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NATIONAL APPRENTICE AND INDUSTRIAL TRAINING AUTHORITY



D.D.

DAILY DIARY

UNDERGRADUATE / DIPLOMA / NVQ 4 / 5 / 6 CERTIFICATE
INDUSTRIAL TRAINING

APPRENTICE'S DAILY DIARY
UNDERGRADUATE / DIPLOMA / NVQ 4 / 5 / 6 / CERTIFICATE

Name : A. D. Upeskha Dilhara

Apprentice's Private Address : 3rd Lane, Thanabima, Bangadeniya

Contact Phone Number : 076 5397153

Category of Apprenticeship : B.S.c. (Hons)

Field of Engineering : Electronic and Telecommunication

Registration Number given by the University / Institute / College : 200128D

Registered Number of the Contract :

Overall Period of Training : 24 week From : 27/01/2023 To : 10/05/2023

NOVATION

Name and Address of Establishment	Workshops / Worksites	Period		Signature of Officer In Charge	Designation
		From	To		

INSTRUCTIONS TO MAINTAIN THE DAILY DIARY

1. As credit will be given for the maintenance of the daily diary at your Interim and Final Assessment, you are advised to maintain your daily diary neat and tidy and to keep it safe till the end of your training period.
2. It is important that daily entries should be made at the end of each day's work and weekly entries at the end of each working week. All entries should be in ink.
3. Daily entries should indicate as clearly as possible the various work performed by you each day.
4. The weekly entries should contain a brief description of the work done each week.
5. In the blank spaces provided, write any new information you may have gathered, any reference that may be necessary, relevant notes from manufacturer's specifications, sketches, diagrams and technical drawings that will be useful to you. In addition, give a brief description of the problems that you may have encountered, how they were overcome and steps taken to avoid their recurrence in the future.
6. Use the space provided to give any detail first, before attaching additional pages.
7. You are advised to make entries of any personal and managerial problems you may encounter in addition to the technological problems.
8. You would obtain the signature of your Engineer / Training Officer/ Foreman each week on the days specified by him.
9. Training Progress Report found at the rear of the daily diary should be completed and certified by the employer of each establishment.
10. Space is also provided at the rear portion of the Diary for any comments/ remarks to be made by the officials of NAITA and officials of the University during inspection or assessments.

IMPORTANT NOTE

- This Daily Diary should be available for inspection whenever called by any authorized officer during normal working hours.
- Whenever the apprentice wishes to meet a NAITA Officer, he/she is expected to bring the Daily Diary along with him/her.
- Under no circumstances will he/she be interviewed without his/her Daily Diary.

WEEK NO: 01

FOR THE WEEK ENDING

Sunday..... 06/10/2023.....

TRAINING LOCATION

Arimac Lanka.....

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	11/27	Went to Arimac Lanka office and signed for agreement and offering letter given by the company. Met the supervisor of team. According to his guidelines first Ubuntu and ROS2 had to be installed and setup the computer.
Tuesday	11/28	Started to be familiar with ROS2 and Gazebo. - Create ROS2 workspace and packages - Write a Node and debugging tools used in ROS2
Wednesday	11/29	Supervisor asked to find what method can be used to build 3D map. Wrote a report on feasibility of creating 3D map using a robot. Evening had meeting with supervisor.
Thursday	11/30	Learned how to use Rviz-graph and Turtlebot for debugging. Made a publisher and subscriber between a topic. Used command line tools to debug ROS2 topic.
Friday	12/01	Got familiar with ROS2 services. Written a python service server and service client. Used debugging tools for services. Tried some experiment with Turtlebot services.
Saturday	12/02	- Holiday -
Sunday	12/03	- Holiday

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Research

- Photogrammetry - using 2 photos with different angles
 - 70% overlap photos have to be taken
- NeRF - use ML to build 3D model
 - input images
 - can be captured shadow, water in detail.

Photogrammetry → polycam (software) , NeRF - LUMA AS (software)
Gaussian Splatting → Recently → polycam
Eto colormap → Stereoscopic rendering
↳ Multi stereo view.

Arched portion has thick wavy pattern on top of which there is a short
ridge with a small depression in the middle. There are two
ridges on either side of the main ridge. The main ridge has a sharp
ridge and a short wavy pattern on either side.
The wavy pattern has a short wavy pattern on either side.
The main ridge has a sharp ridge and a short wavy pattern on either side.
The wavy pattern has a short wavy pattern on either side.

Unlocked
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

After the training session, the trainee has demonstrated a good understanding of the software and its applications. He has shown a keen interest in learning and has asked many questions to clarify his doubts. His answers were clear and well-explained. He has also shown a good attitude towards work and has been able to complete tasks assigned to him within the specified time frame. Overall, he has performed well and is ready to take on more responsibilities.

DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: 02

FOR THE WEEK ENDING

Sunday, 10/12/2023

TRAINING LOCATION

From University (remotely)

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	10/04	Create a new nodes and packages in Ros. Ros2 Run, Ros2 node, Ros2 topic command are used to test my own pkg and nodes.
Tuesday	10/05	Started to study on TF, URDF, Gazebo. Understand what is TF, URDF and why we use Gazebo. Wrote URDF for 2 wheels robot.
Wednesday	10/06	Learn about creating visualize link and adding colors to them. Combine 2 Links with a joint. Added two wheels to robot. Learn about different type of joint in URDF.
Thursday	10/07	Added a caster wheel to robot. Completed the urdf for the robot. Wrote launch file to start robot state publisher. The RViz used visualized the written urdf.
Friday	10/08	Added prize config to launch file. Got understand about Xacro with urdf. What are the Xacro properties and how to use them. Wrote Macros in Xacro and used macro file in another Xacro file.
Saturday	10/09	Had a meeting with supervisor about progress. — Holiday —
Sunday	10/10	— Holiday —

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

→ Cloning] this are build on top of rcl
rclcpp

→ Ros2 create
→ Ros2 run
→ Ros2 node

rename the node

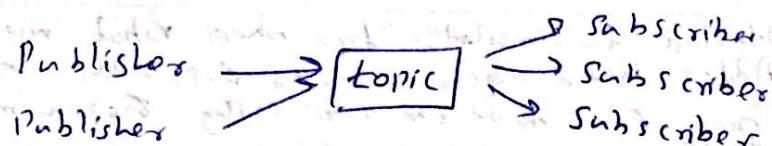
- colon had --symlink-install & with changes in the file we can use.

Red - z
green - y
blue - z
RGB
ng - z
Troll - z
Pitch - y
Raw - z

- URDF - define the structure and properties
- TF - transformation
- RViz to visualize the URDF.

TurtleSim - used to 2D simulation

Topics - used to communicate with nodes.



Robot description contains nodes (Publisher, Topic, Subscriber).

Nodes publish messages to topic and listen to it.

Nodes can be off-line and online.

Online nodes receive messages from other nodes.

Off-line nodes do not receive messages.

Yashika
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O.

- satisfied -

- satisfied -

Yashika has done the project very well and has understood the concepts very well.

Yashika is now ready to work.

Chaitanya

Project Manager

Yashika is good.

Yashika has done the project very well and has understood the concepts very well.

DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: 23.....

FOR THE WEEK ENDING

Sunday, 17.12.2023.....

TRAINING LOCATION

Arimae Lanka.....

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	12/11	Started to simulate two wheel robot with Gazebo. Added inertia macro in urdf. Also added collision shapes. Fixed color of the robot using Gazebo material tags.
Tuesday	12/12	I wrote a launch file to start robot in Gazebo. Although I gave some value to inertia matrix, those values was not enough because robot moved slowly. I fixed that adding more inertia to it. Added plugin to move.
Wednesday	12/13	- Understand about communication nodes (processes) - Watch some videos about opencv python (python class) - Write launch file for gazebo
Thursday	12/14	- Continue with gazebo simulation - Adding object to gazebo world - Learn how to move robot in gazebo
Friday	12/15	Air compressed massage unit - find what are existing devices - Techniques those devices have been used - Match with required devices
Saturday	12/16	- Holiday -
Sunday	12/17	- Holiday -

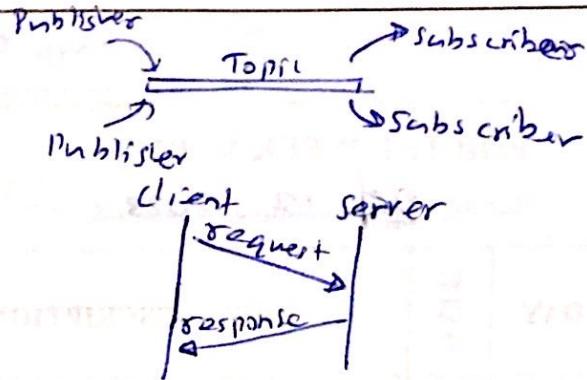
DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

URDF with Macro

- macro : property
- macro : macro
- macro : include .
- real meshes can be to urdf with insertion which can be directly export from CAD software.

