9th International Interdisciplinary Congress on Renewable Energies, Industrial Maintenance, Mechatronics and Informatics

Booklets

RENIECYT
Registro Nacional de Instituciones y Empresas Científicas y Tecnológicas
1702902 CONAHCYT

RENIECYT - LATINDEX - Research Gate - DULCINEA - CLASE - Sudoc - HISPANA - SHERPA UNIVERSIA - Google Scholar DOI - REDIB - Mendeley - DIALNET - ROAD - ORCID - V|LEX

Title: Portable equipment and interface to train in CPR based on monitoring the applied force

Authors: Seseña, Hiram, Zuñiga, Mariana, Nápoles, Elías and Martínez, Moisés

Universidad Autónoma de Querétaro 5498-2024 0009-0005-9599-8954 2002041
Universidad Autónoma de Querétaro 2739-2024 0009-0004-8894-060X 2002165
Universidad Autónoma de Querétaro 2497-2024 0009-0001-2140-9134 1347506
Universidad Autónoma de Querétaro 9562-2024 0000-0001-5495-5185 370689

Editorial label ECORFAN: 607-8695
BCIERMMI Control Number: 2024-01
BCIERMMI Classification (2024): 241024-0001
RNA: 03-2010-032610115700-14
Pages: 15

CONAHCYT classification:
Area: Engineering
Field: Technological sciences
Discipline: Medical technology
Subdiscipline: Medical instruments

ECORFAN-México, S.C.
Park Pedregal Business. 3580, Anillo Perif., San Jerónimo Aculco, Álvaro Obregón, 01900 Ciudad de México, CDMX,
Phone: +52 1 55 6159 2296
Skype: ecorfan-mexico.s.c.
E-mail: contacto@ecorfan.org
Facebook: ECORFAN-México S. C.
Twitter: @EcorfanC

www.ecorfan.org

Holdings
Mexico Colombia Guatemala
Bolivia Cameroon Democratic
Spain El Salvador Republic
Ecuador Taiwan of Congo
Peru Paraguay Nicaragua

