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Design of pictorial diagrams for the development of self-taught teaching electronics kits at the Instituto Tecnológico Superior de la Región Sierra

Diseño de diagramas pictóricos para la elaboración de kits de electrónica de enseñanza autodidacta en el Instituto Tecnológico Superior de la Región Sierra

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Abstract

The year 2020 was seen with a high rate of affectation in all economic and educational sectors, generating a high academic lag, in which the SEP began to generate strategies such as distance education, thereby complying with the provisions of the new Normality ensuring that the National Education System will not be paralyzed by the SARS-COV-2-(COVID19) pandemic, and what was done, will serve for the future of education in Mexico. This modality of the educational system is perhaps ahead of its time, in terms of years, because the response of teachers and students to this new distance experience has been satisfactory for both teachers and students. But the reality and the geographical context of the students is not favorable for the development of the expected competencies in each of the educational plans, to be specific in the area of electronics, the practices in the laboratories were annulled to 100% and taking into account the above, teachers of the Industrial Engineering area in collaboration with the Electromechanical Engineering Career belonging to the Tecnológico Nacional de México, Campus of the Sierra Region, seek to develop a research project that integrates a Basic Electronics Kit to allow students to be self-taught and develop specific skills in the area of electronics, thus avoiding educational backwardness at the higher level.

Electronics, Distance education, Competitiveness

Resumen

El año 2020 se vio con un alto índice de afectación en todos los sectores económicos y lo educativo, generando un alto rezago académico, en el cual la SEP empezó a generar estrategias como la educación a distancia, cumpliendo con ello las disposiciones de la nueva Normalidad asegurando que el Sistema Educativo Nacional no se paralizará ante la pandemia del SARS-COV-2-(COVID19), y lo que se hizo, servirán para el futuro de la educación en México. Esta modalidad del sistema educativo es quizá adelantado a su tiempo, en términos de años, porque la respuesta de docentes y alumnos a esta nueva experiencia a distancia ha sido satisfactoria tanto de docentes y alumnos. Pero la realidad y el contexto geográfico de los alumnos no es favorable para el desarrollo de las competencia esperadas en cada uno de los planes educativos, para ser específicos en el área de electrónica se anularon al 100 % las prácticas en los laboratorios y tomando en cuenta lo anterior, docentes del área de Ingeniería Industrial en colaboración con la Carrera de Ingeniería Electromecánica pertenecientes al Tecnológico Nacional de México, Campus de la Región Sierra, buscan desarrollar un proyecto de investigación que integra un Kit de electrónica Básica para permitir que los alumnos sean autodidactas y puedan desarrollar las competencias específicas en el área de electrónica evitando así el rezago educativo en el nivel superior.

Electrónica, Educación a distancia, Competitividad

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Introduction

With the arrival of the COVID-19 pandemic, the educational process was interrupted without prior notice and millions of students went to confinement and the educational authorities, trying to counteract this impact, launched an educational plan called "distance education" in order to protect health, safety and, if possible, avoid learning loss in students, seeking to avoid high-level dropouts using new techniques to promote rapid recovery from learning.

Mexico, through the Ministry of Public Education (SEP), decided to suspend face-to-face classes. It is an extraordinary situation that shows us different realities related to inequality and poses great challenges, but it also offers us opportunities to act jointly and in a participatory manner. Thus, we see teachers accompanying and supporting students in the face of difficulties, professionals who continue to educate, and also mothers and fathers who put their shoulders to collaborate with this effort. With the above we can point out that as the school system stabilizes and students return to classrooms again, they will need more appropriate systems that allow them to acquire knowledge and skills exponentially. And this is where this project aims to do that; that is, providing the student with a kit that includes materials, a guide and tutorial videos so that he can carry out his electronics practices without the need to be at school and in a laboratory will allow him to avoid the loss of skills in his academic productivity.

Due to the contingency and the geographic location of many students who are pursuing their higher education in electromechanical careers at the Higher Technological Institute of Macuspana and industrial engineering from the Technological Institute of the Sierra Region, they do not have easy access points to technology such as the internet, including a telephone signal and due to the foregoing, this proposal is aimed at all students who take electronics subjects, since when designing the pictorial diagrams it will be facilitated the realization of a basic electronics kit that will include components for the realization of their practices and at the same time correcting part of the problem, as this crisis will have serious consequences for both governments and families, and will hit both the demand and supply sectors of education

Method description

For the development of the study, an experimental and deductive study was chosen, due to the nature of the research.
This research was proposed to:

- The experimental study and understanding of the knowledge acquired in the course of the subject of electricity and electronics.