Communication with nodes

- Topic → publisher, subscriber
- Service → client, server
- Action → client, server

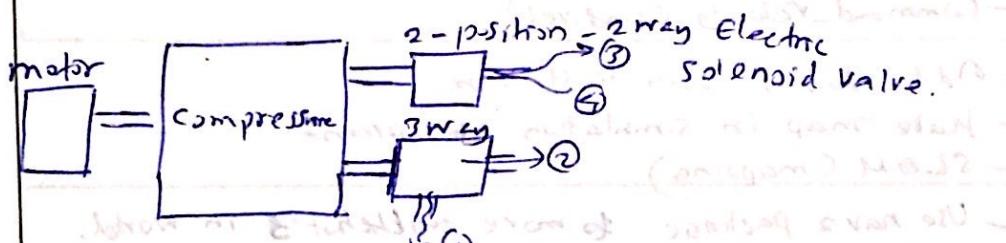


chamber

151,2

chamber ← position around specific area

→ → → | - with some pattern



total required of water 5000 liters of water
otherwise no water more than 2 minutes up to 10000 liters

Yashika
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O.

- Nabilah -

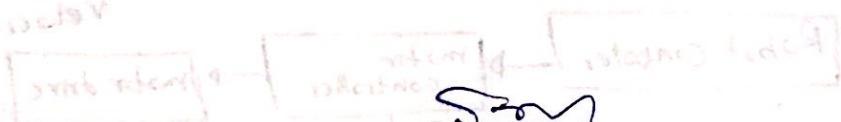
- Nabilah -

WON COMMENDED FOR THE GOOD WORKS IN THIS PROJECT
INTERESTED AND DEDICATED STUDENT OF MECHANICAL ENGINEERING, IN GIVE

seen - Sunita (15V-302) student name

check result & etc.

elements (water tank) seen &
blocker



DATE : 20/05/2024

DESIGNATION AND SIGNATURE

Given at _____ on _____ 2024

WEEK NO: 04

FOR THE WEEK ENDING

Sunday... 24/12/2023....

TRAINING LOCATION

Arimac, Lantek

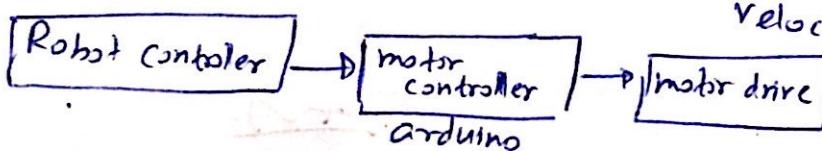
DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	12/18	<ul style="list-style-type: none"> - Watching and try to understand ROS 2 with gazebo - Add diff-drive plugin into gazebo - Command_velocity (cmd-vel)
Tuesday	12/19	<ul style="list-style-type: none"> - Add Lidar plugin to gazebo. - Make map in simulation environment - SLAM (mapping)
Wednesday	12/20	<ul style="list-style-type: none"> - Use nav2 package to move turtlebot3 in world. - Understand & qt graphs of that. - Odometry understanding.
Thursday	12/21	<ul style="list-style-type: none"> - Try to add nav2 stack to custom robot - Make navigation stack to custom robot in simulation environment
Friday	12/22	<ul style="list-style-type: none"> - Make the map using teleop_twist keyboard. - Understand & qt-graph at this stage.
Saturday	12/23	<ul style="list-style-type: none"> - Holiday -
Sunday	12/24	<ul style="list-style-type: none"> - Holiday.

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Command-velocity (Cmd-vel) → Twist type

↳ xyz linear velocity

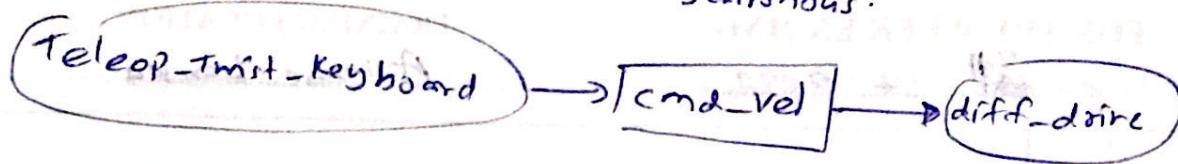
↳ xyz (roll pitch yaw) angular velocity



Lidar → SLAM → map the world.

Navigation → More give pose using SLAM.

SLAM - toolbar → online - asynchronous.



exhibitant hmt mask

Chalochan
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

THESE CERTIFIED THAT THE TRAINEE HAS BEEN PROVIDED WITH ALL THE NECESSARY INFORMATION AND SUPPORT TO COMPLETE THE TRAINING PROGRAMME AS PER THE AGREED SCHEDULE.

DATE : 20/05/2024

.....
DESIGNATION AND SIGNATURE

WEEK NO: ..05.....

FOR THE WEEK ENDING

Sunday.....31/12/2022.....

TRAINING LOCATION

.....Arimac Lanka.....

DAY	Wednesday	Thursday	Friday	Saturday	Tuesday	Monday	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
							Year End holidays
Sunday	12/30	12/29	12/28	12/27	12/26	12/25	
12/31							

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

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WEEK NO: Week 06..

FOR THE WEEK ENDING

Sunday, 07.01.2024

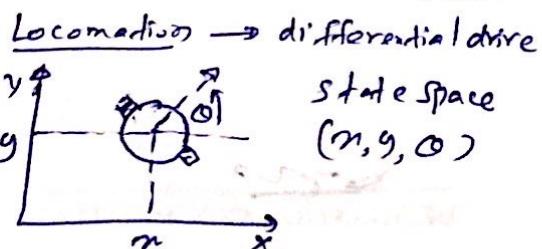
TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	01/01	<ul style="list-style-type: none"> - Had a new year celebration in Office - Get better understand about python subscriber, publisher - Locomotion of a differential drive robot.
Tuesday	01/02	<ul style="list-style-type: none"> - Study about ros2-control - Interface between hardware and ros2 - Understand about parameter in ROS2
Wednesday	01/03	<ul style="list-style-type: none"> - defining parameter of a node as a yaml file. - Study about kinematics for a mobile robot - Differential kinematics for our real robot.
Thursday	01/04	<ul style="list-style-type: none"> - Write a code for finding wheel velocities for given cmd-vel - Get dimensions of our real robot to calculate diff-inverse kinematics.
Friday	01/05	<ul style="list-style-type: none"> - Here how robot can be control by joy stick - Then start to study about Localization - Study about Odometry of from wheels
Saturday	01/06	Holiday —
Sunday	01/07	Holiday —

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

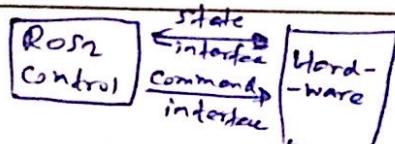
Python subscriber → to make executable we need to add that to setup file.



ROS2_Control

- Position
- Velocity
- Effort / Force

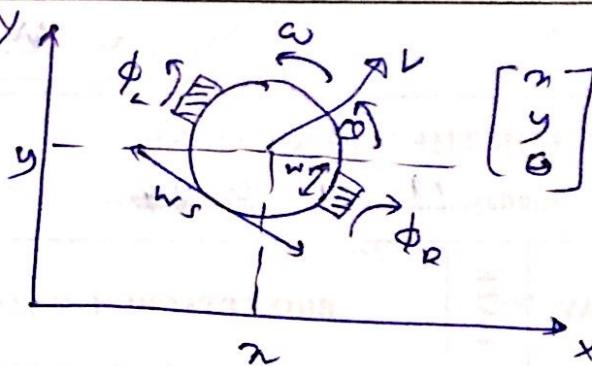
transmission tag → use for mechanical connection between joints.



Plugins → real sensor and motor.

Kinematics ← forward
Inverse

$\begin{bmatrix} x \\ y \\ \theta \end{bmatrix}$ - robot velocity



we need find f for

$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix}$ → wheel velocities

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix} = f(x, y, \theta, \dot{\phi}_L, \dot{\phi}_R, w_L, w_R)$$

odometry → localization

→ wheel odometry

→ Laser odometry

→ Visual odometry

(unrelated) report file, will upload later

.....cplckh.....

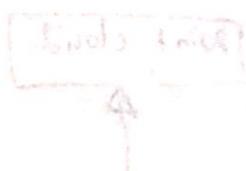
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

- cabidol - $\frac{2}{5}$

- cabidol - $\frac{2}{5}$

PROBLEMS ARE THERE IN THE PROJECT, BUT I AM SURE THAT IT CAN BE SOLVED BY YOU. PLEASE DO NOT GIVE UP.



problems are there in the project, but I am sure that it can be solved by you. Please do not give up.

DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 07

FOR THE WEEK ENDING

Sunday 14.01.2024.

