☑ 4.3.7 Menu Tree / Circuit Diagram

☑ ▶ 1 – Menu Tree

The **Menu Tree** shows the hierarchy of options and actions the user can perform in the Mobile App UI.

☑ *Suggested Menu Tree Structure*

```
EcoSweep Mobile App
│
├── Connect to EcoSweep (Bluetooth)
│
├── Select Mode
│     ├── Manual Mode
│     │     ├── Move Forward
│     │     ├── Move Backward
│     │     ├── Turn Left
│     │     ├── Turn Right
│     │     ├── Adjust Speed
│     │     ├── Control Robotic Arm
│     │     │     ├── Move Arm Up
│     │     │     ├── Move Arm Down
│     │     │     ├── Set Servo Angle
│     │     │
│     │     └── Stop Operation
│     │
│     ├── Semi-Automatic Mode
│     │     ├── Start Cleaning Process
│     │     ├── Stop Cleaning Process
│     │     └── View Sensor Data
│     │
│     └── Automatic Mode (Future Expansion)
│
├── View Sensor Data
│     ├── Ultrasonic Sensor Data
│     ├── GPS Location Data
```

```
│     ├── IMU Data
│     └── Compass Data
│
└── Settings
      ├── Configure Connection
      ├── Set Cleaning Parameters
      └── About / Help
```

☑ *Explanation to Add in Documentation*

- The **Menu Tree** shows the user navigation flow in the EcoSweep Mobile App.
- Users can connect to the EcoSweep robot, select operation modes, control movement and robotic arm manually, view sensor data, and configure settings.
- In **Manual Mode**, users have fine-grained control of movement and arm position.
- **Semi-Automatic Mode** allows the user to start predefined cleaning processes and view real-time sensor data.
- Future expansion includes fully **Automatic Mode** based on AI.

☑ ▶ 2 – Circuit Diagram

☑ *Overview of Circuit Design (Text Data)*

The circuit diagram shows the electrical connections between EcoSweep's main hardware components.

▶ ✅ Main Components in Circuit:

Component	Connection	Description
LiPo Battery	Powers Motor Drivers & Arduino Mega	Supplies high current for motors
LM2596 Buck Converter	Steps down voltage for sensors, microcontrollers	Ensures stable voltage for low-power devices

Arduino Mega 2560	Central microcontroller for sensor reading and actuator control	Receives commands from Raspberry Pi
Raspberry Pi 4	Central processing hub; connected to Arduino Mega via USB	Handles command parsing and Bluetooth communication
BTS7960 Motor Driver	Connected to Arduino Mega digital pins	Controls DC tire motors
PCA9685 Servo Driver	Connected to Arduino Mega via I2C (SDA/SCL)	Controls up to 16 servo motors
Ultrasonic Sensors	Connected to Arduino Mega digital pins	Distance sensing for obstacle detection
IR Sensors	Connected to Arduino Mega digital pins	Edge detection / Line tracking
NEO-6M GPS Module	Connected to Arduino Mega via Serial	Provides GPS coordinates
MPU6050 IMU	Connected to Arduino Mega via I2C	Provides accelerometer and gyroscope data
HMC5883L Compass	Connected to Arduino Mega via I2C	Provides orientation data

▶ ✅ Example Textual Circuit Flow

```
[LiPo Battery (11.1V)]
    ↓
[BTS7960 Motor Driver] ↔ [DC Tire Motors]
    ↓
[Arduino Mega 2560]
    ↓
[PCA9685 Servo Driver] → [Servo Motors (Arm)]
    ↓
[Ultrasonic Sensors, IR Sensors, GPS, IMU, Compass] → [Arduino Mega]
    ↓
[LM2596 Buck Converter] → Supplies 5V to Arduino Mega, Sensors,
PCA9685
    ↑
[Raspberry Pi 4] ⇔ USB Serial ⇔ Arduino Mega
[Mobile App (Bluetooth SPP)] ⇔ [Bluetooth Module] ⇔ [Raspberry Pi 4]
```

☑ Explanation to Add in Documentation

- Power is supplied primarily by a **LiPo battery**, powering high-consumption components like motors and motor drivers.
- The **LM2596 buck converter** regulates voltage for stable operation of sensors and microcontrollers.
- The **Arduino Mega 2560** acts as the hardware controller, reading sensors and controlling motors and servos via drivers (BTS7960 and PCA9685).
- **Raspberry Pi 4** acts as the higher-level communication controller, receiving Bluetooth commands and forwarding them to Arduino Mega.
- The full system works together to enable user control, autonomous movement, and environment sensing.

☑ Summary of Data to Add in Documentation

▶ Menu Tree (as shown in the structured tree above).

▶ Circuit Flow Text (shown above).

▶ Explanation about power flow, data flow, and component interaction.