Distribot_1

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***Abstract*— This document describes the overall characteristics of robot "DISTRIBOT_1" third place in the Colombian robotics competition 2010, and participant of LARC 2010 OPEN, commenting the solutions proposed by the team for the competition. Made in order to serve as a starting point for researchers who begin their studies in the robotics area.**

I. Introduction

The construction of movil robotics platforms for specific purpuse, is closely related to the interaction whit the environment, involves the usage of a variety of actuators, sensors, and diversity of algorithms implemented in all types of digital Systems for processing.

To narrow the issues and to cover it, becomes necessary to approach each part of this set of interrelated topics; mechanical, Electronic, and programming, and from this perspective approach any one of the robot subsystems, the latter understood as, all those processes, repetitive or not , that can be individualized, and their interaction, make up the robotic system for specific purpose.

II. Subsistems

A. Structure and clamp

The main structure is cut in form of "U", were, is a movable platform subject to the firs for four tubes that guide the movement and two gearmotors installed on the sides that move the platform vertically. This platform is designed, to the previous symmetric, although smaller than main structure, has two fixed walls, orthogonal to its base, and a moving wall that serves as the press to hold the cubes. This wall is subject to two gearmotors that provide movement.

The chassis of the device has a frame made in acrylic of 3mm and 6mm thick, this structure is also the basis of the guideline and driving actuators.

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All authors are standing electronic engineering in the Distrital University Francisco José de Caldas (COL), and are now with the student chapter of Robotic and Automation Society, "RAS+UD" in the same University.

Fig. 1. Gearmotor and wheels used

B. Locomotion

The locomotion is an important point in the development of the robot, because this depends the precision and speed of the robot. To accomplish this, we take as base the movement of servomotor, and gearmotor, guideline and driving respectively, thanks to his simple and accurate control by PWM.

The PWM give us the possibility to control the servomotor position and the speed of the gearmotor whit a couple of lines of code.

To connect the two actuators we use a piece like an elbow, designed to allow the axis of rotation of the actuators is the same point of contact whit the ground wheels, to facilitate the control logic in all directions.

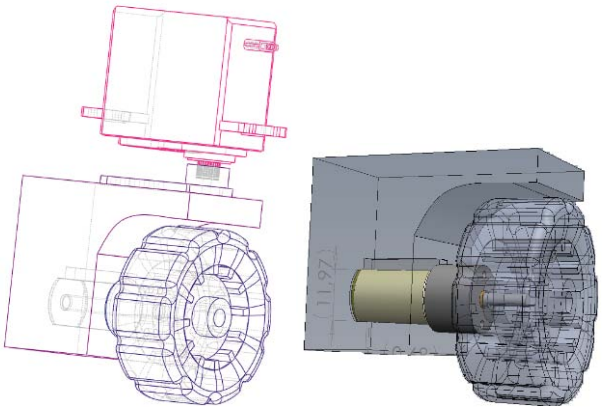

Fig. 2. "Elbow" as connection of actuators

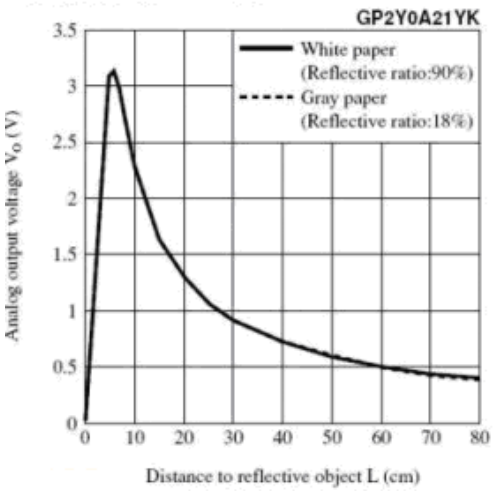

Fig. 3. Curve distance vs. output voltage

C. Sensors

Given the conditions to be overcome for our robot is very important to know primarily about the localization of the Producer's zone and our location within the perimeter of the scenario. Is necessary to use different sensors to give as a clear idea of where and how close are to cubes, color and programming guide designed in solving the problem.

1) *Proximity sensor*: The first thing to take into account to make our task is use of a proximity sensor, which gives us a measure of control in programming to guide the robot and obtain cubes. We use the sensor GP2Y0A21YK because it gives an analog output easily to compare.