TRAINING LOCATION

Arimac Lanka

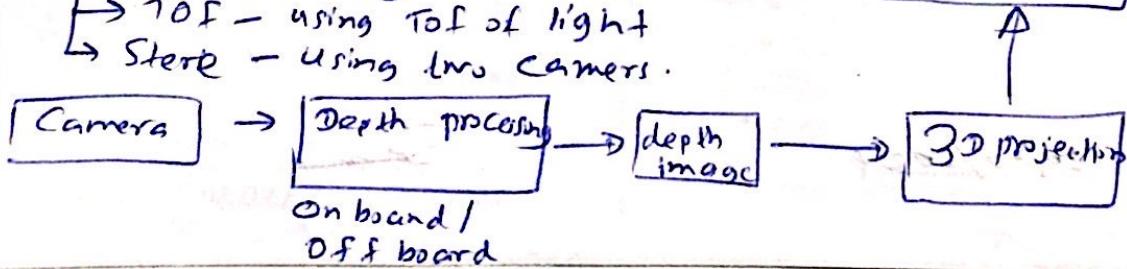
DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	01/08	<ul style="list-style-type: none"> - Supervisor suggested to study about depth cameras and how to get that point cloud first in simulation - Not understand about how to work them and what we can do with them
Tuesday	01/09	<ul style="list-style-type: none"> - Study about depth image and point clouds. - Test the depth camera in Gazebo simulation and get point cloud from that.
Wednesday	01/10	<ul style="list-style-type: none"> - Continue study on depth images - Understand about cost map 2D
Thursday	01/11	<ul style="list-style-type: none"> - Worked on setting the depth camera (Astramini). - But that it could not work with ROS 2 - It works with ROS 1, does not work with ROS 2.
Friday	01/12	<ul style="list-style-type: none"> - Talk with supervisor about camera issue - Find more packages for depth camera - Could not work with ROS 2
Saturday	01/13	- Holiday -
Sunday	01/14	- Holiday -

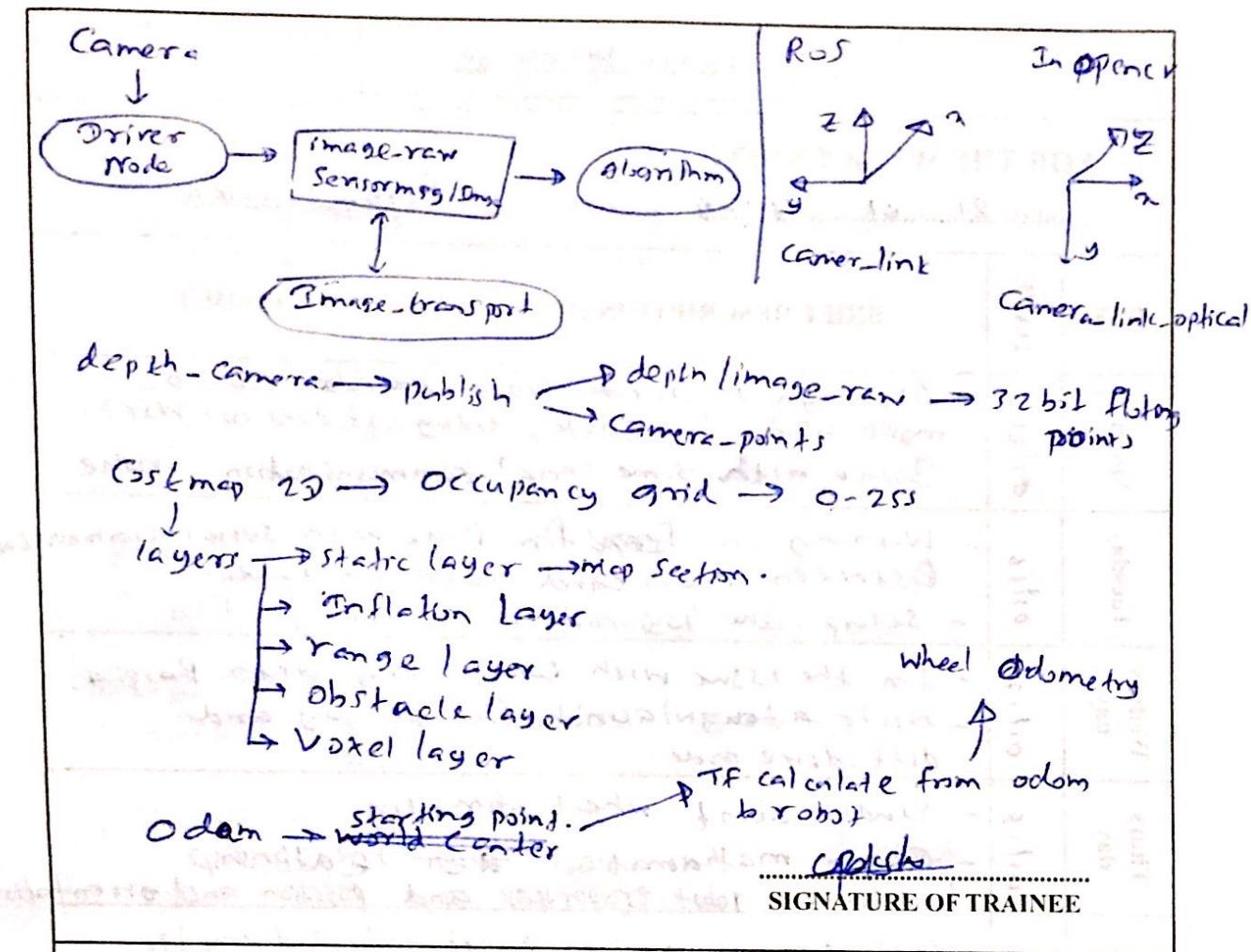
DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Depth cameras

- Structured light - send IR waves
- TOF - using TOF of light
- Stere - Using two cameras.

Point cloud





SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

— capability —
— capability —

This document certifies that the student has successfully completed the project titled "Implementation of SLAM using ROS". The project involved the implementation of a SLAM system using ROS framework. The system was able to build a 3D map of the environment and estimate the robot's position in it. The project was implemented using C++ and Gazebo simulation environment. The student has demonstrated a good understanding of ROS and SLAM concepts. The project is well documented and follows best practices. The student has shown a strong commitment to learning and applying new skills. I highly recommend this student for further studies and research work.

DATE : 20/09/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 28.....

FOR THE WEEK ENDING

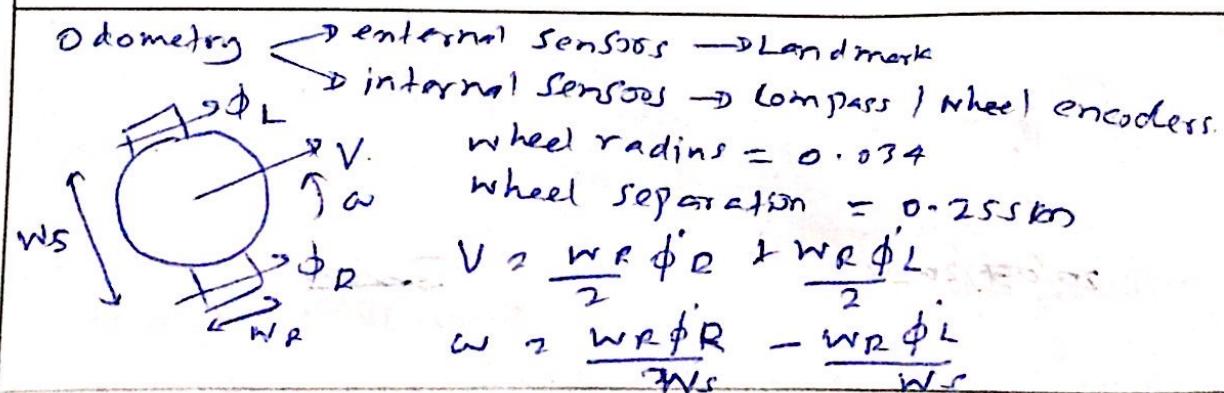
Sunday, 21.01.2024

TRAINING LOCATION

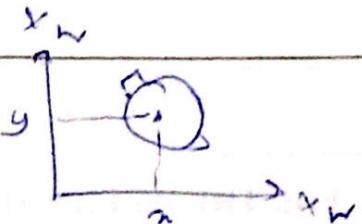
Arima, Lanka.....

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	01/15	<ul style="list-style-type: none"> - Although in previous week the robot could be more using joy stick, today it does not work. - Issue with some serial communication issue.
Tuesday	01/16	<ul style="list-style-type: none"> - Working on fixed fix issue with serial communication between rasp and motor controller. - Setup the joy-node with config file.
Wednesday	01/17	<ul style="list-style-type: none"> - Fix the issue with communicating with Raspi 4. - Write a launch file for joy and diff-drive node.
Thursday	01/18	<ul style="list-style-type: none"> - Study about wheel odometry - Obtain mathematical relationship between robot properties and position and orientation.
Friday	01/19	<ul style="list-style-type: none"> - Get dimensions of robot - wheel diameter wheel separation - Write code for the get wheel odometry
Saturday	01/20	- Holiday -
Sunday	01/21	- Holiday.

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE



$$\begin{bmatrix} v \\ w \end{bmatrix} = \begin{bmatrix} \frac{w_R}{2} & \frac{w_P}{2} \\ \frac{w_R}{w_S} & -\frac{w_P}{w_S} \end{bmatrix} \begin{bmatrix} \dot{\phi}_R \\ \dot{\phi}_L \end{bmatrix}$$



$$\dot{p} = \begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix} = \begin{bmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} v \\ w \end{bmatrix}$$

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix} = \begin{bmatrix} \frac{w_R \cos \theta}{2} & \frac{w_P \cos \theta}{2} \\ \frac{w_R \sin \theta}{2} & \frac{w_P \sin \theta}{2} \\ \frac{w_R}{w_S} & -\frac{w_P}{w_S} \end{bmatrix} \begin{bmatrix} \dot{\phi}_R \\ \dot{\phi}_L \end{bmatrix}$$

Encoder count
Per encoder resolution
= 17100

Position

$$pos = \frac{w_R}{2} (\dot{\phi}_R - \dot{\phi}_L) + \frac{w_P}{2} (\dot{\phi}_L - \dot{\phi}_R)$$

Orientation

$$orien = \frac{w_R}{w_S} [\dot{\phi}_R - \dot{\phi}_L] - \frac{w_P}{w_S} [\dot{\phi}_L - \dot{\phi}_R]$$

Updesh

SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

.....

