

Proposal of an automated container to separate the garbage

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-----ABSTRACT-----

The present work presents a proposal for the automation of a garbage can, which allows the correct separation of the different types of waste. The container has six compartments contained in a metal base that rotates through a stepper motor according to the waste selected by the push button located on the top of the container. Due to its capacity and composition, the proposal is only applicable to urban environments (home, schools, and museums).

KEYWORDS;-Automated container, garbage, motor by steps, microcontroller, PIC, SEDEMA.

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I. INTRODUCTION

Environmental education is a process in which humans become aware of the environment. To acquire values and skills to improve the environment, the deterioration suffered by the planet must be faced in the face of the great threat of the destruction of nature.

Some environmental education actions that humans can take are recycling, not using the car excessively, not wasting water, etc. The present work focuses on the separation of garbage, which is also an action that contributes to environmental education.

According to the Ministry of the Environment (SEDEMA), a person generates 1.5 kg of garbage per day, but most of the waste is reusable or recyclable. Based on SEDEMA, a waste is reusable if it is given a new use without modifying its materiality; however, a waste is recyclable if its material allows it to be reused for the production of a new object or product.

For a piece of waste to be recycled or reused, it is necessary to separate them, since thanks to this action the waste is prevented from mixing and dirtying with other waste and losing its value.

When waste is not separated and is mixed with other waste, it generates a bad smell and becomes contaminated, consequently, it loses the possibility of being reused or recycled. However, if they are separated, the raw materials they contain can be recycled, such as: paper, cardboard, glass, plastic, textiles, PET, tetra pack, etc.

Unfortunately, at the global level, there is a lack of environmental culture and the minority of human beings separates waste from their home, work, school, etc. For this reason, an automated garbage can is proposed as a solution to the problem of garbage separation, which makes it easier for people to separate garbage in a practical and didactic way.

II. SOLUTION PROPOSAL “AUTOMATED CONTAINER”

As mentioned, the problem of waste recycling begins with the poor separation of waste; it is not enough to put all the waste in the garbage, but it must be classified with elements of the same type and structure.

Waste can be classified as:

- Organic: They are those of animal and vegetable origin. For example: Fruit peel, vegetables, food leftovers.
- Inorganic: They are almost all the waste that can be recycled, when they are free of organic matter. For example: bags, packaging, glass, paper, cardboard, metals.

- Sanitary: It is important to place this waste in an airtight container, since it is for personal use. For example: toilet paper, tissues, sanitary napkins
- Specials: Within this classification are telephones, radios, televisions, etc.

Currently there are containers with separations for each type of waste; however, the problem of waste separation has not been solved due to the lack of environmental education on the part of human beings, or because of the unattractive or interactive nature of these containers, as shown in Fig 1.



Fig. 1. Conventional container with partitions.

The proposal proposed by the present work consists of a can that contains 6 compartments; each compartment corresponds to a type of waste. The waste that can be separated in the automatic container is: PET, batteries, paper, aluminum (cans), glass and organic waste. The garbage container has an upper lid, which covers 5 compartments, the sixth compartment is exposed through a hole and said section corresponds to the waste chosen by the user. The selection of the waste to be deposited is done by means of push buttons, that is, a button for each waste; at the moment in which the user selects a waste, the container rotates to the selected compartment. Fig. 2 shows the prototype made in the SolidWorks® design software.



Fig. 2. Prototype of the automated container to separate the garbage.

Internally, the automated container is made up of a stainless steel base, which is the one that contains each of the compartments. Additionally, the container contains wheels on the base for ease of movement. Fig. 3 shows the internal structure of the container.

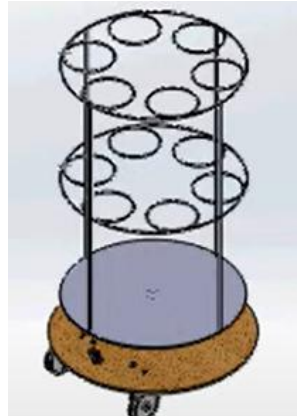


Fig. 3. First part of the internal structure of the proposed container.