PRESENTATION CONTENT

Introduction

Methodology

Results

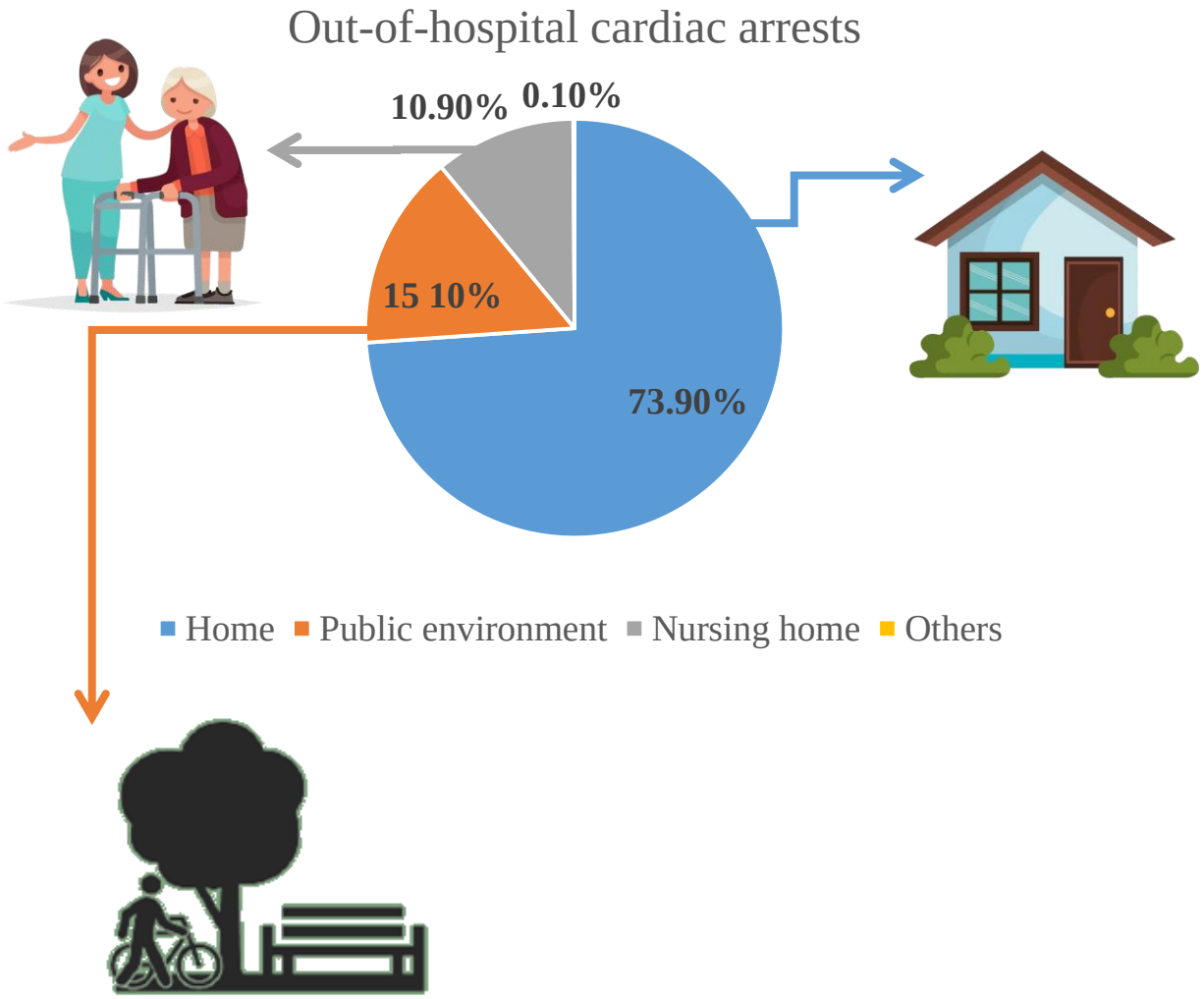
Conclusion

References

INTRODUCTION

- Global Context: Sudden cardiac arrests are a substantial problem because they present a percentage of worldwide deaths. CPR can duplicate or triplicate the survival of person who is facing a cardiac arrest, for which is necessary to count with trained staff in its application. Hence, develop an equipment for the capacitation in CPR training would be useful due to the feedback it could bring to people referred to concrete data in real life.

- The objective of this work: Development of a glove capable of measuring compressions force during CPR based on inalambric technology.

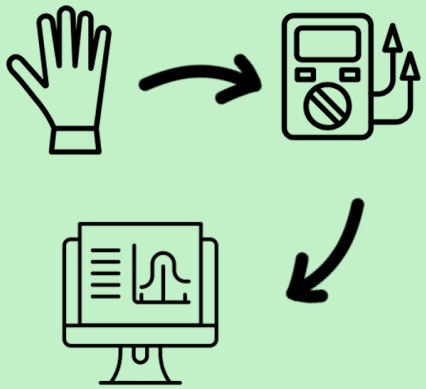


Graphical abstract

Portable equipment and interface to train in CPR based on monitoring the applied force

Objective

Development of a glove capable of measuring compressions force during CPR practice based on inalambric technology.



Methodology

Analysis of a strain gauge sensor.

Requirements for human machine interface.

Distribution analysis of sensors on the glove.

Tests performance on similar surfaces to the training.

Prove functionality of the prototype with teachers and specialists support.

Modification of the prototype based on specialists suggestions for upcoming tests.

Conclusion

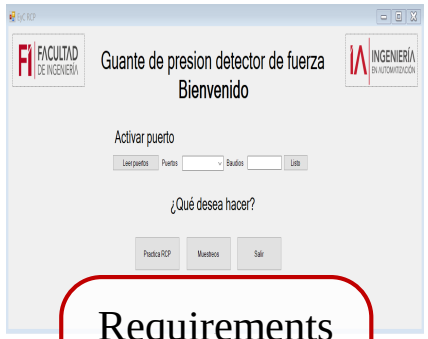
Trained personal give favorable feedback to use for academic purposes, providing teaching support and advising to persons who train.

The prototype differs from other systems due to the force measurment during compressions.

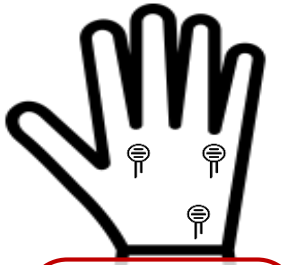
Opens opportunity areas in investigations , for example the mechanic mathematical model of the human torso considers variables such as force.

METHODOLOGY

Analysis of a strain gauge sensor.

