Step	System State / Phase	Condition / Input	Action Performed	Resulting State
1	System Startup	Power applied	Initialize GPIO pins, PWM, motor driver standby, ultrasonic sensor, LED, and button	System initialized
2	System Check	Button default state correct AND ultrasonic sensor returns non-zero distance	Blink RGB LED at 5 Hz for 2 seconds	System check passed
3	Transition	System check complete	Enter PAUSE MODE	PAUSE MODE
4	PAUSE MODE	No button press	Motors OFF; Green LED fades in and out at 1 Hz	Remain in PAUSE MODE
5	PAUSE MODE	Button pressed	Apply debounce delay	Transition to WORK MODE
6	WORK MODE	Entering WORK MODE	Motors ON; Green LED ON (or Blue if low battery)	Active navigation
7	WORK MODE	Distance ≥ threshold	Drive forward at nominal speed	Continue moving
8	WORK MODE	Distance < threshold	Reverse briefly, then turn	Wall avoided
9	WORK MODE	Button pressed	Stop motors; debounce	Transition to PAUSE MODE
10	WORK MODE	Accumulated WORK time ≤ 45 s	Normal operation	Continue WORK MODE
11	WORK MODE	Accumulated WORK time > 45 s	Enter low battery simulation; Blue LED ON; motor speed reduced to 50%	Low battery mode
12	PAUSE MODE	Accumulated WORK time > 45 s	Blue LED fades instead of green	Low battery PAUSE MODE
13	WORK MODE	Accumulated WORK time > 55 s	Motors OFF; Red LED blinks at 10 Hz for 5 seconds	Critical battery
14	Termination	Red LED blink complete	Turn off LEDs; stop motors	System shutdown