Prototype for Triage in a Medical Emergency Room in Hospitals

D. Villaseñor-Chávez [1, a], L.G. Carbajal-Figueroa [1, b], E. Montoya Gutiérrez[1, c], G. E. González Villalobos[1, d],

A. Armenta-Molina[2, e], L.H. Hernández-Gómez [2, f].

Abstract

This paper reports on the design and construction of a portable prototype to streamline triage. It is a crucial procedure in the evaluation and classification of patients according to the severity of their medical condition and the urgency of the care required in emergency rooms. The device facilitates obtaining vital signs from patients, allowing for rapid and reliable assessment. The prototype uses three sensors to measure vital signs: a pulse oximetry module, a thermistor, and a heart rate detector. These sensors allow the measurement of heart rate per minute, oxygenation level, and temperature, respectively. In addition, a Bluetooth communication module is incorporated to transmit data wirelessly through serial communication using COM ports on a computer. The information collected is stored in a database, allowing it to be viewed in real-time through a graphical interface developed in Python. A preliminary assessment of the patient's condition is obtained. The importance of this research is the development of a low-cost. It is a portable device capable of providing a preliminary assessment. This will avoid the delays experienced by emergency rooms in classifying patients.

Keywords: Triage, Pulse oximetry, Thermistor, Interface.

Introduction.

Triage is a fundamental process in emergency departments. It classifies patients by the severity of their condition and prioritizes medical care for those in a critical condition. In Mexico, several studies have been conducted to evaluate the efficiency and effectiveness of triage in different hospitals. Some studies have found that 73% of individuals who attend emergency services undergo triage, and 51% of them are classified as qualified emergencies [1]. However, a considerable percentage of patients are classified as unqualified emergencies. This process can be improved with an informatic system and a proposed prototype [2,3]. The last one consists of three sensors implemented in an embedded system. Vital signs of each patient are evaluated, and they determine the level of urgency after the data is evaluated systematically (Fig. 1).

Methodology

The methodology followed in this research is shown in Fig. 2. The ergonomic characteristics of the Mexican phenotype were considered.

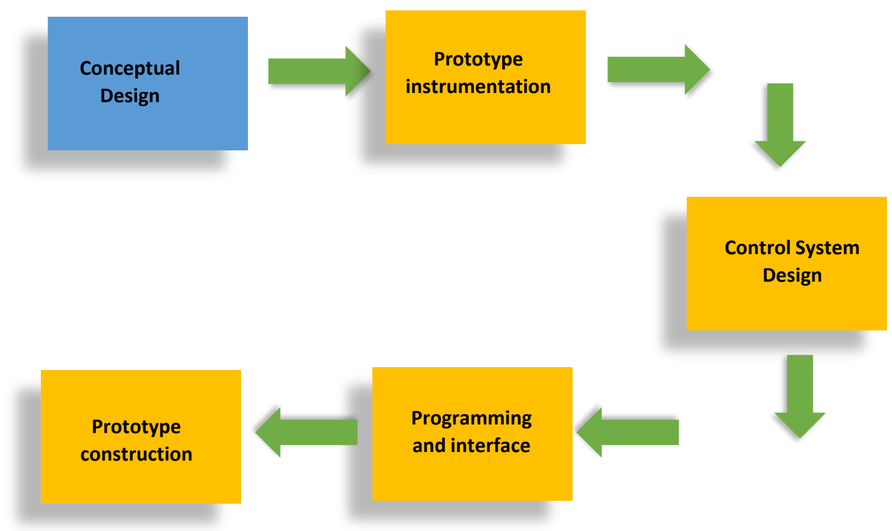

Figure 1. Methodology

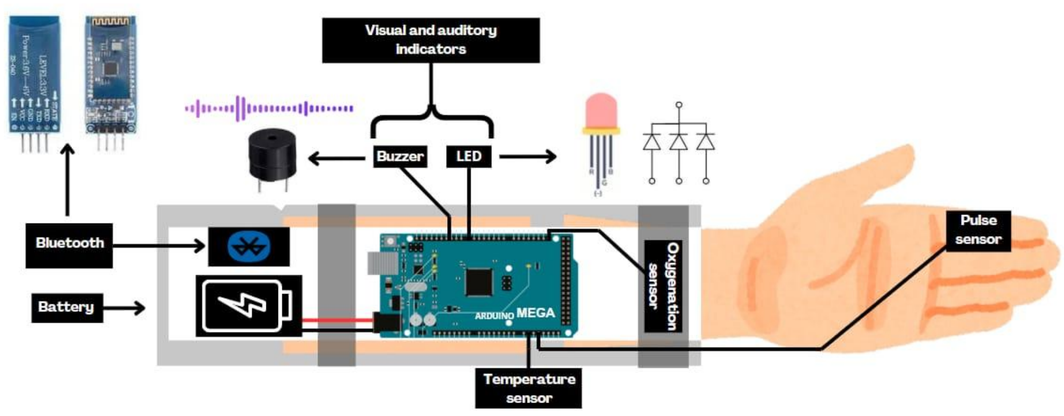

Figure 2. Conceptual design of the proposed prototype.

The vital signs are evaluated with Tinkercad. Figure 3 shows the electronic diagram of this prototype.