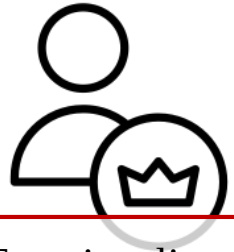


Requirements for human machine interface



Distribution análisis of sensors on the glove

Performance on similar surfaces



Functionality with specialists support

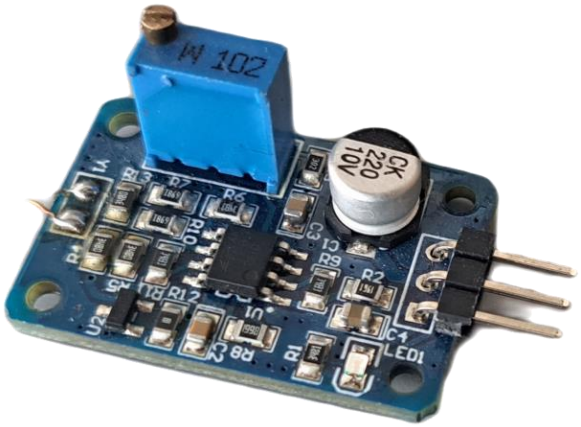
Modification of the prototype

METHODOLOGY

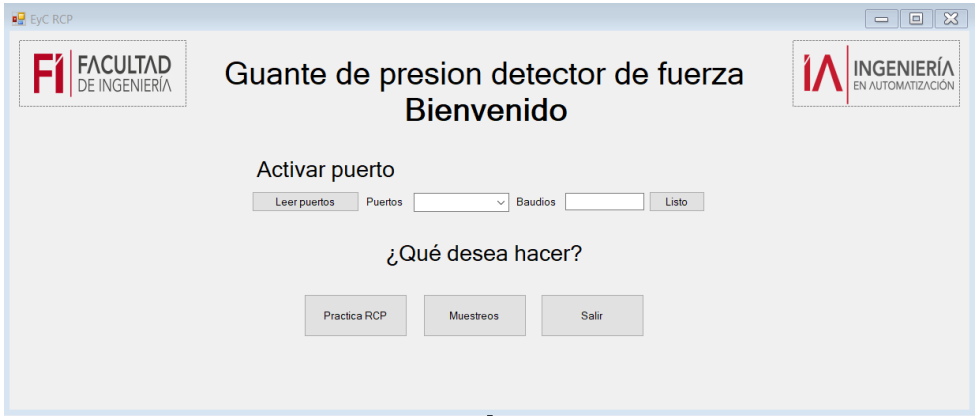
Analysis of a strain gauge sensor.

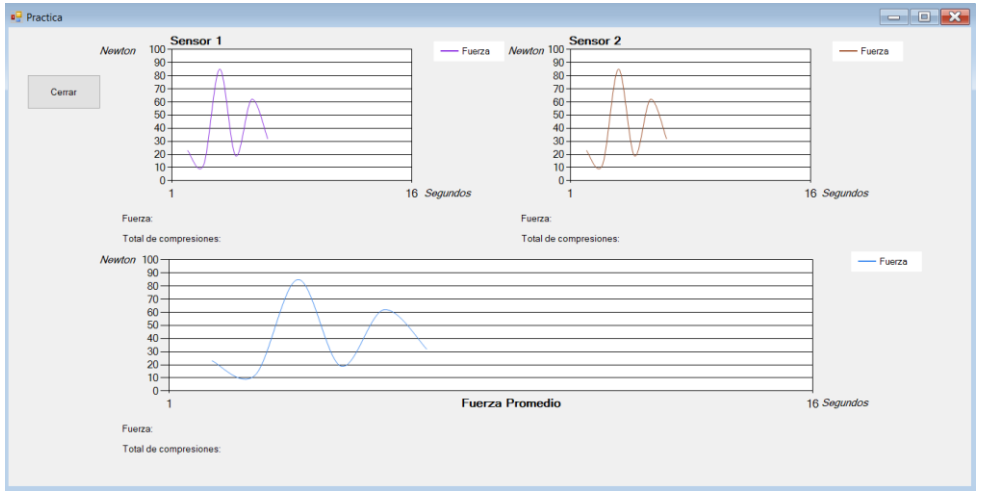
- The strain gauge BF350 function was analyzed, which works based on encapsulated meters, temperature compensation and fluency.

- It was reviewed the conditioning circuit requirements of the signal.



