G. Naraynamma Institute of Technology and Science

(for Women)

(Autonomous)

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Accredited by NBA & NAAC, An ISO 9001:2015 Certified Institution

One Week Workshop on

"ROBOTICS POWERED BY ROS"

Date 25/5/2020–30/5/2020

3 Hours/Day (10.00 AM to 1.00 PM)

Organized by

Department of Electronics and Communication Engineering

In Association with IETE, Hyd & Smart Bridge

Registration link: tinyurl.com/sb-ros

FREE REGISTRATION

LIMITED SEATS APPLY NOW

Sri P. Subba Reddy
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Principal

Dr. Renuka Devi S M
Co-ordinator(9441697653)
Professor, ECE

Dr. B. Venkateshulu
Convenor,
HoD-ECE Dept.

Free for faculty, Limited seats FCFS basis, Registration Starts from 21-5-2020.

Institution of Electronics & Telecommunication Engineers

SMARTBRIDGE

 Gmail   Renuka Devi SM <renuka.devi.sm@gmail.com>

Details About my project

Durga Prasad Bethi <durgaprasad@thesmartbridge.com>   Mon, May 25, 2020 at 9:17 AM
To: Renuka Devi SM <renuka.devi.sm@gmail.com>

Mam,

Please find the attached bio and Work experience

Name: Durga Prasad
Company: Smartbridge
Role: Robotics Engineer
Completed Graduation under JNTUH Affiliated College

Majorly working on ROS framework which includes software development, Robot 3D modelling, development of mathematical calculations for various robots, hardware level and developing AI applications for common needs etc

Projects:

1. Worked with Two-wheeled Robot Simulation using ROS and Gazebo
This is a basic project where we are going to control the two-wheeled robot with the help of keyboard

2. Integration of LDS sensor to the Two-wheeled Robot and Visualize the Data in Rviz.
In Robotics Lidars plays an important role in Obstacle detection, In this project, we used LDS sensor for Obstacle detection on the simulator.

3. Indoor Mapping and Navigation with four-wheeled Robot Using ROS.
  Mapping and navigation through the 3D environment is a huge concept in developing a robot application. Here we used SLAM techniques to perform Mapping and navigation of the 3D environment

4. Integration of Camera to the robot for Object detection using ROS, Keras and TensorFlow.
Object detection is now one of the technique in the Robotics to get the 3D data from the environment so we used a normal HD camera library for detection of simulated objects in the Gazebo simulator.

5. SLAM with Turtlebot3 Burger
Turtlebot3 Burger is one of miniaturized robot used to research ROS, with the help of turtlebot3 burger we did the static and dynamic obstacle detection, and we trained the robot with my office environment using SLAM based on the environment the robot will move into the required workstation in the office with the help of human inputs. like file transfer from one place to another place.

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Thanks & Regards,

Durga Prasad Bethi
Robotics Engineer

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Robotics Powered by ROS

This course includes lectures, discussions on how Robotic Operating System (ROS) works, and hands-on exercises that developers can use to better understand what Robotics does, what it doesn't do, and how it works so that developers can build best solutions for the industry needs

About ROS

The Robot Operating System (ROS) is a flexible framework for writing robot software. It is a collection of tools, libraries, and conventions that aim to simplify the task of creating complex and robust robot behavior across a wide variety of robotic platforms.

Why? Because creating truly robust, general-purpose robot software is hard. From the robot's perspective, problems that seem trivial to humans often vary wildly between instances of tasks and environments. Dealing with these variations is so hard that no single individual, laboratory, or institution can hope to do it on their own.

As a result, ROS was built from the ground up to encourage collaborative robotics software development. For example, one laboratory might have experts in mapping indoor environments, and could contribute a world-class system for producing maps. Another group might have experts at using maps to navigate, and yet another group might have discovered a computer vision approach that works well for recognizing small objects in clutter. ROS was designed specifically for groups like these to collaborate and build upon each other's work, as is described throughout this site.

Why Gazebo?

Robot simulation is an essential tool in every roboticist's toolbox. A well-designed simulator makes it possible to rapidly test algorithms, design robots, perform regression testing, and train AI system using realistic scenarios. Gazebo offers the ability to accurately and efficiently simulate populations of robots in complex indoor and outdoor environments. At your fingertips is a robust physics engine, high-quality graphics, and convenient programmatic and graphical interfaces. Best of all, Gazebo is free with a vibrant community.