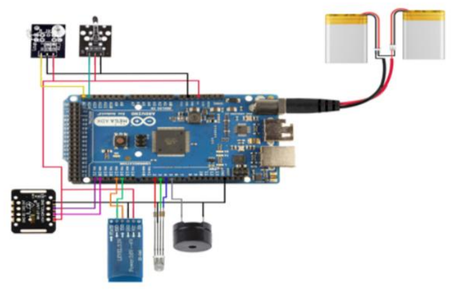

Figure 3. Microcontroller ATmega 2560 connected to the peripheral sensors.

The electronic components are assembled with an Arduino board. An acrylic cover was placed on the top of the device (Fig.4).

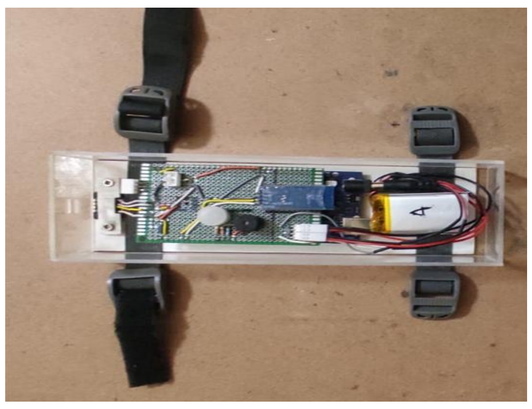

Figure 4. Assembly of the electronic circuit.

Results

Age, gender, height, weight, and medical condition of the patients are obtained with this device. The prototype has a graphical interface, which was developed with Python. The data is visualized in real time. The recorded data are transmitted via Bluetooth and stored in the database with the serial COM port of a computer (Fig. 5).

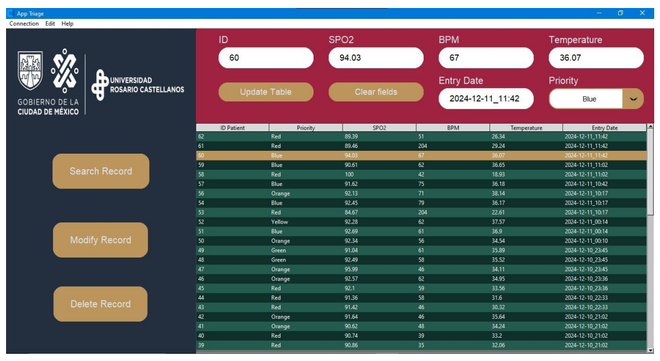

Figure 5. Interface operation.

Tests were conducted on ten individuals and compared the temperature, oxygen, and heart rate evaluated with the prototype´s sensors with the commercial ones. Figure 6 shows that the divergence of the evaluations is bellow 0.21%. Besides, it was tried to replicate the conditions in the emergency room.

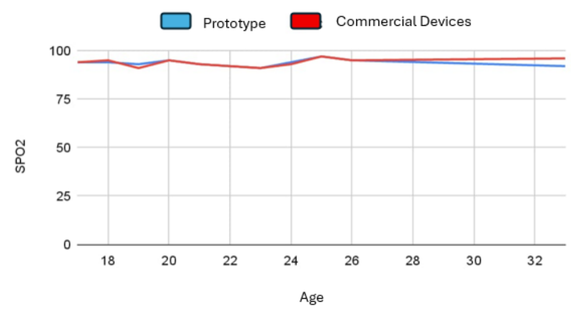

Figure 6. Performance of the prototype evaluation vs. commercial devices.

Conclusion

The optimization of the triage classification in emergency services was the main objective of this project. An embedded system evaluates simultaneously vital signs (temperature, oxygenation, and pulse rate). It includes a user interface based on a database, The results suggest that the prototype improves the patient classification, optimizes the flow in an emergency room, and improves the use of medical resources. It is low-cost and reliable. The development of different devices for triage can be based on the obtained experience.

References

1.Revista Médica del IMSS. (2018). Instituto Mexicano del Seguro Social.

2.Encuesta Nacional de Confianza y Satisfacción para usuarios del Servicio de Urgencias (ENCONSA). (2018). Instituto Mexicano del Seguro Social.

3.Ruiz-Esparza, J., et al. (2016). Clasificación del triage y tiempo de espera en pacientes de urgencias adultos del Hospital General de Zona 89 en el año 2016.

NAPLES, ITALY 30 JUNE-4 JULY
ACEX2025 NAPLES
18th International Conference on Advanced Computational Engineering and Experimenting

[1]Universidad Nacional Rosario Castellanos, Unidad Azcapotzalco, Dirección de Asuntos Académicos, Licenciatura en Ingeniería en Control y Automatización, Calz. Lucio Blanco 11, Providencia, Azcapotzalco, 02440 Ciudad de México, CDMX.

[2] Instituto Politécnico Nacional, Escuela Superior de Ingeniería Mecánica y Eléctrica, Sección de Estudios de Posgrado e Investigación, Edificio 5. 2do Piso, Unidad Profesional Adolfo López Mateos “Zacatenco”, Colonia Lindavista, Alcaldía Gustavo A. Madero, C.P. 07738, Ciudad de México.

ACEX180