METHODOLOGY





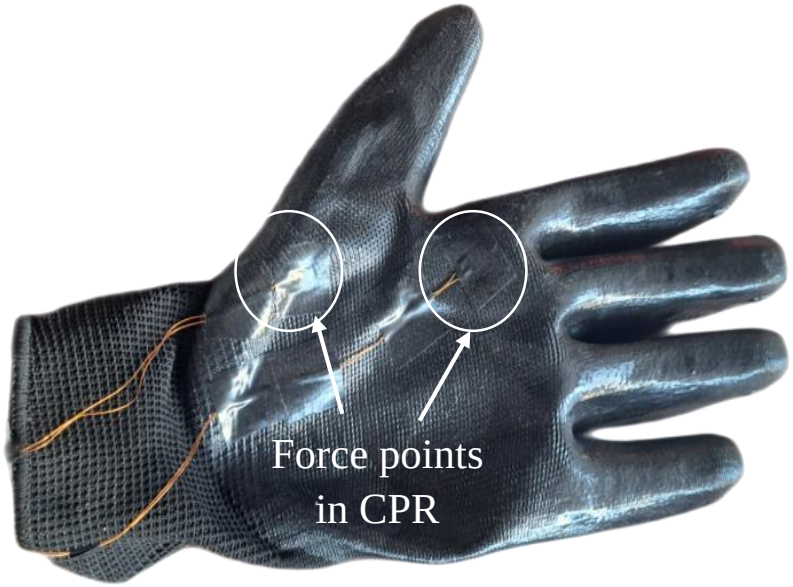
Requirements for human machine interface.

The human machine interface consist of a starting screen and a screen to show dynamic graphs of the force applied during compressions.

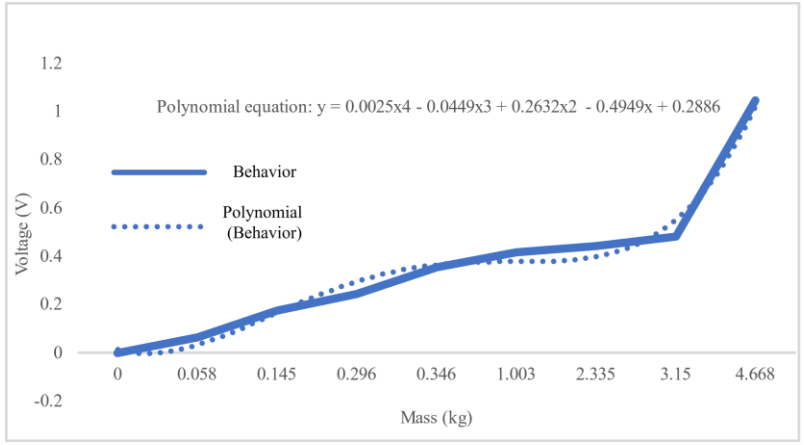
METHODOLOGY

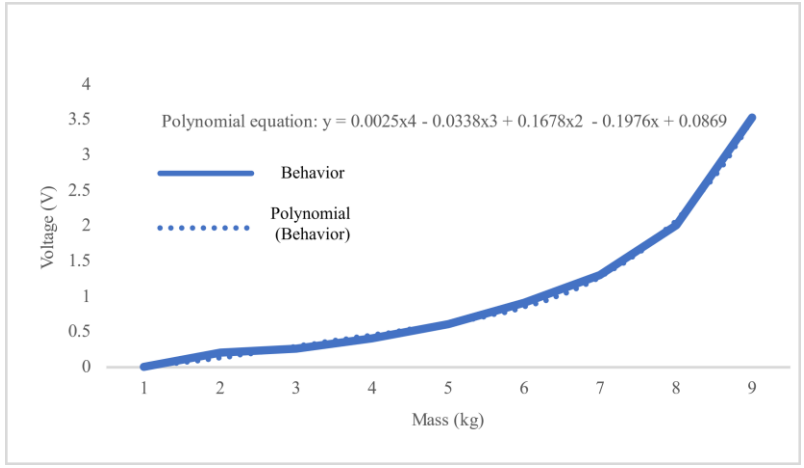
Distribution análisis of sensors on the glove.

Due to the force is applied through the palm, it is of vital importance to determinate the adequate points of measurements during CPR



METHODOLOGY





Performance on similar surfaces.

