- Harder to mechanically keep perfectly aligned on both sides
- Adds weight high on the rails, slightly affecting roll stability



Pros

- Simplest hardware: one pole + one panel → lightweight and cheap
- Panel sits forward for **clear, unobstructed** sunlight
- Does not depend on rail geometry — completely modular
- Easy to replace with a higher-wattage panel later
- Keeps the robot's body accessible for other components

Cons

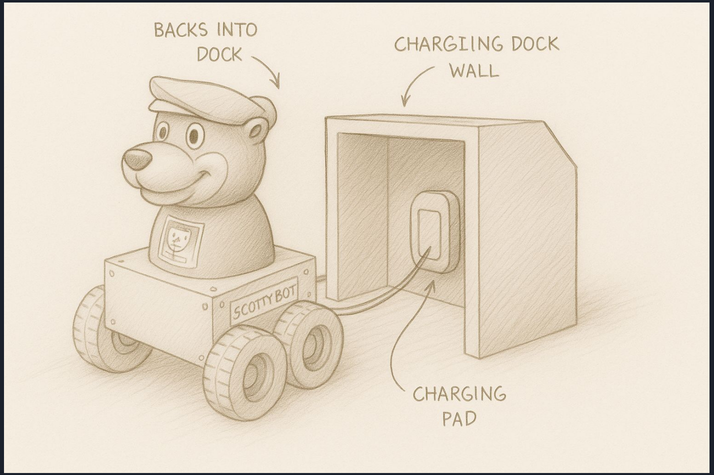
- Adds a front protrusion → can affect close-range maneuvering
- Pole may vibrate more since it's only top-supported
- A single panel means lower total wattage compared to rail systems
- Increases robot footprint, making collisions more likely
- Weight added to the extreme front slightly shifts weight balance

Quick side notes

I have emailed the people listed in the previous weeks slides. Waiting for their responses :)

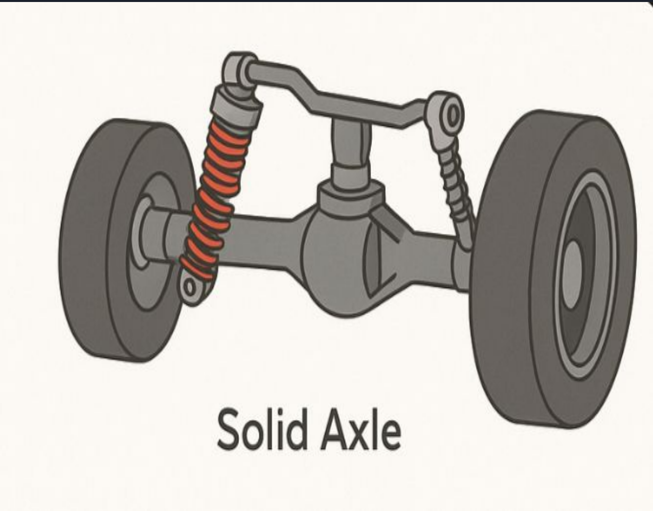
Inside the dock box: a 12V LiFePO4 smart charger

I was thinking of making a mini charging station the scotty bot can come back to something like this:



Solid Axle Suspension Concept

(Single beam connects both wheels)



Pros:

- Very durable and simple — fewer moving parts to break or misalign
- Provides excellent load-sharing between wheels.
- Easy to fabricate using aluminum bar or 3D-printed center mount.
- Works well for slow-speed stability and heavy payloads.

Cons:

- Poor terrain adaptability — one wheel lifting affects both sides.
- Less precise handling — not ideal for skid-steer turning like RoboCUB.
- Adds unsprung weight, increasing shock loads to the frame.
- Limited effectiveness at higher speeds or uneven pavement.

Double Wishbone Mini Concept

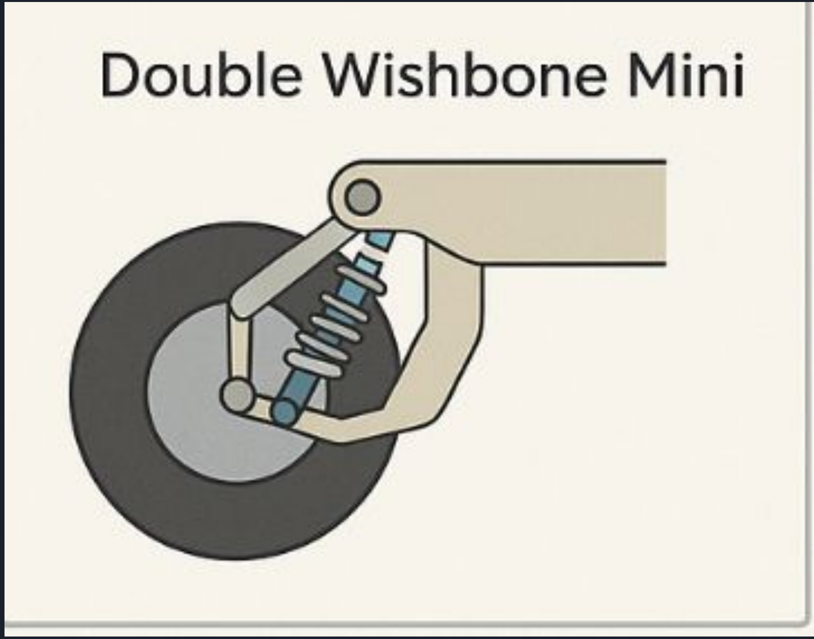
(Compact independent suspension used in RC and small robots)

Pros:

- Allows independent wheel motion, maintaining traction on uneven surfaces.
- Compact design — fits within limited RoboCUB chassis space.
- Coil-over spring absorbs vibration, protecting electronics and sensors.
- Provides good camber control, keeping tires flat to the ground for better grip.
- Lightweight and easily scaled using 3D-printed or polymer control arms.

