EG2310 GROUP 9
End User Documentation and Technical Log

Robot System Name: Bot Can One

System Purpose: To create a system that can take a can from a dispenser, receive input for the table number, and autonomously deliver it.

Hardware Specifications:

List	Specifications	
	Turtlebot	**Dispenser**
Size (mm)(L x W x H)	138 x 178 x 298	132 x 280 x 320
Weight (kg)	1.15 kg	2 kg
Centre of Gravity (cm)	x:9.22, y:7.00, z:8.57 (origin measured from top left corner of left wheel)	-
Capacity	1 can	1 can
Power Supply Expected Operating time	LiPo Battery 11.1V 1,800mAh 2.5h	12.5W Micro-usb wall plug -
Sensors on board	LDS-01 Lidar sensor	-
Electronics (Excluding the pre-existing ones in the Turtlebot3)	Microswitch	3x4 Numpad SG90 Servo
SBC/MCU	RPi3B+	ESP32

Instructions:

Phase 1: Setting up the Turtlebot3 and dispenser

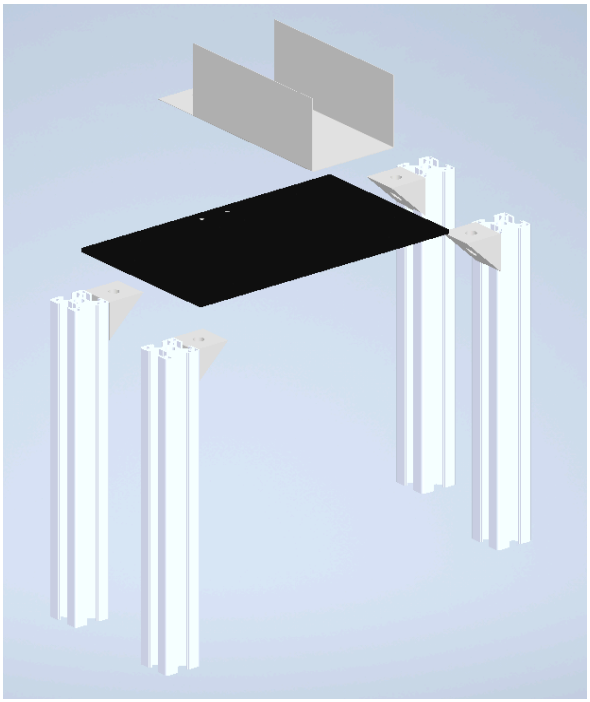
1) Plug in the micro-usb to the ESP32 on the dispenser and switch on the plug to switch on the dispenser.
2) Flick the switch on the OpenCR on the Turtlebot3 to switch on the bot.
3) Ensure laptop is connected to the same network as the bot.
4) On the laptop, start by '*sshrp'* followed by '*rosbu*' on a Ubuntu terminal.
5) In a second terminal, '*sshrp'* followed by '*switch*' has to be entered.
6) In a third terminal, '*rslam*' command has to be entered..
7) In a fourth terminal, '*map2base*' command has to be entered.
8) In a fifth terminal, 'setwp' command has to be entered.

Phase 2: Dispensing and Navigation

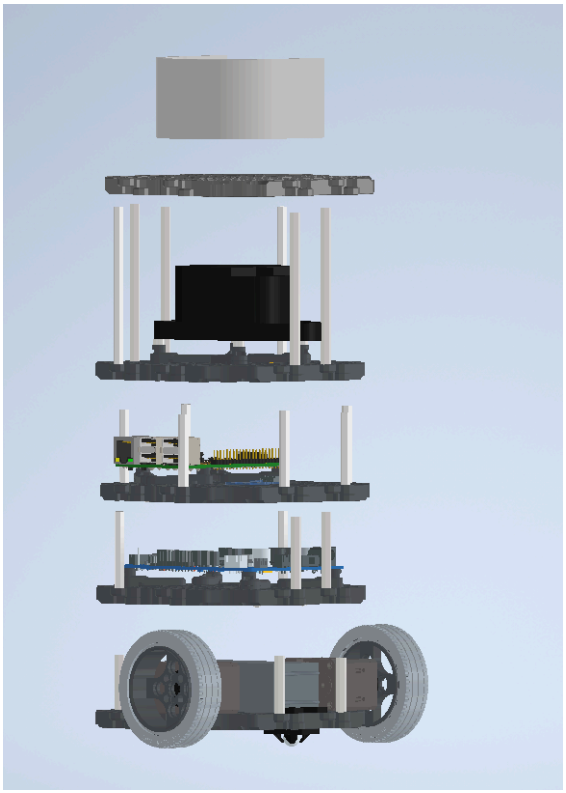
1) User will lay the can **on its side**, with the **top** of the can facing the bot in the channel of the dispenser before the blade of the servo motor.
2) User will input the table number from 1 - 6 using the numpad mounted on the dispenser. It will trigger the servo arm to rotate and the can is dispensed into the Turtlebot3 for delivery.
3) When the bot stops at the desired table, take the can out from the bot.