.....

DATE : 20/08/2020

DESIGNATION AND SIGNATURE

WEEK NO: Week 09

FOR THE WEEK ENDING

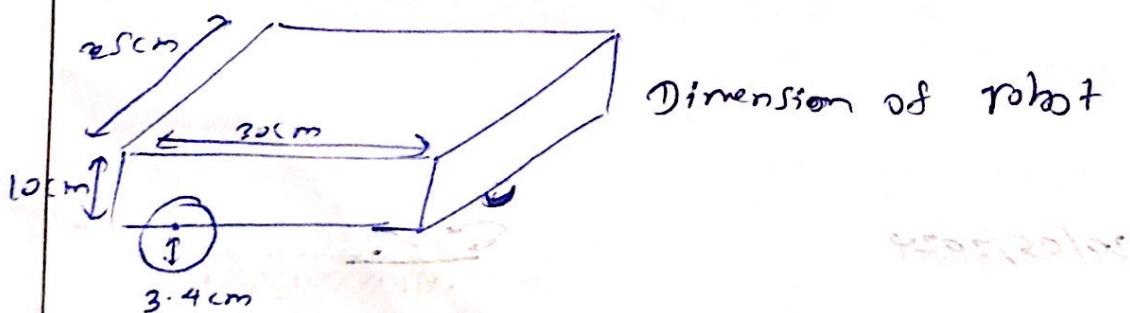
Sunday 28.01.2024

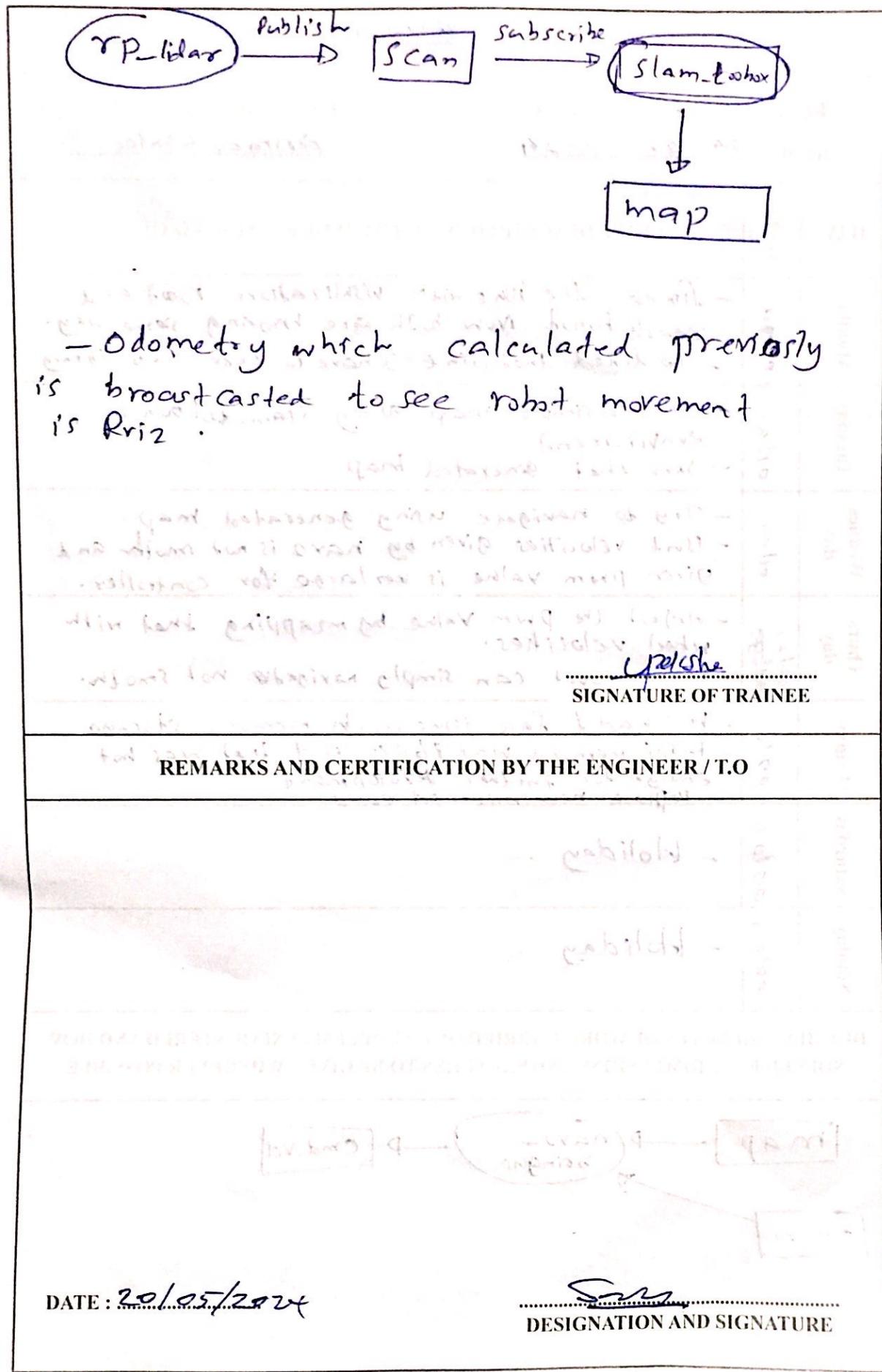
TRAINING LOCATION

Armac Lanks

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	01/22	<ul style="list-style-type: none"> - Study about ROS2 control. - Since we use roboflow motor controller we have to implement controller ourselves.
Tuesday	01/23	<ul style="list-style-type: none"> - Check the lidar with ROS2 - Setting slam tool box for real robot. - Write a code for transforming TF from odom to base foot print.
Wednesday	01/24	<ul style="list-style-type: none"> - Fixed the lidar to physical robot using spacers. - Check whether generated map is correct or not by moving inside the office.
Thursday	01/25	<ul style="list-style-type: none"> - Duruthy Poya day -
Friday	01/26	<ul style="list-style-type: none"> - Try to see robot in rviz - But there is problem with moving robot and real robot (Issue with their transformation)
Saturday	01/27	<ul style="list-style-type: none"> - Holiday -
Sunday	01/28	<ul style="list-style-type: none"> - Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE





WEEK NO: Week 10

FOR THE WEEK ENDING

Sunday 04.02.2024

TRAINING LOCATION

Arimar, Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	01/29	<ul style="list-style-type: none"> - Fixed the issue with visualization robot and ready robot. Now both are moving same way. - To fixed that issue - I have to refer TF2-library
Tuesday	01/30	<ul style="list-style-type: none"> - Made a simple map using slam-toolbox in environment. - Save that generated map
Wednesday	01/31	<ul style="list-style-type: none"> - Try to navigate using generated map. - But velocities given by nav2 is not smooth and given pwm value is very large for controller.
Thursday	02/01 02/02	<ul style="list-style-type: none"> - Adjust the pwm value by mapping that with wheel velocities. - Now robot can simply navigate. not smooth.
Friday	02/02	<ul style="list-style-type: none"> - We had to face issue with memory storage. - Raspi memory was 8GB and that was not enough for further development. - Replace new micro sd card.
Saturday	02/03	<ul style="list-style-type: none"> - Holiday
Sunday	02/04	<ul style="list-style-type: none"> - Holiday

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE



mapping of velocities

$$[0, \text{P} \cancel{2}] \xrightarrow{\text{map}} [50, \text{P}50]$$

cmd_vel_before
mapping

cmd_vel
after mapped

- I have to do this mapping when PWM value less than 50, movement is not enough and larger than 150, movement is very high. Therefore we have to use aroke mapping

SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

✓ satisfied

✓ satisfied

[Signature] - No. 1 - Date: 20/05/2020

(Signature)

DATE: 20/05/2020

DESIGNATION AND SIGNATURE

WEEK NO: Week 11

FOR THE WEEK ENDING

Sunday.....19.6.21. 2021

TRAINING LOCATION

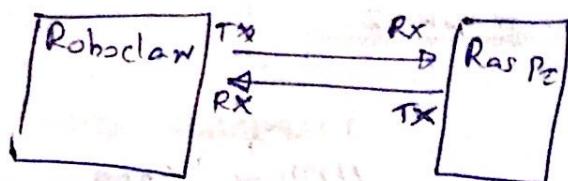
Arimed, Lankat

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	02/05	- Holiday given by company because independence day was in Sunday.
Tuesday	02/06	- Reinstall Ubuntu for the new micro sd card - Made serial communication with motor controller.
Wednesday	02/07	- Install related packages we needed s.t. Slam tool box, naro brings up - check whether simple navigation is working for new updated features.
Thursday	02/08	- Try to integrated IMU sensor on the robot and get those information for orientation.
Friday	02/09	- Could found a library for bno055 imu which is given by manufacturer. - But that does not work today.
Saturday	02/10	- Holiday -
Sunday	02/11	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

IMU sensor
(BNO055) → imu-sensor-msg

IMU is used for finding orientation in our project.



→ we used
Packet-serial method
for communicating

enable serial com port
in the interfaces in
ubuntu.

