Autonomous land robot for coastal waste pick

Physical simulation platform

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Abstract— The IEEE Open category challenge this year is to assembly a robot able to pick up 20 soda empty black cans. To solve the problem, we have used many concepts and skills in artificial vision, robotics, mechanics and control systems.

Key Words— Mechanics, Artificial vision, robotics,control systems.

I. Introduction

Building an autonomous robot able to recognize and pick up cans is a great challenge. As we know, the system is impulsed by a four-pulley belt system. The artificial vision is guided by a cracked platform of Xbox®. The pick up system is an object we created, similar to a mop; and the throwing system is a mobile box driven by a shaft.

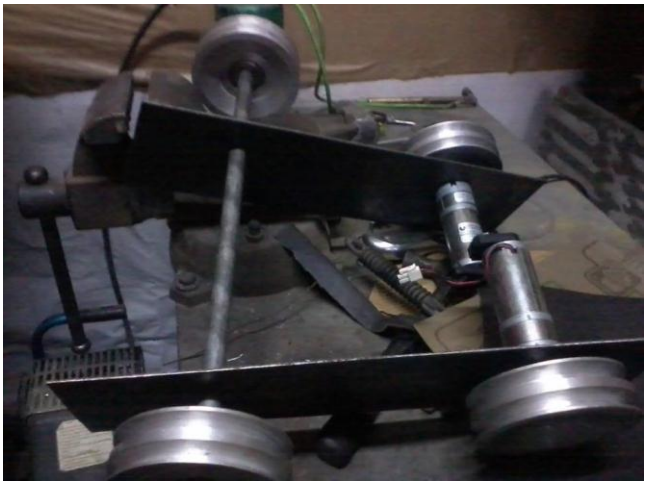

Fig. 1

II. Brainstorm

Brainstorm was the first meeting we had. We used all this time to propose solutions to the task. A large list of ideas was done. Every tiny decision we take has a founded reason. The main idea was to make the robot able to recognize a can, pick it up and then throw it in a specific area. In this stage we concluded that we needed a pulley belt system driven by two engines and two different engines which move the pick-up system and the throw system.

III. Robot Construction

In the second stage we considered the way to build a cube of 0.05 m able to achieve the challenge. The main points were: materials, weight, and height, location of engines, artificial vision and control.

So we can divide this stage in two parts: hardware and software

A. Hardware

Hardware (Fig.1), is the mechanical part of the robot. Our robot has chassis, tray, and pick-up system. Here we have to work with materials and dimensions.

The chassis: A steel box is the main structure of the robot. The joints are made from aluminum. .It consists on a pulley belt system. We use four pulleys made from aluminum, two in each side moved by two engines, placed on the back. These are communicated by aluminum shafts. “To achieve that speed control of the line, is necessary to rule all the machines and conveyor belts to thespeed required”[1]. The front part is joined by a cylindrical shaft. The back part uses a square shaft,

to hold the two engines. In the four pulleys we work with shootings.

The tray: Done from a plastic box, is placed in the back part of the chassis. We chose plastic because of its lightness. The shape of a box is perfect to retain cans. A lateral axis is impulsed by an engine will be the responsible to move the box and drop the cans to the circle.

The pick-up system: In this part, we created an object. It consists on a thin shaft with rubber strips sewn on it. Is similar to a mop. The strips are long enough to achieve the cans (no matter how they are positioned).

The pick-up system is connected to the tray by an inclined plane.

B. Software

Software is the intelligence of the robot. We work basically with a cracked platform of Xbox® and engine control.

A cracked platform of Xbox®:We used his camera and depth sensor for artificial vision

Engine control: We created an algorithm able to control the four engines, guided by the cracked system.Based on data recollected by artificial vision, congruent actions with the competence are realized; in this case, is about black cans lying all over the beach. Through a power stage and control of engines, using encoder and a control system PID, the appropriate movement of the engines of displacement, is ordered and reviewed; driving the engines of the mop and the tray.

IV. Focused Problems

A. Moving on arena

Is such a difficult thing because we need a special system of displacement. We solved this by using a four pulley belt system fed by two engines on the back of the box. This way, is easier for the robot to move all over the arena.

B. Recognizing black cans

Maybe is the most difficult part of the Project. We solved this by cracking an Xbox® platform. It was really hard to achieve all the programming details. It is about receiving data from the platform, processing it and then giving orders to the engines.

C. Putting all the cans on the circle

Once we had achieved the control of the Xbox® platform, this part wasn't as difficult as it seems. The systems give the order to move to the engine placed on the shaft of the tray.

D. Control

The control work is to difference the variety of objects on the arena, searching the appropriate route for the picking, avoiding obstacles immersed in the field and choosing between picking up or wasting; as the case determines.

We look for a swift development in the competition, through priority logic, trying to take as much advantage as possible with the time provided

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