- The generation of material that facilitates the understanding of matter electricity and electronics.

The established procedure is described below with a series of steps to follow in order to fulfill the project objective.

1.- Interviews The application of interviews to students to reaffirm the lack of knowledge and laboratory practices, due to the isolation caused by the pandemic, with this it was possible to corroborate the lack of a more flexible learning method.

2.- Design of practices. With which, by way of experimentation, it is confirmed that the designed model will serve and will be easy for students to understand when interpreting it, this accompanied by the knowledge they acquire during the semester.

3.- Experimentation and development of practices. Through the running of the practices in a software its functionality is determined, and they are carried out physically for their verification and approval.

4.- Design of pictorial diagrams. The design of the pictorial diagrams in the Fritzing software that will serve as a means for drawing up the plans of the elements that are required.

Analysis from the method

The proposed methodology allows a functionality analysis to be carried out since it is reduced to the study and evaluation of the operation of the electronics kit, so it is necessary to find out its components first of all and the reason for each of these, from another perspective it is also necessary view the same object in use.

All this in order to diagnose the use for which it is intended, which will be to comply with the practical skills of the electronics field; being equally essential that the scope of it can be evidenced.

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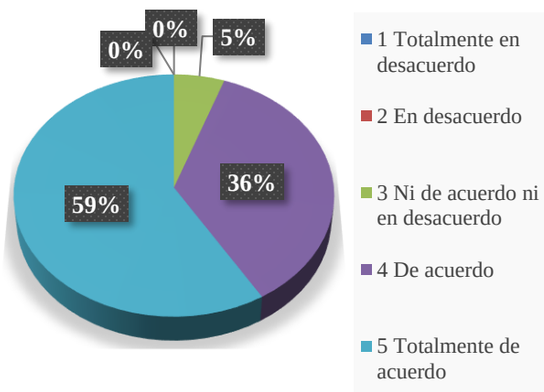
At the beginning, the problem was raised focused on the null use of laboratories in the pandemic, which leads to not reaching the practical competencies of the study plan. This being an important factor at the time of graduation of ITSS students.

For this, some solutions were sought, of which it was decided to develop a practical electronics kit at home. An investigation of the basic elements for the understanding of this technology was carried out, always looking for the iteration with the subjects assigned in the syllabus of the subject in question.

Once the topics of interest were selected, the opinion of the students was sought through a survey. From which the following graph was obtained



Graphic 1

59% of the students (54 students) fully agree to work on a basic electronics kit from home and that it would be an excellent way to carry out laboratory practices, 36% (33 students) agree with this statement , 5% (5 students) neither agree nor disagree, while no student disagrees and totally disagree.

At the end of the survey, it was decided to make the diagrams that include the components selected in the research. They were carried out in a software called Proteus8.0 and were simulated right there for analysis.

Pictorial diagrams were also made in Fritzing for better understanding of the students and at the end the physical practices were carried out to verify that the diagrams and simulations worked correctly

Results

The following results of the pictorial diagram design are presented through the study:

