☑ 4.3.4 Sequence Diagram – EcoSweep Cleaning Robot

🎯 Purpose of the Sequence Diagram

To show the time-ordered interaction between different system components (actors and objects) during a typical operation flow — e.g., User controlling EcoSweep in Manual Mode.

☑ ▶ Example Scenario: Manual Control of Robot Movement

☑ *Sequence of Steps*

Step	Description
1	User opens the Mobile App and connects to EcoSweep via Bluetooth.
2	User selects Manual Mode.
3	User presses “Move Forward” button.
4	Mobile App sends structured command (mode, action, direction, speed) over Bluetooth to Raspberry Pi.
5	Raspberry Pi receives the command, parses it, and forwards it via USB Serial to Arduino Mega.
6	Arduino Mega processes the command → Controls BTS7960 Motor Driver → Moves DC Tire Motors forward.
7	Arduino Mega optionally reads sensor data (Ultrasonic, IMU) and sends feedback to Raspberry Pi.
8	Raspberry Pi optionally forwards sensor data back to Mobile App for status display.
9	User observes movement and sensor data (optional), then sends next command or stop command.

☑ ▶ Sample Sequence Diagram Structure (Textual)

```
User -> MobileApp: Open App & Connect to EcoSweep
User -> MobileApp: Select Manual Mode
User -> MobileApp: Press "Move Forward"
MobileApp -> RaspberryPi: Send Command (mode, action, direction,
```

```
speed)
RaspberryPi -> ArduinoMega: Forward Command via USB Serial
ArduinoMega -> MotorDriver (BTS7960): Drive Tires (Forward at speed
X)
ArduinoMega -> SensorModule: Read Sensor Data (e.g., Ultrasonic)
SensorModule -> ArduinoMega: Return Sensor Data
ArduinoMega -> RaspberryPi: Send Sensor Data (optional)
RaspberryPi -> MobileApp: Forward Sensor Data (optional)
```

☑ ▶ Example Sequence Diagram Table (to add in documentation)

Step	From	To	Action / Data
1	User	Mobile App	Open App & Connect via Bluetooth
2	User	Mobile App	Select 'Manual Mode'
3	User	Mobile App	Press "Move Forward"
4	Mobile App	Raspberry Pi	Send command packet
5	Raspberry Pi	Arduino Mega	Forward command via USB Serial
6	Arduino Mega	Motor Driver (BTS7960)	Control Tire Motors (Forward)
7	Arduino Mega	Sensor Module	Read Ultrasonic, IMU data
8	Sensor Module	Arduino Mega	Sensor Data Value
9	Arduino Mega	Raspberry Pi	Send sensor data
10	Raspberry Pi	Mobile App	Display sensor data (optional)

☑ Explanation to Add in Documentation

- This **sequence diagram** represents the flow of a single command cycle from the user to EcoSweep and back (for feedback).
- It demonstrates how the system reacts step-by-step in real time to user input, processes the command, controls hardware, and optionally provides sensor feedback to the user.
- Each arrow in the diagram shows a data transmission or method call along a time axis.

☑ Summary of Data to Add in Documentation

▶ Example Sequence Table (as shown above).

▶ Textual Sequence Diagram Flow (as shown above).

▶ Visual UML Sequence Diagram Guidelines:

- Use vertical lifelines for each entity (User, MobileApp, RaspberryPi, ArduinoMega, MotorDriver, SensorModule).
- Arrows between lifelines to represent method calls or data transmission.
- Sequence proceeds top-down (chronological order).
- Include optional feedback from SensorModule to MobileApp.