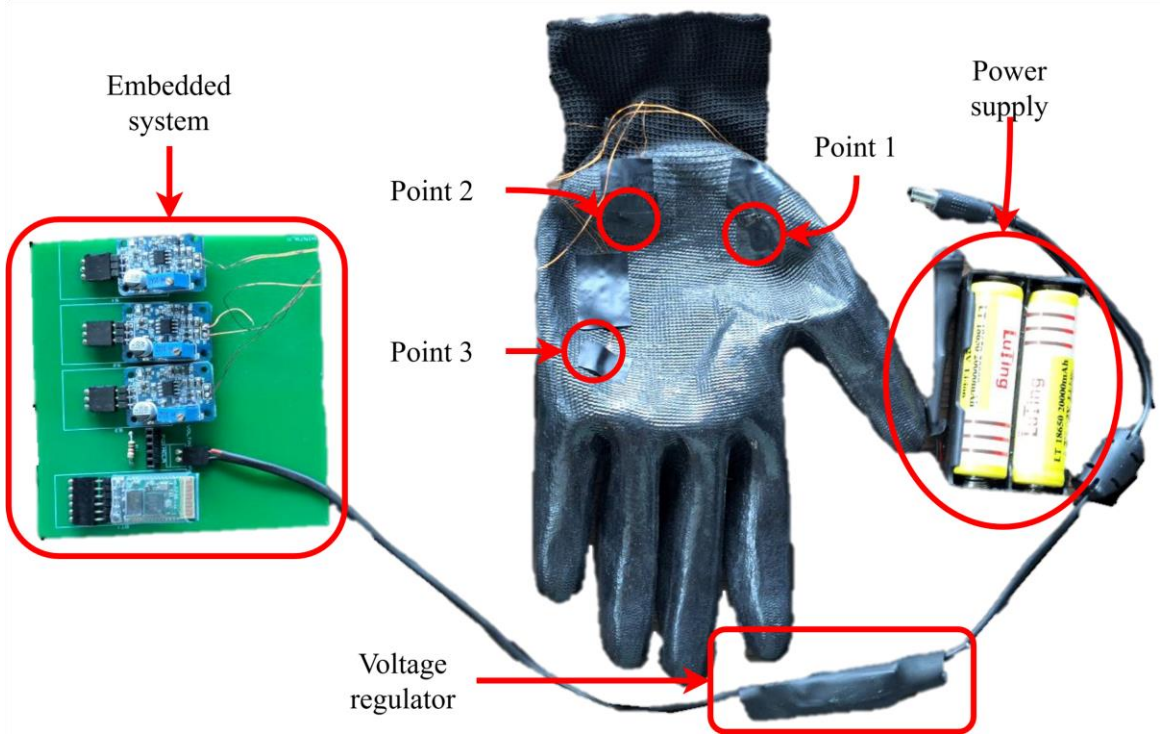
Tests were performed on similar surfaces in order to obtain a database to optimize the management of variables for each sensor. It was obtained the responses through polynomial equations, which would allow to be embedded in a microcontroller for the processing.

METHODOLOGY

Functionality with specialists support.

With the support from specialists, it was possible to test the prototype to probe its functionality. It was provided training equipment (manikin) for the tests

METHODOLOGY



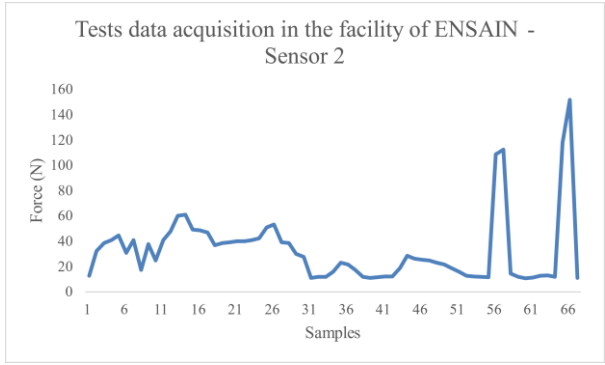
Modification of the prototype.

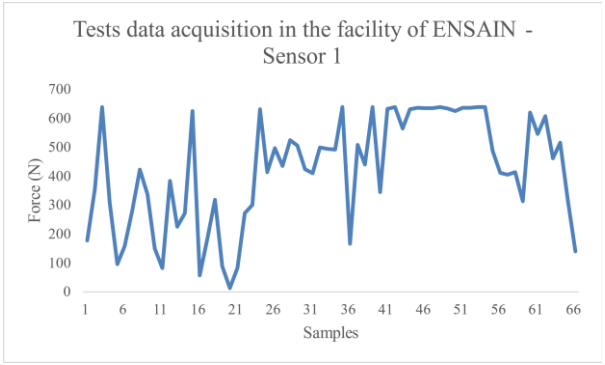
The specialist provided feedback respect to different aspects as size, circuit design and sensor location.

