***ROS - Robotics Operating System***

**What is ROS ?**

Ros is not an actual operating system like mac, windows. Basically it is an environment to operate robots…

***ROS - Robotics Operating System***

Plumbing + Tools + Capabilities + Ecosystem

Process simulation control Pakage

Management organisation

Inter process visualisation planning Software

Communication Distribution

Device drivers Graphical user perception Documentation

Ineterface

Data Logging mapping Tutorials

* Collection of tools, Libraries and convetion that aim to simplify the task of operating our robot.

Why is it helpful ?

ROS contains many modules:-

1. **PERCEPTION MODULE ;** By this module an robot collects information about its surrounding.
2. **EXPLORATION MODULE** ; If an robot gets into unfavourable environment how it explore it.
3. **PATH LINE MODULE** ; If my robot has a goal, how it will develop a path to achieve that goal.
4. **SLAM MODULE** ; (simulation localization and mapping)**-**

It helps me to localize my robot in the map and also to develop my map at the same time.

* These modules are interconnected with each other and this interconnection helps a robot to do it’s work.
* We need to provide information from one module to another and this is done by **ROS.**
* Many developers have their expertise in different module.
* ROS provides a platform to share their information about their regarding module
* For Example : if we take a robot vehicle

(MOVING IN A ROOM)

Here we will see How ROS will work

* A radar will be attached on our vehicle it will sense the obstacle and send it to ROS in ROS we have path line module and map to avoid obstacle and achieve it’s goal

***How to run ROS ? What are its requirement ?***

; Unbuntu/Line operating system

; graphic card / CPU

***What is Node ?***

NODE is an executable that communicate through ROS.

Like if we have different type of sensor so every sensor have different types of nodes, through their respective node the sensor publish their information, these are catched by different node they may be sensor or algorithm type. These all nodes are connected by ROS node.

***How does robots communicate using ROS ?***

**Publisher node** – **ROS master – subscriber node**

**Publishing and subscribing**

*A*ny node can publish a message to any topic

Any node can subscribe to any topic

Subscribing means you are sort of registering that thing

**Publishing** – you are sending message to the topic you want to see all the data comes on the topic.

* Multiple nodes can publish to the same topic
* Multiple nodes can subscribeto the main topic

***PUBLISH/SUBSCRIBE TOOL***

* ROS node list – provide list of all running nodes
* ROS node info – what a topic, node is publishing or subscribing to
* ROS topic list – all running topic
* ROS topic info – all the nodes that are publishing or subscribing
* ROS topic echo – what date is published

***Messages*** –

* A serialisation format for structured data
* Allows nodes written in C++ and python to communicate with each other
* Define in a .msg file
* Must be compiled into C++/python before using them

PUBLISHER ----- ROS MASTER ---- SUBSCRIBER

ROS master can be started with ROS score or ROS launch

How does ROS MASTER works

Like a node will say I want to subscribe on this topic so master will say I am now a publisher who is publishing the topics and helps in estabilishing a peer to peer connection