2) Color sensor: the color sensor gives as the possibility to distinguish between different colors and so know the order in which we have to collect and organize the cubes. The color detection is based on reflections contrast of colors: a blue surface when exposed to green light shines very brightly, however in the presence of red light appears to be black. An orange surface, on the other hand, displays reflection characteristics that are opposite that of blue. The idea is to take advantage of this property and create a system where a CDS cell can be used to differentiate between colors. The circuit [1] used is based on a voltage divisor, and that signal is processed by A/D converter.

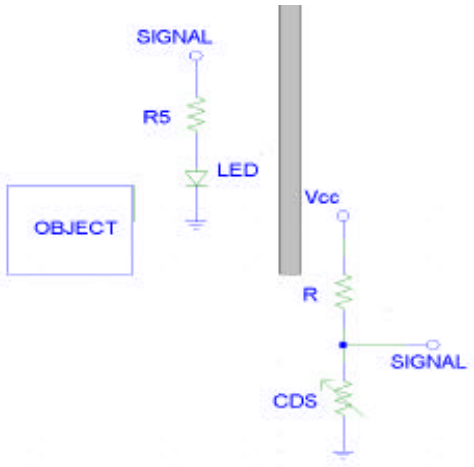

Fig. 4. Color sensor circuit [1]

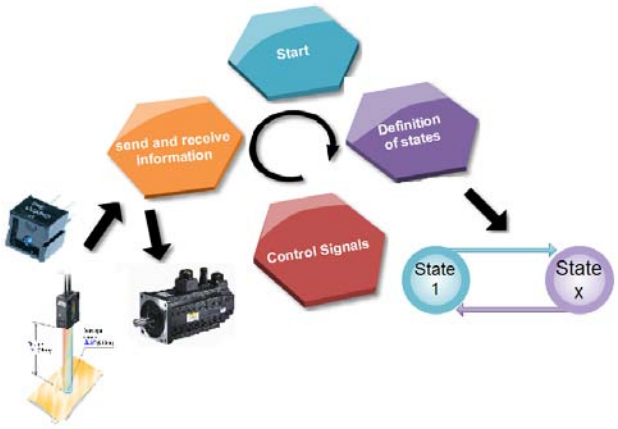

Fig. 5. Basic state diagram representing the structure of the code

III. Algorithm

We have developed an algorithm which allows modifications to suit provide a solution to the problems that arise when the robot comes to interacting with the scenario; this algorithm is basically developed through processes that ease the programmer to find errors solution and have the code organized.

We get a programmable platform where they can add additional peripherals without having to spend much time in large portions of code reform.

IV. PCBs

Because the robot needs to communicate with the outside, taking signs of his environment, then they decide what to do and have sufficient resources to perform these tasks, the design of circuits that allow us to perform these actions requires proper order and good organization in the physical space of the robot, therefore they have designed some circuit boards that provide greater security to cleanliness and external events that could negatively impact the electronics of the robot, these circuit boards are classified into three types: the first they correspond to the inputs of the system, light sensors, distance, color, and the second type corresponds to the control PCB, which houses the microcontroller and the elements that process the signals from the system inputs, and finally control circuit boards communicate with the actuators, who execute the actions that show microcontrollers, and this PCB has power, that will allow these actuators receive sufficient

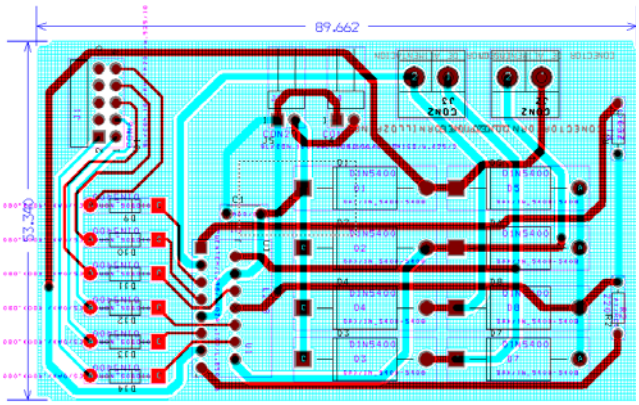

Fig. 2. PCB

energy for efficient operation, since the circuits control are not capable of supplying enough power to the actuators, this latter type of form is essential, both to provide the necessary energy to isolate the components of external signals and unnecessary for the overall system. Here is part one of the PCBs that were used for the construction of the robot.

ACKNOWLEDGMENT

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REFERENCES

[1] E. M. Schwartz, “A Color Detection Method for Introductory Robotics,”. *2003 Florida Conference on Recent Advances in Robotics*, Florida, 2003.