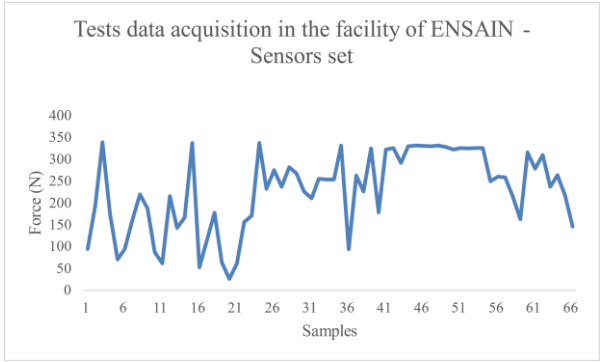
RESULTS

After the proposal modifications, finals tests were performed with trained staff in CPR practice. The behavior data by each sensor prove the functionality of the prototype while performing compressions.

- First sensor range behavior: 600 N – 640 N.
- Second sensor range behavior: 100 N – 150 N.
- First sensor range behavior: 220 N – 340 N.







CONCLUSION

- Development of an equipment capable of measuring compressions force for CPR practice
- Feedback from specialists in CPR practice regarding the feasibility of using the equipment for academic purposes
- Dynamic practice with real time data which shows the performance of the force related with compressions
- Differences from other systems due to it measures the applied force to achieve a compression
- Resource to measure force capable to be implemented in other investigation as a mechanic mathematical model of the human torso which considers variables like force

REFERENCES

Andrade Donoso, A. F., & Escobar Murgas, L. A. (2010). World Intellectual Property Organization Patent No. WO 2010/148529 A1.

Barthod, C., & Marechal, L. (2010). World Intellectual Property Organization Patent No. WO 2010/130754 A1.

Betancourt Almachi, E. J., Betancourt Almachi, B. J., Betegon Gil, A., & Gómez Vicente, R. (2017). World Intellectual Property Organization Patent No. WO 2017/013278 A1.

Celaya Cota, M. d. (2024, 07 19). MUERTE SÚBITA CARDÍACA Y RCP EN MÉXICO.

Cheng, A., Fijacko, N., Lockey, A., Greif, R., Abelairas-Gomez, C., Gosak, L., & Lin, Y. (2024). Use of augmented and virtual reality in resuscitation training: A systematic review. Resuscitation Plus, 18(100643).

Gruenerbl, A., Pirkl, G., Monger, E., Gobbi, M., & Lukowicz, P. (2015). Smart-watch life saver: smart-watch interactive-feedback system for improving bystander CPR. Proceedings of the 2015 ACM International Symposium on Wearable Computers - ISWC'15, 19-26.

REFERENCES

Lavonas, E. J., Magid, D. J., Aziz, K., Berg, K. M., Cheng, A., Hoover, A. V., Mahgoub, M., Panchal, A. R., Rodriguez, A. J., Sasson, C., Topijan, A. A., Gelpi, F., Aranibar, H., Swieszkowski, S. P., & Fraga, J. (2024, 06 14). American Heart Association. CPR & First Aid Emergency Cardiovascular Care.

Packer, R. A., Freeman, G. A., & Kaufman, C. L. (2022). United States Patent No. US 11348686 B2.

Palsma, H. J., & Drent, G. (2012). World Intellectual Property Organization Patent No. WO 2012/141586 A1.

Pandey, P., Maharjan, P., Seo, M. K., Thapa, K., & Sohn, J. I. (2024). Recent progress in wearable triboelectric nanogenerator for advanced health monitoring and rehabilitation. International Journal of Energy Research, 34.

Previdi, J., Cabañas, J., Raymond, T., Dillon, W., Rittenberger, J., Hoover, A., Starks, M., Kessler, A., Stewart, L., Li, T., Uzendu, A., Morgan, R., & Zelop, C. (2024, 07 19). Reducción de las desigualdades en el paro cardpiaco extrahospitalario.

Richard, C. J., & Piazza, A. J. (2013). World Intellectual Property Organization Patent No. WO 2013/093757 A1.

Tang, Y., Fu, H., & Xu, B. (2024). Advanced design of triboelectric nanogenerators for future eco-smart cities. Advanced Composites and Hybrid Materials, 7(3).

REFERENCES

Tomita, T., Iwami, T., Nishina, S., & Kawamura, M. (2010). World Intellectual Property Organization Patent No. WO 2010/147129 A1.

Vicedo Peinado, R. (2010). World Intellectual Property Organization Patent No. WO 2010/136626 A1.

Yang, S.-J., Kim, D.-Y., Kim, N.-H., Jeong, S.-H., Kim, B.-J., & Chang, I.-B. (2013). United States Patent No. US 2013/0330698 A1.

ECORFAN®