Power Requirements for Components

Raspberry Pi: The Raspberry Pi typically requires 5V with at least 2.5-3A (depending on the model)

For example, the Raspberry Pi 4 needs around 3A

Motors: depend on motor type

Motor Drivers: depend on motor driver we will use it

Power Management:

Separate Power for Motors and Raspberry Pi: Since the Raspberry Pi is sensitive to voltage fluctuations

it's recommended to power the motors and the Raspberry Pi separately.

Motors need more current, and surges can cause the Raspberry Pi to reboot or behave unpredictably

Using voltage regulator: to give Raspberry Pi required voltage in case we use 12V battery and Raspberry Pi need 5V

Battery Types:

LiPo (Lithium Polymer) Batteries:

- **Pros:** Lightweight, compact, high discharge rates (great for motors), and can store a lot of energy.
- **Cons:** Require careful charging and monitoring to avoid over-discharge or swelling, which can be dangerous.

Li-Ion (Lithium-Ion) Batteries:

- **Pros:** Higher energy density than LiPo, safer and more stable, often used in power banks.
- **Cons:** Slightly bulkier than LiPo, lower discharge rates (not always great for high-power motors).

NiMH (Nickel Metal Hydride) Batteries:

- **Pros:** Safer than LiPo, no risk of over-discharge, good for moderate power applications.
- **Cons:** Heavier and less energy-dense compared to LiPo and Li-Ion batteries.

Lead Acid Batteries:

- **Pros:** Cheap and reliable, used in many automotive applications.
- **Cons:** Very heavy, not suitable for small or lightweight projects, and lower energy density.

Suggested Power Setup:

Motors: Use a higher voltage battery (e.g., 11.1V LiPo) and connect it directly to the motor drivers.

Raspberry Pi: Use a step-down converter (e.g., 12V to 5V buck converter) to power the Raspberry Pi from the same battery.