ROS 2 package reinstalled

- glam_box
 - nav2_bringup
 - tf_transformation
 - xacro
 - colcon
 - ros_localization
- add user to dialout group

Python3, pip, VS code, SSH server

To record data how far and speed

eject

barrier for boundaries

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REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

✓ cabtolt

✓ cabtolt



DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 12

FOR THE WEEK ENDING

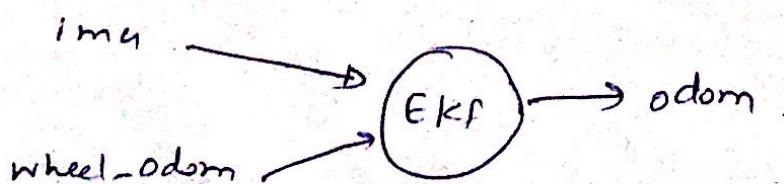
Sunday 18/02/2024

TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	02/12	found reason why BNO055 does not work with I2C in Raspi. Manifactory told that there is issue with imu uart in Raspi. with clocking.
Tuesday	02/13	- Could BNO055 work with I2C communication - Could get process orientation and rawdata from that library.
Wednesday	02/14	- Used Extended Kalman filter (ekf) with imu and wheel encoders. - Try to mapping using odom given by ekf node.
Thursday	02/15	- Mapping does not work well. because of tf error given by ekf. - If broadcasting by ekf node is not correct
Friday	02/16	- Referred previous year interns codes and change ekf config according to that. - Then issue is fixed.
Saturday	02/17	- Holiday -
Sunday	02/18	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE



BNO055

- UART → can not use because already use and issue with Raspberry PI.
- I2C → can use and no issue shows
 - Issue with clock stretching and that can be solved using community support.

Extended Kalman filter → algorithm is used to position and orientation

Included in robot-localization pkg.

We can adjust config file according our needs like what topics need to be subscribed and published.

imu → orientation ~~can~~ work well.

imu → position does not work well.

Power = 5V

I2C → SDA
→ SCL.

Lokesh
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

Engineer's Name -	2/2
Engineer's Name -	2/2

NOTICE TO THE READER: THIS REPORT IS THE PROPERTY OF THE INSTITUTE OF COMPUTER SCIENCE & ENGINEERING, JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD, APRAIL 2024.

DATE : 20/05/2024

.....
DESIGNATION AND SIGNATURE

WEEK NO: Week 13

FOR THE WEEK ENDING

Sunday 25.02.2024

TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	02/19	Not Leave (funeral of Hasith's mother)
Tuesday	02/20	Ready digazer for pitching session
Wednesday	02/21	Ready small RnD robot which we were are testing for narration
Thursday	02/22	Pitched the small RnD robot and Digazer for clients asked for
Friday	02/23	- Holiday -
Saturday	02/24	- Holiday -
Sunday	02/25	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Good job with the software and hardware. I am very happy with the course. I am also very grateful to the faculty for their support and guidance.

Yours sincerely,

Rakesh

REMARKS AND CERTIFICATION BY THE ENGINEER / TO

DATE : <u>20/05/2024</u>	<u>DESIGNATION AND SIGNATURE</u>
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DATE : 20/05/2020

DESIGNATION AND SIGNATURE

WEEK NO: Week 14

FOR THE WEEK ENDING

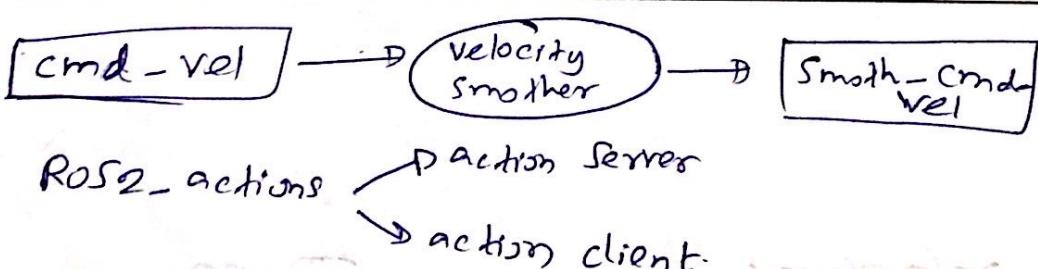
Sunday 03.03.2024

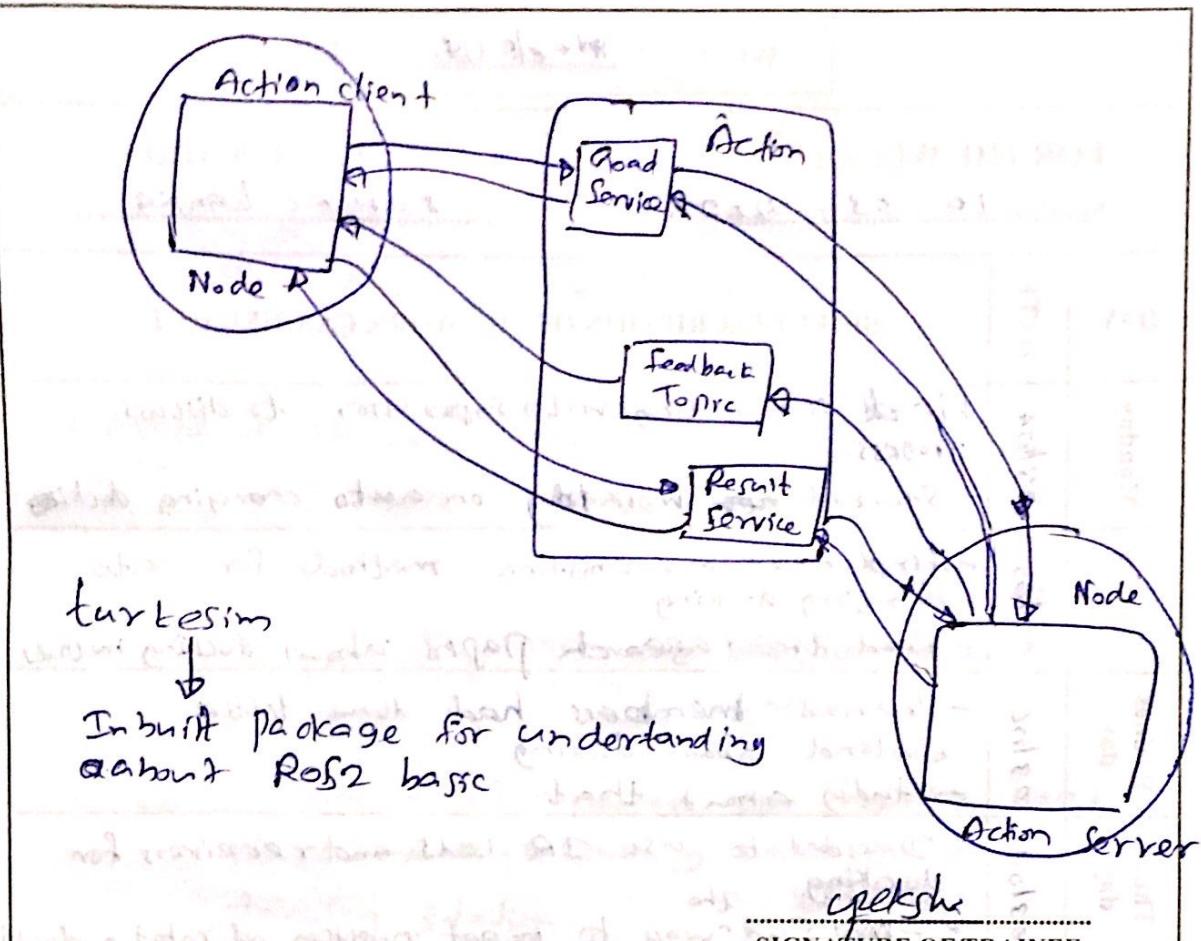
TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	02/26	When I run navigation for created map velocity given by nav2 is not smoothed. - Therefore I used separated velocity smoother.
Tuesday	02/27	- Created new map in the office with existing things in the office of small area. - Navigation is happening well now in new map.
Wednesday	02/28	- Integrated IMU and depth cam on the small robot. using spaces. - Check the navigation autonomy
Thursday	02/29	- Learned about ROS missing things about ROS2 topic and actions.
Friday	03/01	- further further study about ROS2 actions
Saturday	03/02	- Holiday -
Sunday	03/03	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE





Signature
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REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

✓	✓
✓	✓

ROBOTS ARE BEING TESTED IN THE LAB TO ENSURE THAT THEY ARE WORKING PROPERLY.
SUBMITTED BY THE TEAM MEMBERS OF ELECTRICAL & COMPUTER ENGINEERING, 3RD SEMESTER.

