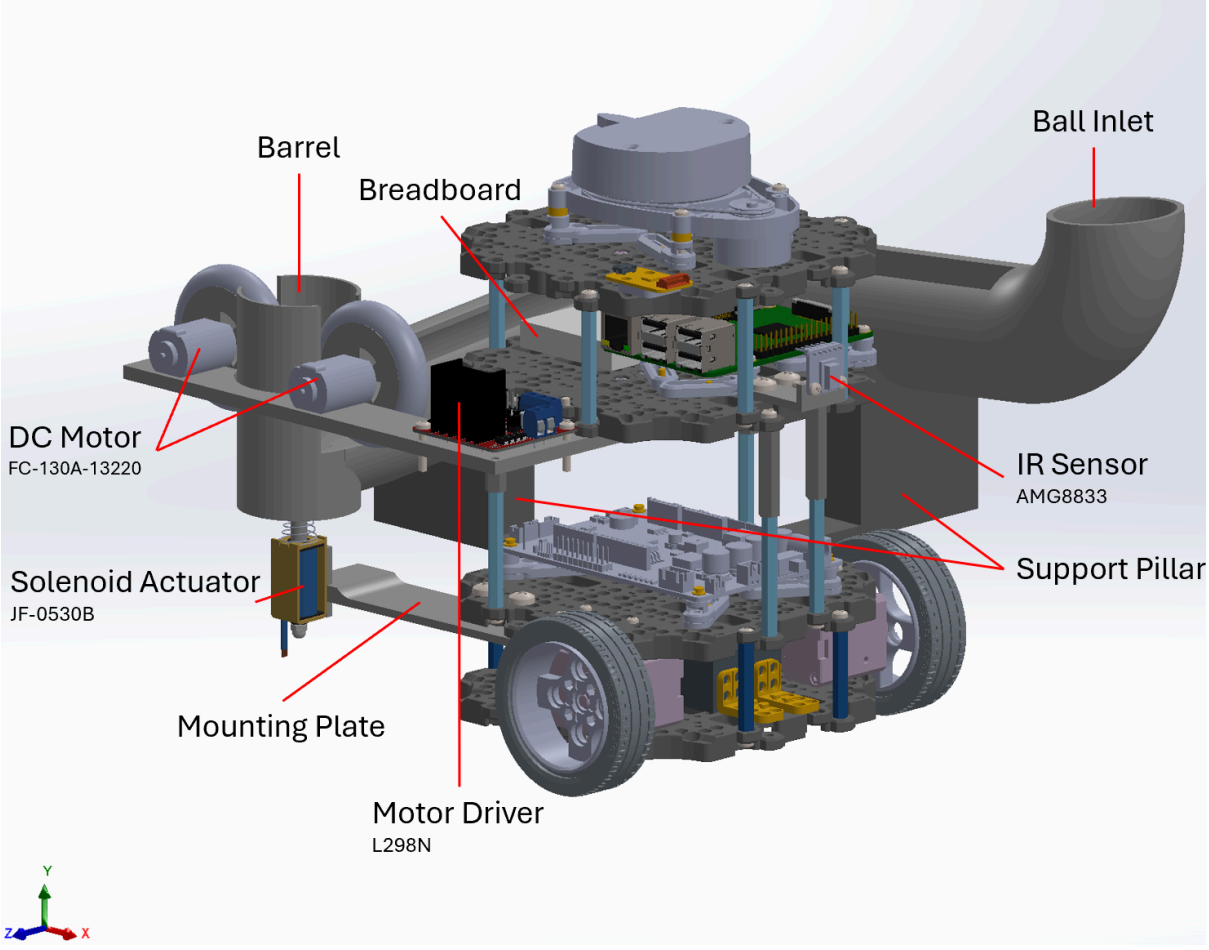
Section 1: General System Description & Critical Data (Spec Sheet)

1.1 General System Description

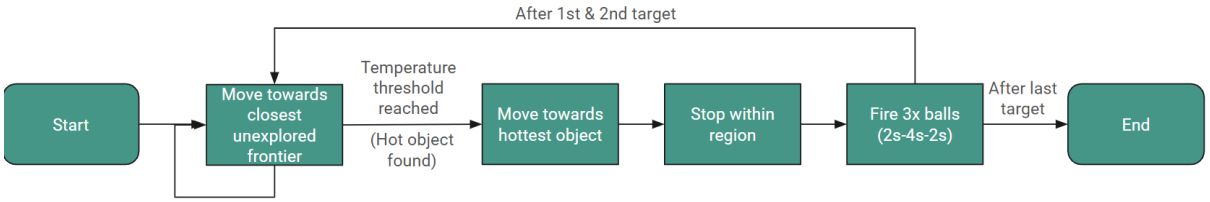
Field	Details
Model	TurtleBot3 burger
Software Version	ROS 2 Humble
Weight	1442g
Battery capacity	11.1V Li-ion, 1800 mAh (standard TB3 battery)
Max Runtime	~1 hour under normal operation
Charging time	~1 hour
Purpose	1. Turtlebot successfully avoids obstacles in maze 2. Turtlebot autonomously navigates the maze to find heat signatures 3. TurtleBot launches ping pong balls when heat signature found

1.2 Components



Section 2: Technical Guide

2.1 Software Logic Flow



2.2 Setup procedure

1. Add nine (9) ping pong balls into the ball inlet
2. Turn on TurtleBot 3
3. **On RPi - Terminal 1:** `source ~/turtlebot3_ws/install/setup.bash ros2 launch turtlebot3_bringup robot.launch.py`
4. **On RPi- Terminal 2:** `source ~/ros2_ws/install/setup.bash ros2 run launcher_service heat_seeker_node`
5. **On Laptop - Terminal 1:** `ros2 launch slam_toolbox online_async_launch.py use_sim_time:=false`
6. **On Laptop - Terminal 2:** `ros2 launch nav2_bringup navigation_launch.py use_sim_time:=false params_file:=/home/<user>/colcon_ws/src/Autonomous-Explorer-and-Mapper-ros2-nav2/nav2_params.yaml`
7. **On Laptop - Terminal 3:** `ros2 run custom_explorer explorer`
8. **On Laptop - Terminal 4:** `ros2 launch nav2_bringup rviz_launch.py`

Section 3: Acceptable Defect Log

Ref	Description	Severity	Impact	Resolution	Comments
3.1	Discolouration of 3D printed parts	Low	None	None required	Purely cosmetic defect due to superglue drying on 3D print material
3.2	Tube is mounted too flat of an angle	Medium	Balls are unable to roll down the tube	Add sponge/ foam as padding to prop up tube	Due to slight deviations from CAD model to real life replications. Issue can be fixed in future versions

Section 4: Factory Acceptance Test

Ref	Sub-system	Description	Pass/Fail	Comments
4.1	Turtlebot	LiDAR should be spinning	Pass	
4.2		Turtlebot should play a power up tone upon boot up	Pass	
4.3		Turtlebot does not beep intermittently	Pass	
4.4	Electrical	All wires are connected	Pass	
4.5		OpenCR, USB2LDS green LEDs are on upon bootup	Pass	
4.6		L298N, RPi red LEDs are on upon bootup	Pass	
4.7		OpenCR orange LED is blinking during operation	Pass	
4.8	Mechanical	When the launch function is called, the flywheels spins & solenoid actuator activates in proper sequence	Pass	

Section 5: Maintenance and Part Replacement Log

Ref	Part	Date	Comments
5.1	USB2LDS	14/4/2025	Board likely shorted during testing
5.2			
5.3			