Finally, after successful completion of this course students will be able understand the robot project structure, sensor integration to the robot and its importance, Robot communication process, robot project considerations, Robot simulation considerations, Basics about ROS and Gazebo simulation

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Course content:

Day1: Introduction to Robotics

- Introduction to Robotics
- Classification of Robotics
- Applications of Robotics in various industries
  - Manufacturing
  - Automobile
  - Industrial Engineering
  - Agriculture
  - Aerospace
  - Healthcare
  - Food processing units etc
- Common types of industrial Robots based on Joint type
  - Articulated
  - Cartesian
  - Cylindrical
  - Polar
  - SCARA
  - Delta
- Robotics manufacturing Companies
- Important Considerations of robotics project

Day2: Introduction to ROS and ROS cheat sheet

- Introductions to ROS
- Importance of ROS in industriesROS terminology
- ROS based Robots a. Turtlebot3 burger b. Franka Emika Panda etc
- ROS file system configuration
- ROS Cheat Sheet
- Importance of catkin workspace
- Navigating the ROS Filesystem
- Creating Catkin workspace
- ROS in built Packages

Day3: ROS topics, services

- Creating ROS Package
- Writing simple Publisher and Subscriber using python
  - Writing the Publisher topic
  - Writing the Subscriber topic
  - Building your nodes
- Writing a Simple Service and Client using python
  - Writing a Service server
  - Writing the Service Client
  - Building your nodes

Day4: Introduction to Rviz and Gazebo simulator

- Introduction to GUI tools
- Explanation about Rviz
- Introduction to Gazebo and its features
- Hands on exercise with model builder on gazebo for making robot world

Day5: Building two wheeled Robot

- Introduction to URDF and its properties
- Basic syntax explanation
  - Links
  - Joint
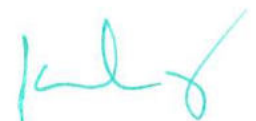 - Sensor etc.
- Building two wheeled robot using URDF

Day6: Integrating two wheeled Robot with LDS sensor

- Introduction to Xacro
- Converting two wheeled robot URDF file into Xacro file
- Introduction to Laser Distance Sensor
- Integration of laser Distance sensor to the two wheeled robot
- Object Detection through Laser rays

Note: we are not including any hardware part because hardware will come in the Advanced level courses

Prerequisites:

1. Everyone must have their own personal computer with minimum specification 4 GB RAM 64 bit Operating system, 250 GB Hard drive space
2. Knowing Basic Python, Basic HTML and linux commands is added advantage
3. Oracle VirtualBox with Ubuntu 16.04 must for this program
4. Daily sessions will be conducted through Zoom.
5. Daily Duration of the session is 3 - 4 Hrs.which includes Concept explanation, Hands on session and Q & A.
6. Session recorded videos will be provided on daily Basis
7. Related codes will be shared on the session time through email or drive access

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Department of

Computer Science & Engineering

presents Faculty Development Programme on

Impact Of Internet Of Things On Society
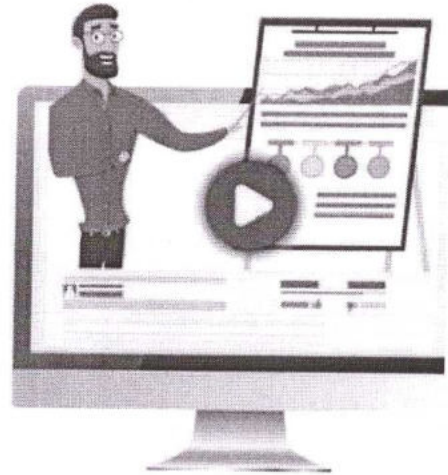
📅 25/5/2020 to 29/5/2020

For further details contact
Mr J Maruthi Nagendra Prasad/
Mr A Vijaya Krishna
Phone number: 9392435280

Chief Patrons:

Sri. C Gangi Reddy,
Hon' Secretary, AET

Sri. C Yella Reddy,
Vice Chairman, AET

Sri. C Abhishek Reddy,
Executive Director, AET

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Institution of Electronics &
Telecommunication Engineers

Certificate of Participation

This is to certify that

Dr. Renuka Devi SM

has participated in 6 days Online Workshop on **ROBOTICS POWERED BY ROS**

from **25-05-2020** to **30-05-2020**, organised by Department of **ECE, GNITS** in

association with **IETE HYDERABAD & SMARTBRIDGE.**

Mr. Durga Prasad
SMARTBRIDGE

Prof. A. Ravi Kumar
CHAIRMAN, IETE HYD

Dr. K. Ramesh Reddy
PRINCIPAL, GNITS

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