✓	✓
✓	✓

DATE : 20/05/2024
 DESIGNATION AND SIGNATURE

WEEK NO: Week 15

FOR THE WEEK ENDING

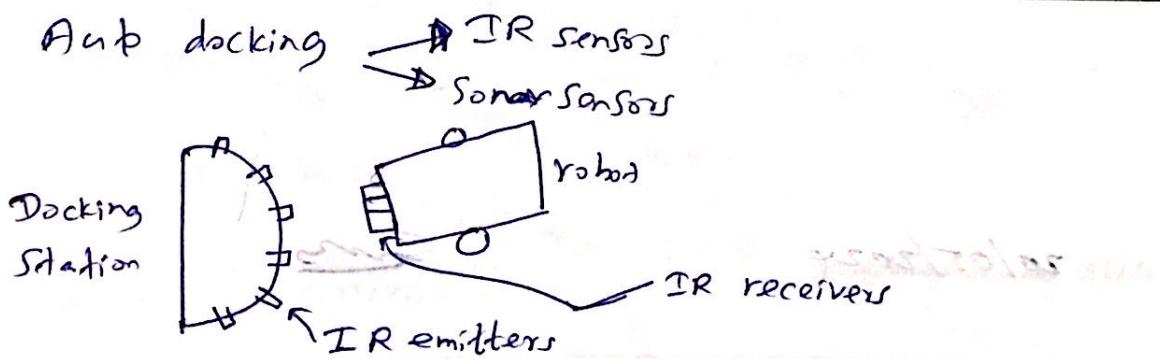
Sunday 10.03.2024

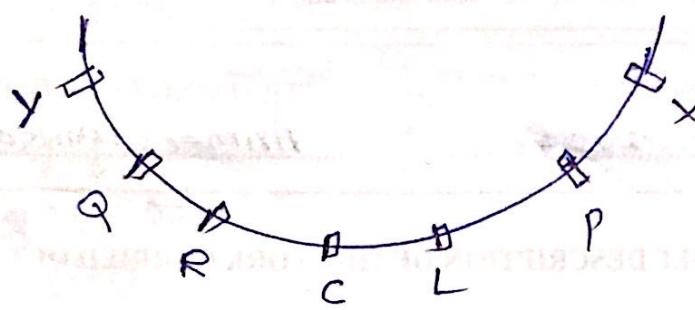
TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	03/04	<p>Had a meeting with supervisor to discuss progress.</p> <ul style="list-style-type: none"> - Started new working on auto charging dock.
Tuesday	03/05	<ul style="list-style-type: none"> - find what are existing method for auto charging docking - Read two research papers about docking methods
Wednesday	03/06	<ul style="list-style-type: none"> - Previous members had done little extend about docking - Study about that.
Thursday	03/07	<ul style="list-style-type: none"> - Decided to use IR LEDs and receivers for docking * - Find Find way to get get position of robot & docking station
Friday	03/08	<ul style="list-style-type: none"> - Developing method to set position and orientation
Saturday	03/09	<ul style="list-style-type: none"> - Holiday -
Sunday	03/10	<ul style="list-style-type: none"> - Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE





Method - IR Led emitter bits which represent character in 8 bits

At receiver read the character ~~sent~~
robot can catch and decide position of
Robot wrt to docking station

Purpose - When robot reaches low battery level
it should automatically navigate to
charging station

Codelab
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REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

WONDERFUL PROJECT FOR ROBOTIC CHARGING STATION FOR OUR CLASS
PROJECT HAS BEEN COMPLETED IN FULL FORM WITH THE WORKING OF THE SYSTEM.

Robot moves from one point to another &
comes to base station
and will charge from base station & return
to user fast after 3d
time approx 10 sec

DATE : 20/05/2020

SM
DESIGNATION AND SIGNATURE

WEEK NO: Week 16.....

FOR THE WEEK ENDING

Sunday 17.03.2024

TRAINING LOCATION

Animes Lanka.....

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	03/11	<ul style="list-style-type: none"> - Found the way to send character using bit stream of IR. - Hardware serial pins of can be used.
Tuesday	03/12	<ul style="list-style-type: none"> - According to character and board rate we use IR led triggered and that can be received at the robot using IR receiver.
Wednesday	03/13	<ul style="list-style-type: none"> - Find how to use serial pins of arduino for this purpose. - For this we have to user hardware serial pins.
Thursday	03/14	<ul style="list-style-type: none"> - for IR receivers previous team has used HS0038 receivers which is accurate - Read data sheet according our need.
Friday	03/15	<ul style="list-style-type: none"> - HS0038 work at active low. - This has high immunity against ambient light
Saturday	03/16	<ul style="list-style-type: none"> - Holiday -
Sunday	03/17	<ul style="list-style-type: none"> - Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Arduino mega

→ Hardware serial → 4 sets available can be send at once

→ Software serial → any digital pin can be used. But can not be sent at once.

- We need to send all the characters parallelly

HS0038



→ Frequency range

(31 - 38) KHz

VS Out
(+5V)

character → 'C' → 8 bit → 56700 bits/s
33KHz TX from code table

HS0038
RX
III
Decide

'C'
cyclic

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REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

reliable

reliable

NOTE: THIS CERTIFICATE IS ISSUED TO DESIGNATION AND SIGNATURE
ABOVE ARE MENTIONED IN THE PRACTICAL WORK SHEET.

DATE: 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 17.....

FOR THE WEEK ENDING

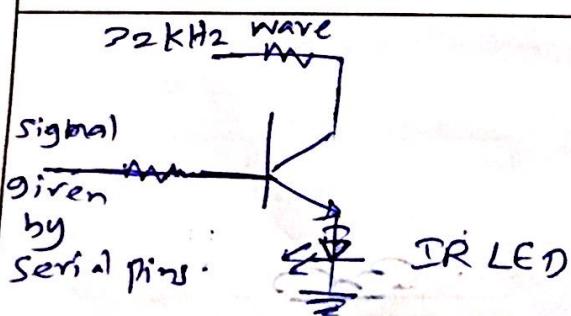
Sunday 24.03.2024.

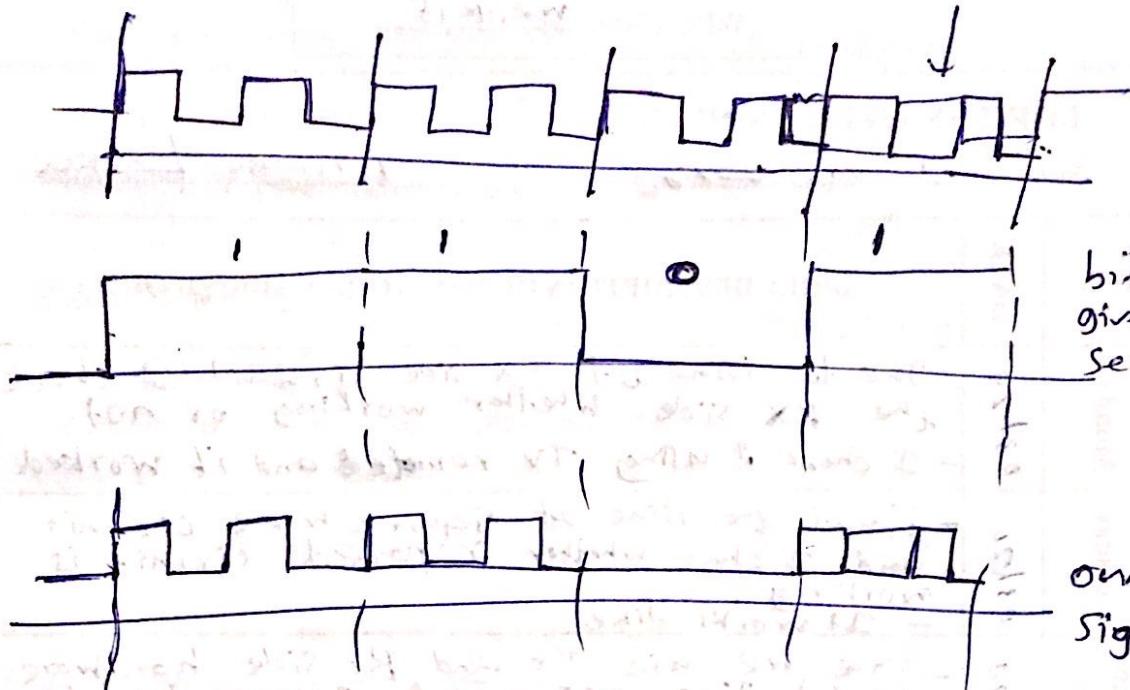
TRAINING LOCATION

Armed Banks

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday 03/18		- Previous team has designed a modulated circuit for generate 32 kHz signal which triggers according character we send.
Tuesday 03/19		- When I checked the square wave signal that does not generate. - There should be error in circuit.
Wednesday 03/20		- Previous year interns came to office - Had discuss with them.
Thursday 03/21		- I checked the square wave using oscilloscope and it didn't give square wave.
Friday 03/22		- Discuss issue with senior engineer and he brought the circuit to check and fix the issue.
Saturday 03/23	03/23	- Holiday -
Sunday 03/24	03/24	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE





