Implementation of algorithms in a ros-based embedded system for the manipulation of autonomous devices



TÉLLEZ-CASTELLANOS, Aranzazú Mahelet & LARA-GONZALEZ, Luis Rey

Abstract

This project addresses the idea of the integration of an embedded system with middleware resulting in the programming and control of a mobile device, allowing the automation of the same. This project mainly tries to increase the fields of robotics within the automation of existing devices. These applications, which are intended to achieve with automation, are only methods of helping people by applications, which are interface to active with automatoria, are only included to high people of performing these jobs, so it was decided to carry out this project. General Objective: Implement algorithms in an embedded system based on ROS for the manipulation of autonomous devices, Specific objectives: Develop ROS-based algorithms to establish a tracking path for the control of an autonomous device, Implement algorithms in an embedded system for device control, To show the operation of the algorithms made in ROS in an autonomous device with a predetermined route, Methodology: The methodology used in this project is the "waterfall" type, because it is a traditional model that, as its name suggests, is a linear and sequential process: in a very detailed way there is a starting point that would lead us to an end point in different stages: Conception, Analysis, Design, Construction, Testing, Implementation and Maintenance.

Introduction

Among the latest advances that are currently being made in the field of robotics, one of the most striking and that are gradually being implemented more in everyday life is that of autonomous vehicles.

This project addresses the task of integrating ROS (Robot Operating System) with the general purpose platform Arduino UNO.

ROS constitutes as a middleware since it is a software that assists the particular applications designed in this project as well as any general purpose application designed on it, to interact or communicate with each other and the hardware used. It works as a distribute software abstraction layer.

The main mission that was intended to be achieved with the integration is, by means of a distributed system, to perform the program and control of a mobile robot through the design of applications that provide the system with different features and functionalitie

Materials and methods

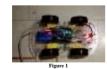
Embedded systems

ROS version with specific libraries and tools for the control of r whicles. etc.). It is compatible with Ubuntu Willy, Xenial.



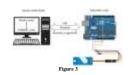


Results



The L298N module receives signals through its four inputs, outputs of the Arduino UNO are digital. This module detect four PINs were used to control the module: PIN 4 and PIN 5

ne drive module was assembled together with the oth untu 16.04 operating system with Windows 10 partiti s that allow communication between ROS and Arduin



empleted, it was time to remove the physical contact and proceed with the wireless allowed sending commands from ROS to the Arduino UNO embedded system



The last step was the realization of the master algor the Bluetooth master module that establishes comm ino IDE to Arduino UNO. This algorithm was implemented on the board with inding of characters from Bluetooth master with ROS to the Bluetooth slave.



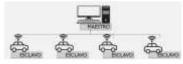
Conclusions

In any case the completion of this project, rather than representing an end as such, goes much further and opens the door to more interesting lines of research and develor that could be very useful for personal interest but above all opens endless possibilities for continuity.

Future of research

oned above, the completion of this project does not mean a period in terms of development or functionalities. The project could be extended in different ways:

- Adding extra components that provide the system with extra functionalities easily adaptable:
 GPS receiver avoiding the constant loss of the location of the device.
 Set of sensors that allow the function of taking the measurement of different variables.
 Examine the idea of a change of embedded system, that is, to change the main controller for a system of greater capacity and scalability. The idea of the ESF32 is
 proposed, which is compatible with the algorithms afterwally implemented and which, at present, already has a wide range of information on the subject.
 It is intended the addition of more devices to be controlled, that is, to have an endless number of slave devices to be controlled by a master device that, through the
 algorithm, follow the instructions issued and perform the required tasks.
- ed through this project would be the ESP32, Arduino (in any model or presentation) and



Acknowledgments

E-mail: 317030022@upjr.edu.mx

I am very grateful for the support provided by the Universidad Politécnica de Juventino Rosas for financing part of the project, as well as to my tutor who never left room for doubt in our area of work and always encouraged me to continue growing the project and not to leave

References

nero A. (2014). Integración de ROS con Arduino y Raspberry Pi (Tesis de pregrado). Universidad de Sevilla, Sevilla, España

Contact: TÉLLEZ-CASTELLANOS, Aranzazú Mahelet

Project website: https://www.ecorfan.org





© (2021) All rights reserved | ECORFAN, S.C. ECORFAN®-México-Bolivia-España-Ecuador-Camerún-Colombia-Salvador-Guatemala-Nicaragua-Perú-Paraguay-República Democrática del Congo - Taiwán

DOI: 10.35429/S.2021.1.3.11.13