Fig. 4 shows the automated container with the containers, which initially as a test are proposed to be made of PVC cylinders.

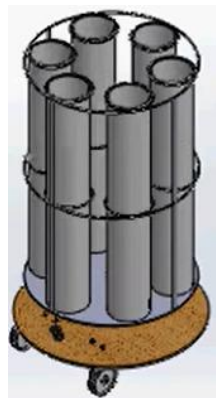


Fig. 4. Second part of the internal structure of the proposed container.

III. IMPLEMENTATION AND OPERATING RESULTS

To test the operation of the proposed automated container, a base prototype is made, which has as main components those shown in Table 1, in the same way its function in the prototype is briefly described.

ELEMENT	FUNCTION
Push button	When pressed, it sends the signal to the brain (PIC) so that it performs the function of turning the stepper motor
CHARACTERS LCD 16X2	When receiving signals from the PIC, it must show specific messages on its screen for each signal received according to the programming
Motor by steps NEMA 23	Rotate a certain number of degrees in response to signals received by a logic controller
Bridge H L298 y L297 Driver	Together they form a driver to control the stepper motor
Microcontroller PIC 18F4550	It is the brain that contains the programming of the automated container
Lead battery	Provides a voltage of 12 volts with 4 amps of intensity, it is rechargeable
Aluminum foil	They function as mechanical supports in the prototype structure
Selector button	It is to turn on or turn off the prototype

Reinforced cardboard boat	It is the structural component that serves as the casing of the prototype
Protoboard	The entire control circuit is interconnected in this structure
1" long by 7/8" diameter coupler with 3/16" hole and 1/8 tap	Attaches NEMA 23 motor to metal base
Metal rod structure	Fundamental structural component of the prototype, which rotates by means of the motor containing the PVC tubes
PVC pipes 4" by 51 cm high	Contain the waste deposited in the prototype according to its properties

Table 1 Main elements of the test prototype.

To make the prototype, a prefabricated boat based on reinforced cardboard of 120 cm in diameter was used, as shown in Fig. 5.



Fig. 5. Cardboard boat used for the test prototype.

Based on the size of the boat, the skeleton of the prototype is made of 1/4" stainless wire rod and support rods, as shown in Fig. 6, the base is made up of a base and six rings welded together, each ring corresponds to a compartment for a specific waste.



Fig. 6. Internal structure of the container (skeleton of the prototype).