bit stream
given by
Serial pin

Output
Signal

Cvetko
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

July 16, 1931

DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 18

FOR THE WEEK ENDING

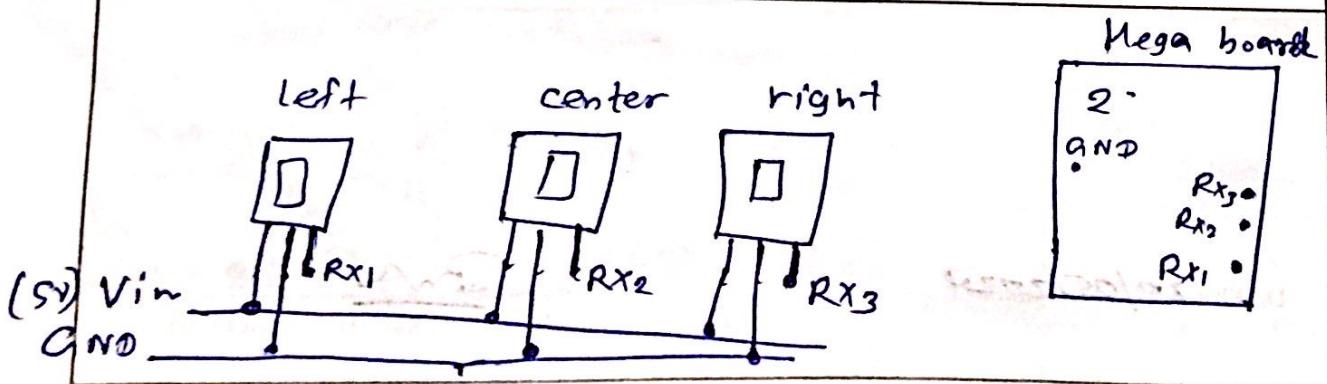
Sunday 31.03.2024

TRAINING LOCATION

Arimae Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	03/25	<ul style="list-style-type: none"> - Due to issue of Tx side circuit I check the Rx side whether working or not. - I check it using TV remote and it worked
Tuesday	03/26	<ul style="list-style-type: none"> - Fixed the issue of Square wave circuit and I check whether repaired circuit is working. - It works fine.
Wednesday	03/27	<ul style="list-style-type: none"> - Since we use Tx and Rx side hardware serial pins . we needed 3 mega boards. - Lack of mega board in the workshop I more check it with STM nucleo board.
Thursday	03/28	<ul style="list-style-type: none"> - Study about STM32 - Nucleo board and programming - Install STM32cube IDE
Friday	03/29	<ul style="list-style-type: none"> - Holiday - (Good Friday)
Saturday	03/30	<ul style="list-style-type: none"> - Holiday -
Sunday	03/31	<ul style="list-style-type: none"> - Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE



Stm32 cube IDE → C language

→ clock configuration

→ Pin Configuration

Stm32 Nucleo board → 3 serial pins

↳ STM32 has three serial ports
↳ STM32 has three serial ports

↳ STM32 has three serial ports
↳ STM32 has three serial ports

↳ STM32 has three serial ports
↳ STM32 has three serial ports

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↳ STM32 has three serial ports

Upchar
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

- exhibited -

- exhibited -

ATR/NR P-08-GAN
Date: 05-05-2020

ITR/NR P-08-GAN
Date: 05-05-2020

Son
DESIGNATION AND SIGNATURE

DATE : 20/05/2020

WEEK NO: Week 19.....

FOR THE WEEK ENDING

Sunday 07.04.2024

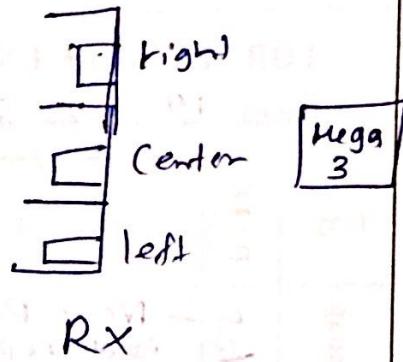
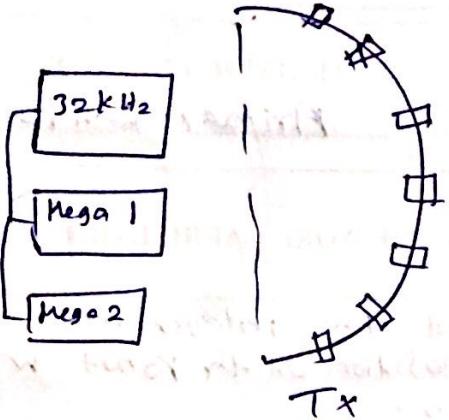
TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	04/01	<ul style="list-style-type: none"> - Study how to use port of STM32 for serial communication - Code it in C.
Tuesday	04/02	<ul style="list-style-type: none"> - When I discussed STM32 programming supervisor told that better more with Arduino to check our method is working or not since STM32 programming takes take much time
Wednesday	04/03	<ul style="list-style-type: none"> - Went to Pettah to buy a new mega board and multimeter. - Make connection between TX circuit and Rx side.
Thursday	04/04	<ul style="list-style-type: none"> - Configure the serial communication between arduino and Raspi <ul style="list-style-type: none"> → Python script → Arduino code.
Friday	04/05	<ul style="list-style-type: none"> - Check the all the character send by Tx side (docking station) is received by Robot correctly. - Write a code for send the date from arduino to Raspi
Saturday	04/06	<ul style="list-style-type: none"> - Holiday -
Sunday	04/07	<ul style="list-style-type: none"> - Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

- PA10 - Rx } USART0
PA9 - Rx }
- PA2 - Tx } USART1
PA3 - Rx }
- PB11 - Rx } USART2
- PB10 - Tx }



- Here we use serial communication between arduino and Rasp Pi
- In ROS1 we can use Rosserial for publishing a topic from arduino. But in ROS2 Rosserial does not work.
- There is Microros for ROS2 like Rosserial
But we can not use micro Ros in mega board because of RAM is not enough of mega micro controller.

Gopalchandra
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

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DATE: 20/05/2024

DESIGNATION AND SIGNATURE: Sonu

WEEK NO: Week 20

FOR THE WEEK ENDING

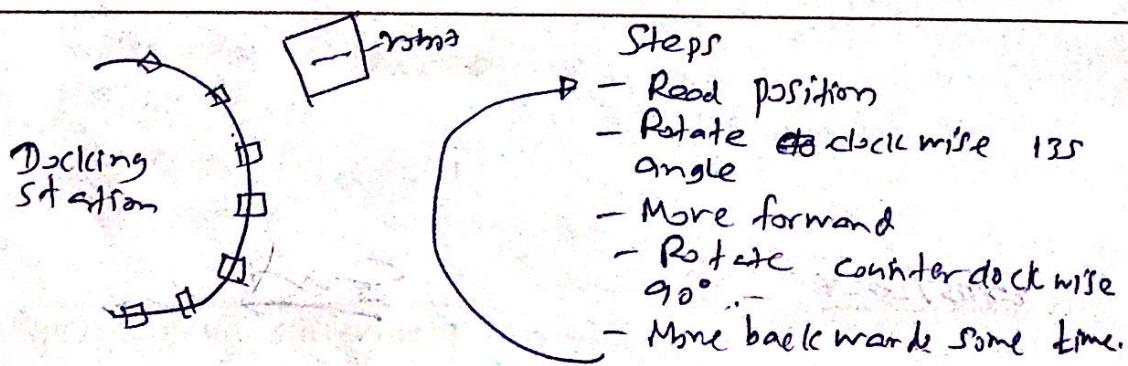
Sunday 14/04/2024

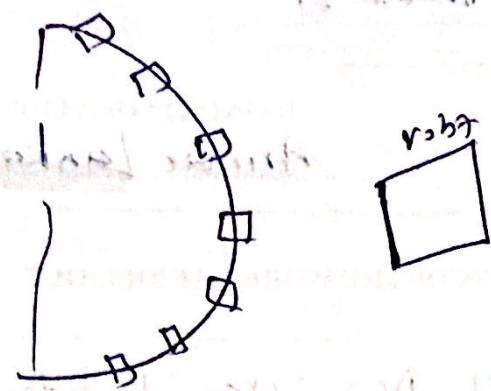
TRAINING LOCATION

Anuradhapura, Sri Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	04/08	- Now Raspi received the integer which represent the position of the robot wrt to docking station.
Tuesday	04/09	- Wrote a python script for drive the motors to bring the bot to the middle of docking station.
Wednesday	04/10	- Fine tune the python script for driving motors Afterwards and number of docking station.
Thursday	04/11	- IR sensor checked and it was burned. - Replaced a new IR sensor and now robot more to middle position wrt docking station.
Friday	04/12	- Sinhala Tamil New Year holiday -
Saturday	04/13	- Holiday -
Sunday	04/14	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE





 robot is middle position

But not parallel
the docking station

C Pelsch

SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

<p>NAME</p> <p>Mr. S. R. Srinivasan</p> <p>POSITION</p> <p>Manager - Sales</p> <p>WEEKLY BUDGET</p> <p>Rs. 100/-</p>	<p>NAME</p> <p>Mr. S. R. Srinivasan</p> <p>POSITION</p> <p>Manager - Sales</p> <p>WEEKLY BUDGET</p> <p>Rs. 100/-</p>
<p>DATE : 20/05/2024</p>	
<p>DESIGNATION AND SIGNATURE</p>	

DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 21.