Cons:

- More complex geometry — requires accurate mounting points for upper/lower arms.
- Slightly higher fabrication difficulty than rigid or trailing-arm setups.
- Limited suspension travel (≈ 25–30 mm) compared to larger



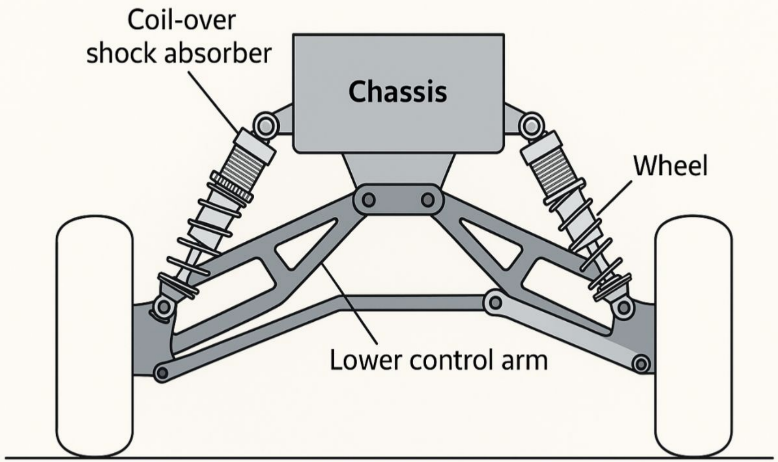
Independent Suspension

Pros:

- Provides maximum traction and smooth motion across sidewalks or ramps.
- Reduces vibration transmission to sensors and electronics by up to 60%.
- Enables RoboCUB to handle sidewalk gaps, curbs, and slopes efficiently.
- Improves energy efficiency — less slippage means less motor current draw.

Cons:

- More parts and joints — increased maintenance requirements.
- Slightly higher weight due to additional control arms and dampers.
- Precise alignment is critical; poor setup can cause uneven wheel loading.



Independent suspension concept adapted for RoboCUB

Sensor Concept #1

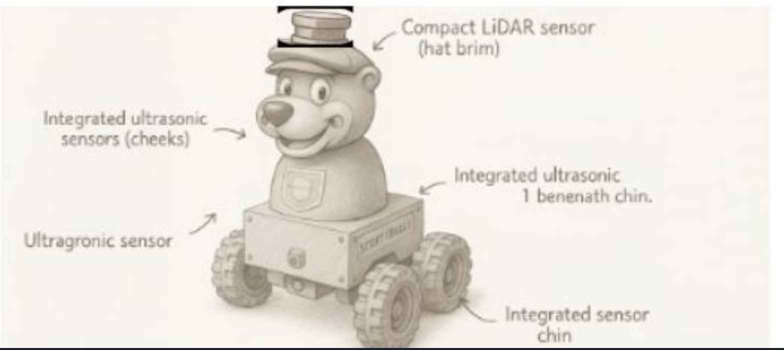
2 **ultrasonic sensors** provide front and side obstacle detection for navigation.

LiDAR sensor mounted above the solar panel enables 360° environmental mapping.

This setup helps ScottyBot avoid bumping into things.

It keeps the design simple and works well for moving safely.

Sensor Concept #2



The LiDAR on the hat scans the area in front of ScottyBot.

The cheek sensors help detect things on the sides.

The chin sensor spots objects close to the ground.

This setup gives ScottyBot a wide view for safer movement.

Sensor Concept #3

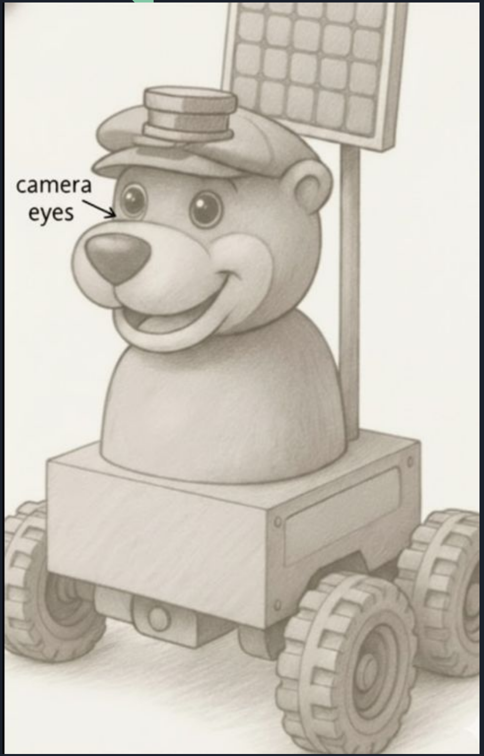
Cameras in the eyes let ScottyBot see and recognize objects.

Ultrasonic sensors around the body help detect close obstacles.

The LiDAR on top scans the area for mapping and distance.

This setup gives ScottyBot both vision and accurate sensing all around.

Sensor Concept #3



The eyes act as cameras to see in front of ScottyBot.

They help recognize people, objects, and paths.

The design looks natural and friendly.

Great for vision-based navigation and interaction.

Sensor Concept #3

https://www.youtube.com/watch?v=mi6HCmJwO3U