

Olmeca 2021 Team Description Paper*

Daniela Sarahí Cruz Hernández, Johan López Castillo, Melvin Ramón Leal Quiroz, César Antonio Rivera Morales, Ana Georgina Ramírez Patraca, Javier de Jesús Rosales Osorio, Adolfo de Jesús Pedraza Monge, Anabel Bellido Varela, Diana López López, Julio César Sandria Reynoso, Héctor David Kennedy Cabrera
Universidad Tecnológica del Sureste de Veracruz
maa19190211.mleal@alumnos.utsv.edu.mx

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Abstract—This document presents the Olmeca team that represents the Universidad Tecnológica del Sureste de Veracruz, through the Jaguarbot robot to participate in the RoboCup Brazil Open - @Home Virtual 2021.

The main task to be solved by the robot is voice recognition to execute a movement command of the servomotors in the robotic arm, as well as the use of vision sensors for tracking a person.

I. INTRODUCTION

The Olmeca team is conformed by students and professors from the Mechatronics Engineering career at the Universidad Tecnológica del Sureste de Veracruz to participate in the RoboCup Brazil Open - @Home Virtual 2021.

Web site: <http://www.robotica.utsv.mx/en/robocup-en/>

Classification video: <https://youtu.be/9xfVrU0nQ6E> The team is formed by: Mechatronics study program students:

Daniela Sarahí Cruz Hernández, Johan López Castillo, Melvin Ramón Leal Quiroz, César Antonio Rivera Morales, Ana Georgina Ramírez Patraca, Javier de Jesús Rosales Osorio.

Mentoring team:

Julio César Sandria Reynoso (MSc in Artificial Intelligence) Anabel Bellido Varela (Mechatronics Engineer) Adolfo de Jesús Pedraza Monge (Mechatronics Engineer) Diana López López (Mechatronics Engineer) Héctor David Kennedy Cabrera (MSc in Micro and nanosystems) and Eduardo Josué Cortés Gómez (Student of computer systems)

The Universidad Tecnológica del Sureste de Veracruz participated in the Robocup at home contest 2021 in the league OPL, with the name of robot jaguarbot (inspired by the Olmec jaguar that symbolizes the darkness of mother Earth and Bot derived from the word Robot capable of performing operations autonomously).

It has a special interest in participating in the OPL league, providing implementations in the field of service robots through the commercial robot Jupiter from the LattelRobotics company. We had experimented with vision control, motorization planning, robotic arm control, as well as voice recognition to execute tasks.

In the following months, it is planned to work in real environments such as university classrooms, local restaurants and shopping mall parking lots. in order to acquire greater knowledge and sensitize our community about the high relevance of these automata.

Details of the robot hardware and software are found in the annex. The main task to be solved by the robot is voice recognition to execute a movement command of the servomotors in the robotic arm, as well as the use of vision sensors for tracking a person.

II. RESEARCH FOCUS AND INTERESTS OF THE GROUP

The focus of this university group is to implement robot or automaton technology, applying navigation and visualization techniques to perform service activities in small university classrooms through tasks where the interaction of people can be supplied in support of the post-covid scenario

III. ROBOT DEVELOPMENT

A. Open-source Robot Platform

The platform used is that of the Jupiter robot, a robot designed for educational solutions, it is an open platform, it has systems that personalize it (manipulator system, upper and lower vision, microphone, speakers) functions used for speech recognition applications and follow me.

The robot has a TurtleBot 2 platform, the TurtleBot2 can execute SLAM algorithms (simultaneous location and mapping) to build a map and drive around the room or stage, it has a mounting structure where various types of hardware can be placed, as well , has software for its control, libraries for visualization, planning and perception is compatible with ROS.

ROS: Robot operation system it is open-source software for the Robot, which provides us with a large collection of robotic tools and libraries. With Ros as fundamental software, it allows the work to be adapted so that we can carry out the manipulation of the navigation, vision and speech functions.



Figure 1. Robot accessories

Robot navigation: The Kobuki system and the MS Kinect sensor are the mobile base of the robot, the navigation package is from Turtlebot, the previous application is used for the recreation of maps with Gmapping and localization with Rviz running ROS on Ubuntu 16.04 LTS.

The robot can go to a certain location that is indicated from the map, generating a navigation route.

Robotic arm and manipulation of objects: We are using TurtleBot Arm9 for object manipulation. It consists of 5 Dynamixel AX-12A servo motors, controlled by an ArbotiX-M / USB2 Dynamixel controller board. A raised arm is developed for flexible height manipulation. The current design aims to allow the manipulation of objects in height ranges from 0.4 m to 0.8 m. Fig 1.

Speech interaction and location of the sound source: For human speech interaction we use CMU pocketsphinx, as our Robot is a lightweight speech recognizer, it is based on a support library called sphinxbase. The recognizer requires a language model and a dictionary file that can be built automatically from a corpus of sentences, for text to speech (TTS) we are using the CMU festival system together with the ROS package sound-play. In order to improve the efficiency of speech recognition, we use a strategy for the robot to hear the trigger keyword, recognize itself, and switch to searching for programs to recognize the actual command. Once the command has been recognized, the robot can switch to grammar search to acknowledge confirmation and then return to keyword listening mode to wait for another command.

IV. ROBOT APLICATION RELEVANCE

With this application of the robot, We can work with the implementation of mapping, travel sensors, tasks are optimized from voice commands, it allows detecting obstacles and avoiding them, the efforts made in this work group allow articulating the different university careers and promote the adoption, adaptation and use of free software and hardware.

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