FOR THE WEEK ENDING

Sunday 21.04.2024

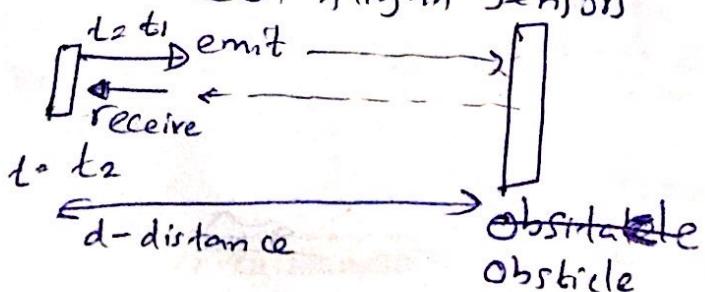
TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	04/15	- Sinhala Tamil New year holiday -
Tuesday	04/16	- Gave two TOF sensor by Pololu - Had a meeting with supervisor - Tested TOF sensor using library given by Pololu.
Wednesday	04/17	- Fixed TOF sensors to on the robot using plastic brackets - Give power supply all the sensors using dot board
Thursday	04/18	- Wrote a arduino code getting error from using two sensor. - According error control motor speeds
Friday	04/19	- When tested whether robot move parallel to normal direction docking station, it had issue with tuning code. - Tune the code and for purpose we need.
Saturday	04/20	- Holiday -
Sunday	04/21	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

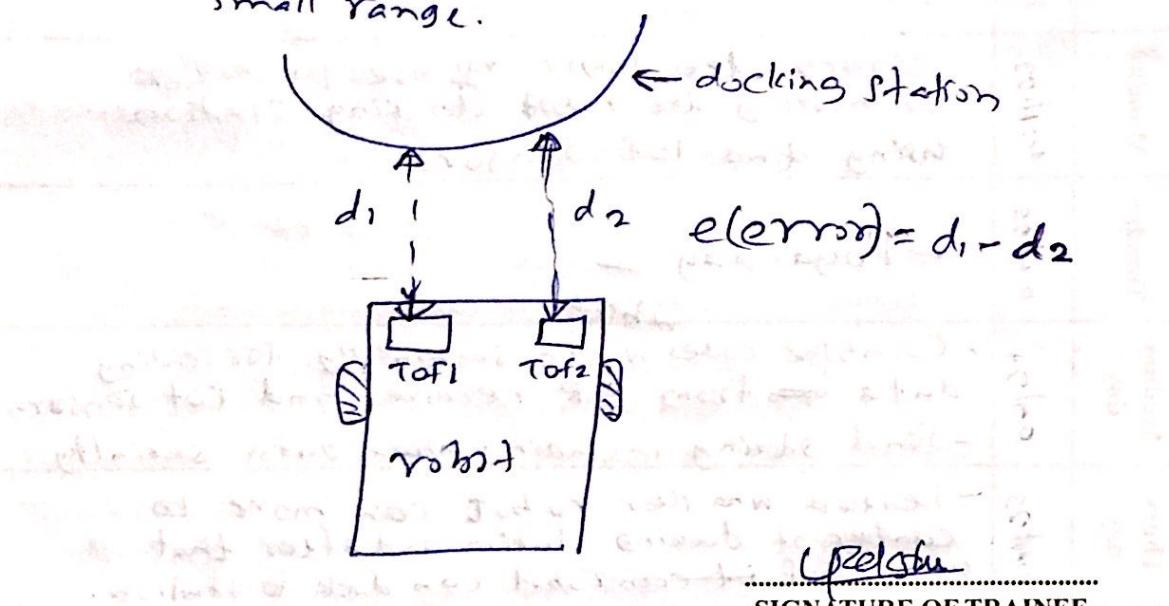
TOF - Time of flight sensors



Sensor knows emit wave velocity as V

$$d = \frac{1}{2} (t_2 - t_1) \cdot V$$

ToF → act as sonar sensor better result and small range.



Signature
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

DATE : 20/05/2020

Designation and Signature

WEEK NO: Week 22

FOR THE WEEK ENDING

Sunday 28.04.2024

TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	04/22	- Change the logic to use previously for moving the robot docking station using two ToF sensors.
Tuesday	04/23	- Poya day -
Wednesday	04/24	- Combine codes wrote separately for sending data from IR receiver and ToF sensor. - Send string including above data serially
Thursday	04/25	- Tested whether robot can move to center of docking station and after that using ToF it can robot can dock to station.
Friday	04/26	- Fine tune some variables in the combined code like sleeping times and velocity speeds.
Saturday	04/27	- Holiday -
Sunday	04/28	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

$$e(\text{error}) = d_1 - d_2$$

d_1 - distance from ToF₁

d_2 - distance from ToF₂

```

if  $d_1 > 250$  and  $d_2 > 250$ : more backward
else:
    if  $e > 0$ :
        rotate clockwise direction
        sleep(1)
    else:
        stop robot
    else:
        rotate counter-clockwise
        sleep(1)
    stop robot
if  $d_1 < 50$  and  $d_2 < 50$ : stop robot
} check while
 $d_1 < 50$  and
 $d_2 < 50$ 
} then dock happened

```

Yelka

SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

+ capability +	+ 8/10 +
+ capability +	+ 8/10 +
+ capable enough after	
	
Solve difficult tasks without problem or error	
DATE : <u>20/05/2021</u>	

DESIGNATION AND SIGNATURE

WEEK NO: Week 23

FOR THE WEEK ENDING

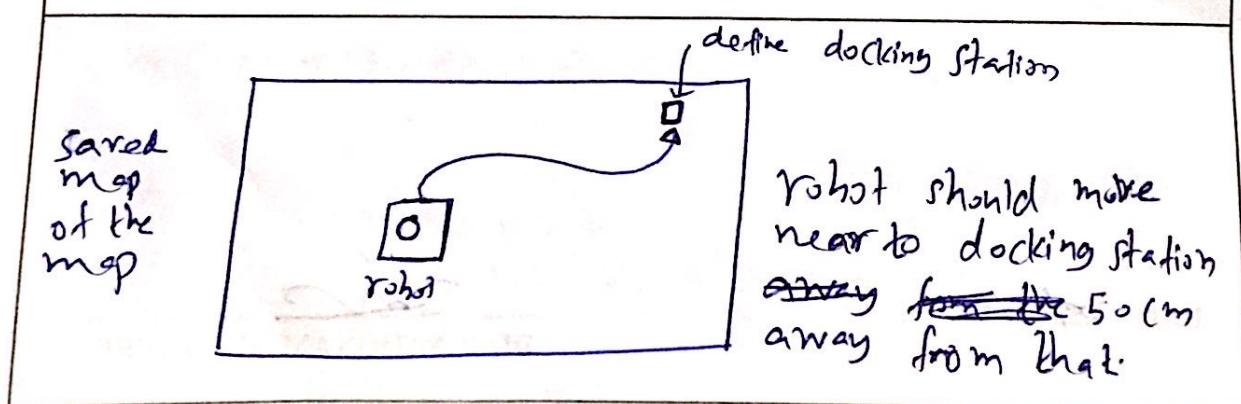
Sunday 04.05.2024

TRAINING LOCATION

Arimac Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	04/05	- Define a position and orientation of the docking station in map we created we inside the office.
Tuesday	04/05	- Wrote a code to move robot 50 cm away from the docking station autonomously using Nav2_save-map package.
Wednesday	05/05	- May Day -
Thursday	05/05	- Had to face unexpected error when on power on the Rasperry PI could connect through SSH - It show that firmware file is missing.
Friday	05/05	- Since we put all the source files inside a drive folder bring back to Rasperry pi inside workspace we created.
Saturday	05/05	- Holiday -
Sunday	05/05	- Holiday -

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE



firmware file missing → does not boot
Rasberry Pi.

check the error Rasberry Pi community.
may ↓

It happens during a update ↗, if board
was power off.

Try few friends community have suggested.
But those did not work

Format the SD card and install
Ubuntu 22.04 and RPi2 humble.

C P D L W
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

DATE : 20/05/2024

DESIGNATION AND SIGNATURE

WEEK NO: Week 29

FOR THE WEEK ENDING

Sunday 12/05/2024

TRAINING LOCATION

Arimed Lanka

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday 05/06		<ul style="list-style-type: none"> - Checked all the functionalities we previously implemented worked well. - If there was error, fixed them.
Tuesday 05/07		<ul style="list-style-type: none"> - Had a meeting with supervisor. - Upload document we created when we learned new things and source codes.
Wednesday 05/08		<ul style="list-style-type: none"> - Supervisor came to office and check our progress of robot and problem it had. - Gave lunch by supervisor for me and Hashika.
Thursday 05/09		<ul style="list-style-type: none"> - Went office keep the equipment we used in proper manner because workshop is main branch
Friday 05/10		<ul style="list-style-type: none"> - Gave the clearance from asked by HR management - Had a discussion with people we familiar in the office. <p>- Holiday -</p>
Saturday 05/11		<p>- Holiday -</p>
Sunday 05/12		<p>- Holiday -</p>

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

functionality we checked

- tele operation
- Mapping
- Navigation
- Auto charge docking.

Upload to Gitlab Source codes and documents

SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O.

DESIGNATION AND SIGNATURE

REMARKS AND ADDITIONAL NOTES:

PROGRESS REPORT OF AN ESTABLISHMENT ON TRAINING

PERFORMANCE

Name of Establishment : Arimac Lanka Pvt. Ltd.

Period of Training - From : To :

Comments of Training :

1. Conduct Excellent
2. Attitude to work Excellent
3. Attendance Excellent

NO. OF DAYS LEAVE TAKEN	AUTHORIZED	UNAUTHORIZED
		<p>Arimac Lanka (Pvt) Ltd PV 81513</p>
Signature of the officer incharge for training (with rubber stamp)		<p>No. 02, 6th Lane, Colombo 03, Sri Lanka. Tel: +94-115219554 Email: hello@arimaclanka.com</p>

PROGRESS REPORT OF AN ESTABLISHMENT ON TRAINING

PERFORMANCE

Name of Establishment :

Period of Training - From : To :

Comments of Training :

1. Conduct
2. Attitude to work
3. Attendance

NO. OF DAYS LEAVE TAKEN	AUTHORIZED	UNAUTHORIZED
Signature of the officer incharge for training (with rubber stamp)		

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