

**TECCIENCIA**  
Journal of research

Vol. 10 no. 18

Issn: 1909 – 3667

E-Issn: 2422-3670

<http://tecciencia.ecci.edu.co/>

**Director**

M.sc. Emeterio Cruz Salazar  
Universidad ECCI, Colombia.

**Editor in chief**

Dr. Ing. Carlos Andrés Forero Núñez  
Universidad ECCI, Bogotá, Colombia

**Editorial board and scientific committee**

Dr. Ing. Jesus Requena Carrion,  
School of Electronic Engineering and computer  
science queen Mary University of Kingdom,  
London, United Kingdom

Dr Ing. Pedro Prieto Pulido,  
Universidad del Valle, Cali, Colombia

Dr. Ing. Leonardo Juan Ramírez López,  
Universidad Militar Nueva Granada,  
Bogotá, Colombia

Dr. Ing. Joachim Jochum,  
University of Applied Sciences Hochschule  
Offenburg, Offenburg, Germany

Dr. Ing. Nalladurai Kaliyan,  
University of Minnesota, Minnesota, Usa

Dr. Ing. Luis Javier Martínez Guerrero,  
Universidad ECCI, Bogotá, Colombia.

**Editorial team**

Ing. Msc Lizet Camila Salgado Franco,  
Universidad ECCI, Bogotá, Colombia

Ing. Luz Adriana Suárez Suárez,  
Universidad ECCI, Bogotá, Colombia

**Institution of editorial and design**

Universidad ECCI

**English style correction**

Steven Scherenzel  
Luisa Fernanda Gualy García  
International Logistic

**Electronic layout and cover design**

Ing. (c) Laura Carolina Hernández Solórzano  
Universidad ECCI, Bogotá, Colombia

**Printed by**

International Print LTDA.  
Format: 21.5x28 cm  
Paper: Enamel C25 90g  
Font: Times New Roman  
Edition Printed: 200 copies

*The intellectual production here, is author's property.  
Each author is responsible of the article published in the  
journal.*

**EDITORIAL**

**Hybrid model of the spread of  
Toxoplasmosis between two Town of  
Colombia**

1

Carlos Peña, Karen García, Hermes Martínez.

**Controller optimization for a solar  
tracking system using differential  
evolution**

7

Helbert Espitia, Fabio E. Sierra

**PSoC-based embedded system for the  
acquisition of EMG signals with Android  
mobile device display**

14

Javier Andrés Almeida, Mayra Rodríguez, Juan Sebastián  
Rubiano

**Grafting telinne monspessulana fiber with  
vinyl-trimethoxysilane. Effect of dicumyl  
peroxide catalyst**

20

Arnoldo E. Delgado, Oscar Y. Buitrago, William Aperador

**Technical efficiency measurement of the  
teaching function in the undergraduate  
attendance programs at Universidad  
Militar Nueva Granada.**

25

Oscar Y. Buitrago, Anny A. Espitia, Daniela Linares

**Development board based on the  
TMS320F28335 DSP**

36

Julian Saavedra, Jonathan Firacaitve, Cesar Trujillo



## Directors

### Superior Council President

Lic. Luz López De Soler

### Rector

Msc. Fernando Arturo Soler López

### Academic Vice -Rector

Msc. Guillermo Jerez López

### Research Vice- Rector

Msc. Emeterio Cruz Salazar

### E-learning Vice -Rector

Msc. John Jairo Motta Calderón

### Administrative Vice-Rector

Msc Mary Alexandra Calderón

### General Secretary

Ing. Luisa María Hincapié Rozo

### Postgraduate Direction

Adm. Segundo A. Martínez Aguilera

## Deans

### Engineering

Dr. Orlando Garzón

### Economics and Administrative

Dr(E) Harnoldo E. Puerta Cabarcas

### Arts

Dra. Esperanza López De Bolívar

## Address

Cra. 19 No. 49.20 Bogotá D. C. Colombia  
PBX: (57 +01) 3 53 71 71

[www.ECCI.edu.co](http://www.ECCI.edu.co)

## Coordination

### Industrial Engineering Coordination

Ing. Julio Aníbal Moreno

### Mechanical Engineering Coordination

Ing. Carlos A. Cristancho Rivera

### Electronic Engineering Coordination

Msc. Luis Fernando Rico

### Biomedical Engineering Coordination

Ing. Herman Dávila Torres

### Environmental Engineering Coordination

Msc. Alejandro E. Moreno Andrade

### Plastics Coordination

Ing. Hernán Enrique Castillo Lozano

### Management Accounting Coordination

Esp. Raúl Alfredo Martínez Martínez

### Foreign Trade and International Business Coordination

Lic. Haroldo Enrique Puerta Cabarcas

### Marketing and Advertising Coordination

Msc. Jaime Ortiz Vanegas

### Fashion Design Coordination

Esp. Dis. Diana Pilar Castañeda

### Modern Languages Coordination

Lic. Luis Orlando Gutiérrez Sosa

### Nursing Coordination

Enf. Elizabeth Murrain

### Articulation Coordination

Ph.D. William Ariza

### Language Center

Lic. Tito Solano Rua

### Corporate Welfare

Psic. Claudia Castelblanco Rodríguez

## Editorial

**H**einrich Schliemann was born in Germany in 1822. He had difficulties studying when he was a child, coming as he did from a humble family. He started working at a very young age while studying on his own and learning a variety of languages. He managed to become a very successful businessman thanks to his proactive approach to life and his knack for communication and learning, quickly climbing the business ladder and acquiring enough experience to create his own gold-trading business.

While working in bookstores, the young Schliemann came across the Greek literature. One classic that caught his attention was Homer's Iliad. This epic recounts the battle between the Greeks and Trojans, where great warriors like Achilles, Hector, and Agamemnon faced each other in battle. Schliemann grew curious about the history of Troy and came to think that the place must have truly existed. Years after building his fortune, he devoted himself to pursuing his dream of finding Troy, and he used the Iliad poem as the key to finding the exact spot where the story took place. Ignoring the skepticism towards him of scientists of the day, he set off and managed to locate the city of Hisarlik, where, to everyone's astonishment, he discovered the remains of Troy.

Heinrich Schliemann is an example of what it means to be a researcher. A researcher seeks information, compares and contrasts it and then analyzes it, discovering new knowledge in the

process – or, in this case, a city once considered mythical. With the Iliad verses in hand, Schliemann verified information, checked maps, and went in search of the city.

Schlieman's case shows us how fundamental reading is in the work of any researcher. For him, besides being his inspiration, reading was also the tool that guided him and led him to discover the ruins of Troy. It is a clear example of the effort, dedication, and patience that a research requires to generate developments that contribute to the needs of society.

Despite difficulties of access to resources and staff, the number of researchers in Colombia has been growing, and these researchers have become more and more relevant. The new knowledge generated in this country will become increasingly important with the passage of time. These research results scarcely come from the work of a single person, but rather from the cooperative work of research groups, which manage to build a collective vision that can gradually transform society.

In the following pages, TECCIENCIA journal, with its commitment to the dissemination of research advances in the engineering field, presents some studies developed by scientists from several national universities. These results contribute to the construction and expansion of knowledge in diverse fields such as energy, materials, electronics, and bioengineering, among others

***M.Sc. Fernando Arturo Soler López***  
***Rector***