Assembly Document for the Dispenser:

No.	Components	QTY
1	30x30 x 265 mm Aluminium profile bars	2
2	30x30 x 320 mm Aluminium profile bars	2
3	220 mm x 132 mm Aluminium sheet	1
4	132mm x 70mm x 52.5mm Aluminium U-channel	1
5	30x30 Aluminium profile brackets	4



Assembly Document for the Turtlebot3:



Refer to the *ROBOTIS e-manual* for the assembly of the base Turtlebot3 Burger.

In addition to that

1) Make a fifth waffle plate using the same method to make the other waffle plates (1st, 3rd or 4th layer)
2) To secure the fifth waffle on the Turtlebot3, make 6 sets of custom supports using two 45mm waffle supports that are joined together using one set screw each. Each of the 6 supports will have a height of 90mm
3) Then fasten the supports in between the fourth and the fifth waffle
4) Finally, place the cupholder on top of the fifth waffle and secure it

Acceptable Defect Log:

Defect Description	Defect Classification		
	Critical	Major	Minor
At times, bot does not detect accurate orientation due to hardware issues		X	
Visualisation of the map does not always show up accurately			X
The bot might tend to vibrate slightly while navigating.			X

Factory Acceptance Test:

Component	To be checked	Observation
Structural stability	Structural platforms and components are installed correctly	Perform a shake test to check for any loose elements
	Verify all fasteners are installed and tightened	Use screwdriver/spanner to fasten tightly until cannot be tightened anymore
Dispenser	Check if the can is dispensed into the bot after input of the table number	Check if the servo motor works in the right direction opening the way for the can to dispense.
Navigation software	Rteleop to check if the bot moves	Pressing w,a,x and d will move and rotate the bot. ‘s’ will stop
Autonomous Navigation	Check if it moves to any predefined point autonomously	Given a pre-defined map and allow it to move
Rviz	Check if the bot is visible on the map	Open up the RViz terminal to check the presence of bot

Maintenance and Part Replacement Log:

Defect Date	Description	Rectification	Close Date
25th Feb 2023	Flawed functioning of the LIDAR	Replaced it with another one from the Lab	26th Feb 2023
28th March 2023	The holes in the metal sheet mounted smaller than expected	Drilled larger holes to fit in the M6 screws	28th March 2023

GUIDELINES NOT TO BE PRINTED

Rupan
MingYuan
KJ
Aditi(basically everything else :D THANKS!)

FINISH

Section 1	General System Description & Critical Data	Model, software version, weight, center of gravity, battery capacity, high level description of bot purpose etc… - Centre of gravity - Battery capacity (discharge and charge) - High level description of bot - HOW TO USE DISPENSER
Section 2	Assembly Document	Illustrated part breakdown, logic block diagram, Wiring and connections, Assembly Procedures - Logic block diagram - Wiring and connections - Assembly procedure (for dispenser)
Section 3	Acceptable Defect Log	Detailing what is not in perfect condition, but still acceptable for carrying out the mission - (ISSUE)Motion accuracy: The bot does not always detect its orientation correctly due to hardware issues. (SOLUTION) Compensated with software. - (ISSUE)Visualisation does not always start up accurately. Have to restart if need
Section 4	Factory Acceptance Test	Checklist of Factory Checks that have been carried out before mission - Shake test: no loose parts (battery is loose) - Manual Control test: Rteleop the bot can work - Visualisation test: Rviz can show where the bot is on the map - Automated control test: Given a predefined path it can navigate autonomously - Safety Test: Collision detection - Docking Test: Robot can go back to the dispenser and turn to line up with the u-channel - Dispenser test: Dispenser dispenses automatically based on keypad and pn532 microswitch

		- NFC Test: NFC tag can be detected by PN532 -
Section 5	Maintenance and Part Replacement Log	Detailing maintenance operations and replacement of critical components on the System - Lidar x1