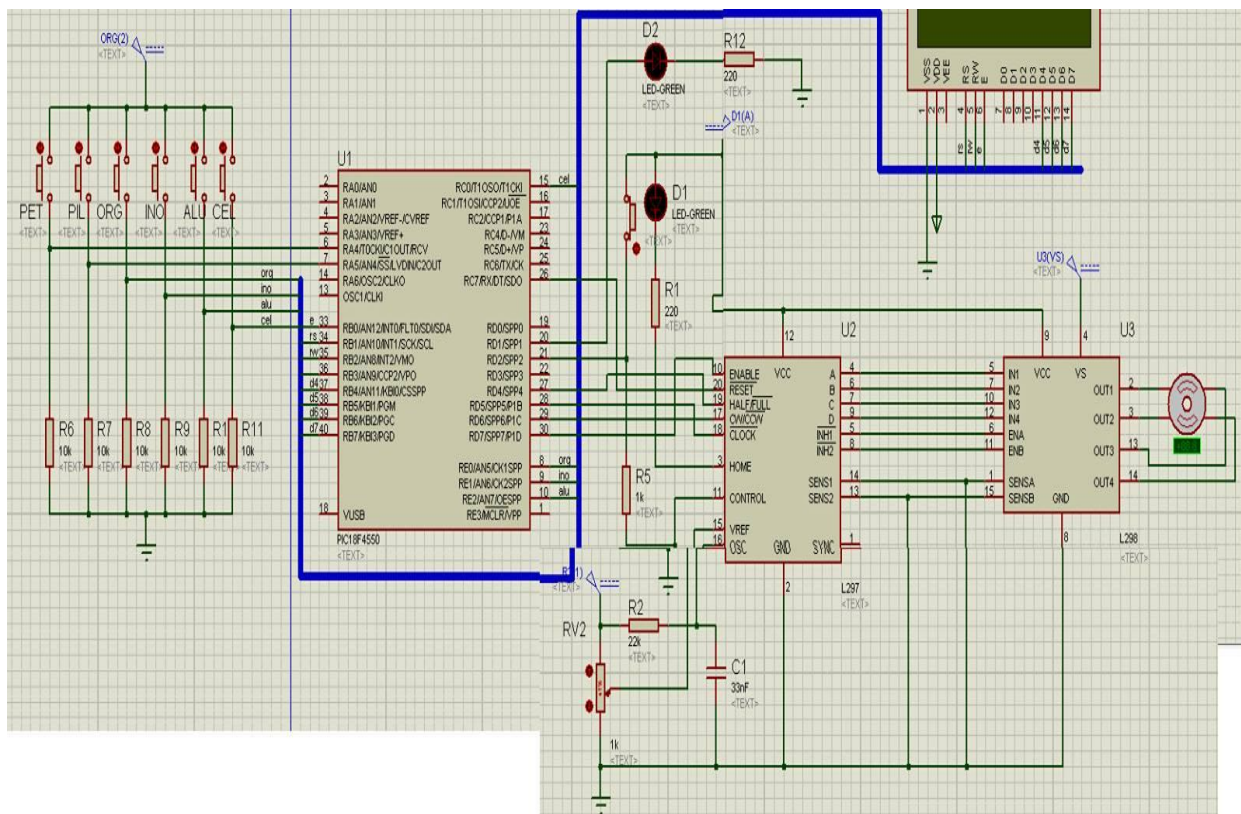
Once you have the welded wire rod structure, you add the individual PVC containers as shown in the Fig.7.



Fig. 7. Complete internal structure of the container.

The operation of the automated container is programmed in the Programmable Integrated Circuit (PIC) 18F4550, in which the movement of the stepping motor and the text shown on the display are programmed. The display (LCD) is in charge of showing the text that corresponds to the waste selected by the user, as well as indicating when it is time to deposit the garbage.

The programming of the PIC 18F4550 was carried out in the DEV C++ program, and the simulation of its operation was carried out in Proteus; said simulation is shown in Fig. 8.



To determine the functionality of the prototype, a series of tests were carried out, which are shown in Table 2, where it is observed that the task is the desired one, since, in the physical tests, the container turns to the compartment selected by the user and stop there to wait for the waste to be introduced.

Function	Satisfied	Notsatisfied
Moving the Switch ON turns on the container and then turns on the display	X	
When a push button is pressed, the internal part of the boat makes the turns (Send the signal)	X	
The message is displayed on the LCD screen of the selected waste	X	
The motor rotates positioning itself in the degrees of the compartment that contains the selected waste	X	

Table 2 Automated container operation.

IV. CONCLUSION

The present work is a proposal that aims to support people in the separation of their daily waste, this through the automated container, resulting in an attractive and striking proposal for users. The idea when developing this type of prototypes is so that the waste can be reusable and recyclable; and thereby has an environmental improvement contributing to the so-called environmental education.

Because it is a prototype, it is only designed for domestic, school use (urban environments) and its industrial use is ruled out, due to the type of container material. The container presented is presented as a prototype, since it was desired to propose an idea that would contribute to the environment, attacking a problem that occurs from home, such as the separation of garbage, another way to improve said problem is the dissemination of the importance of the separation of waste generated by human beings.

As for the tests carried out on the proposed prototype, these were satisfactory, since the container is positioned by means of the rotation of the stepper motor in the selected waste and shows on the display the waste selected by the push button, the knowledge in language C and handling of electronic components were important for the development of this work.

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