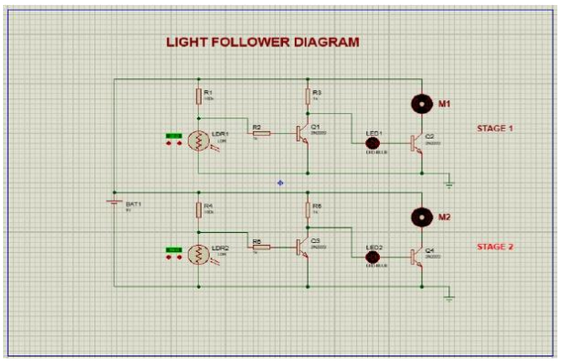


Figure 1 Light follower

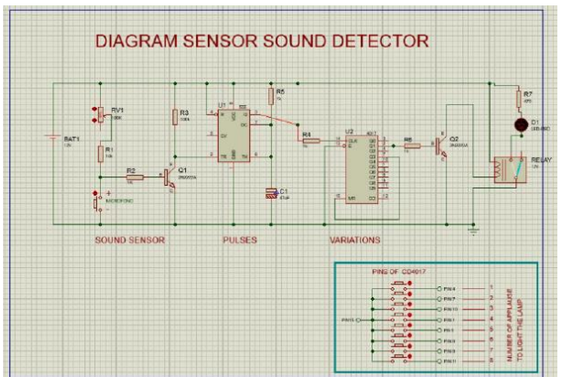


Figure 2 Sound detector sensor

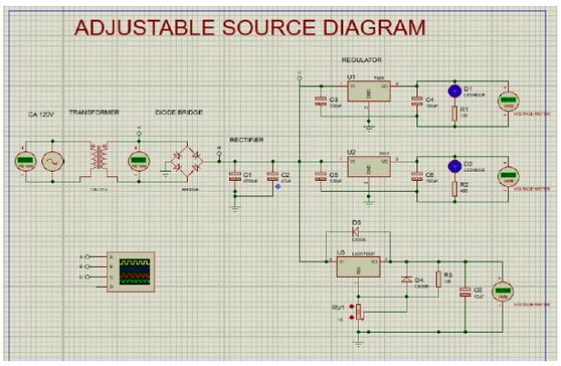


Figure 3 Adjustable source

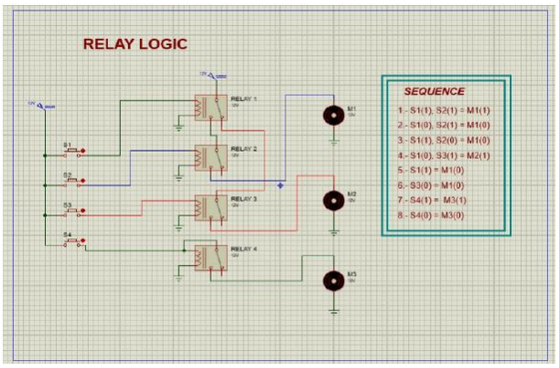


Figure 4 Relay logic

In the end, the veracity of the circuits that will be part of the basic electronics kit to carry out practices at home was verified through the schematic, pictorial and physical diagrams on the breadboard.

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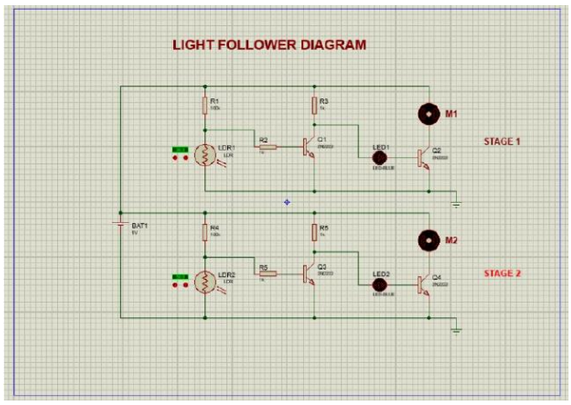

Figure 5 Schematic diagram

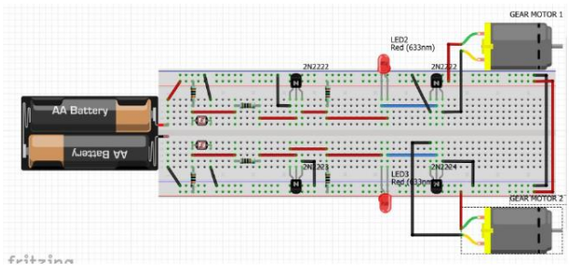

Figure 6 Pictorial Diagram

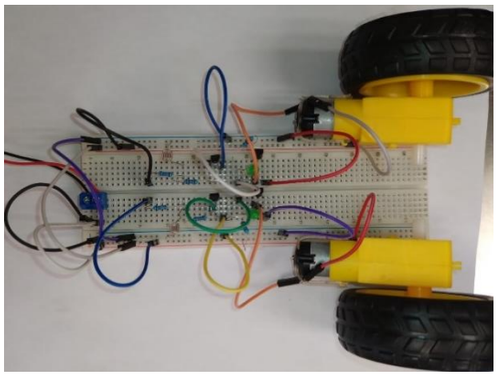

Figure 7 Diagram on real breadboard

Conclusions

The constant search for information helps us and provides better tools for understanding and analyzing the data obtained, which is why the design of pictorial diagrams provides us with a better understanding of electrical circuits for the time of interpretation and experimentation. component physics in practice.

By obtaining the expected results, its functionality in the teaching method is confirmed, which allows students in a dynamic and didactic way to carry out practices supported by teachers, and the means provided to them.

It should be noted that the present study is part of an investigation, in which it is intended to design self-taught teaching kits, therefore it represents a representative advance and confirms that the knowledge of the experts will be distributed in the best way.

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