

Data management system implemented in wristbands with RFID technology (SAYETS)

Sistema de administración de datos implementado en pulseras con tecnología RFID (SAYETS)

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Abstract

In the last decade, the loss of elderly family members has been a major problem, as well as in traffic accidents, therefore, it is important to know personal information such as medical issues for the proper care of those affected. SAYETS, is a project that aims to design an administration and data management system implemented in a wristband with RFID technology, so that the information is transmitted to different users. The project contributes to the health sector, since there are emergency cases in which it is not possible to disclose the necessary information about the health of the affected elderly, such their medical history with personal information (name, age, address) so as emergency contacts (names, telephone numbers, addresses, relationship). SAYETS can also be applied in several areas, such as work and personal usage.

System, Data management, Health

Resumen

En la última década, la pérdida de familiares mayores de edad ha sido un gran problema, así como en accidentes de tránsito, por lo tanto, es importante conocer información personal como cuestiones medicas para la correcta atención de las personas afectadas. SAYETS, es un proyecto que tiene como objetivo desarrollar un sistema de administración de datos implementado en una pulsera con tecnología RFID, programada para que la información sea transmitida a diferentes usuarios. El proyecto contribuye en el sector de salud, dado que, existen casos de emergencia en los cuales no es posible dar a conocer la información necesaria sobre la salud de las personas mayores afectadas, como su historial médico con información personal (nombre, edad, domicilio) así como los contactos de emergencia (nombres, números teléfonos, domicilios, parentesco). Así mismo, SAYETS puede ser implementado en varias áreas, como laborales y personales.

Sistema, Gestión de datos, Salud

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Introduction

The reason for the implementation of the SAYETS project comes down to the search for new ways to prevent the disappearance of elderly people, as a consequence of the lack of information necessary for their identification. Also, the loss and death of the adult population due to the lack of medical data, as well as the delay in obtaining these parameters. [1]

The project will be implemented to provide a safe life, as each wristband will be technologically programmed to ensure the safety and well-being of the wearer.

In addition, the focus of the project is to use each device as a reliable source of information, and to fulfil the function of a locator, in situations of loss or accidents on the part of the wearer.

This project aims to design and promote an innovative product with the development of RFID-coded bracelets, in which the personal data of the owners of the device will be included, in order to fulfil the purpose of reducing the disappearance of older adults, because, by wearing the bracelet, it will be easier to find their whereabouts.

In recent years, multiple projects have been developed, mainly focused on the health care of children and the elderly, including the use of electronic and radiofrequency systems (RFID), which aim to provide greater care to the population, as in the case of the project carried out by Arce Valdez et al. (2021), which focuses on the care of the elderly, as well as in the article Barillaro et al. (2017) which develops a project to monitor and send an alarm in case of problems of an elderly person. [1][3]

In addition, there are other projects such as the ones developed by Dolatabadi et al. (2019) and Elsa (2017) that seek to improve the care of adults and children, but all the aforementioned projects do not have the necessary features for the storage and visualisation of an adult's data, so the project developed and shown in this article generates a product that can replace those mentioned above. [6][7]

Motivation

The reasons that encourage the realization and implementation of the project, are reduced in the search for new ways to prevent the disappearance of older people, as a result of the lack of information necessary for the identification of the same.

Also, the loss and death of the adult population due to the lack of medical data, as well as the delay in obtaining these parameters. There are currently more people over the age of 60 than under the age of 4. By 2050, women aged 60 and over will represent 23.3 per cent of the total female population and men will constitute 19.5 per cent of the total male population.

The increase in the number of older adults will have an impact on the health care system and challenges to family organisation, as well as additional care workloads, especially for women, who do most of the care work (Figure 1).

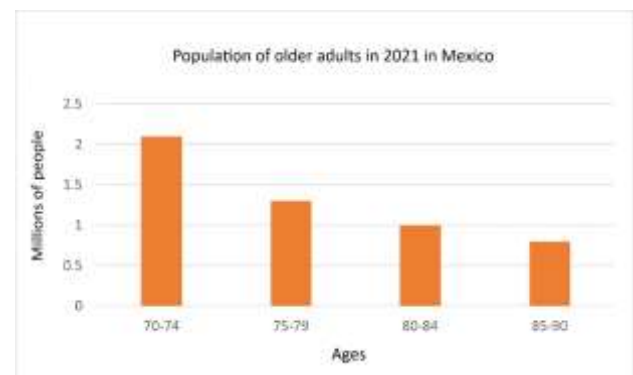


Figure 1 Older adult population

Source: INEGI, General Population and Housing Census, 1970 Inmujeres based on CONAPO. Population Projections 1990-2009 and 2010-2050.

At first hand, it was noted that: "The World Health Organisation (WHO) estimates that approximately 60 million people globally are living with Alzheimer's, of which 8.1 percent are women and 5.4 percent are men over the age of 65". And according to figures obtained from the health ministry: "It is estimated that in Mexico approximately 1.3 million people in Mexico suffer from Alzheimer's disease, a figure that represents between 60 and 70 percent of dementia diagnoses and most often affects people over 65 years of age.

Materials and methods

Oracle Cloud was implemented to create a virtual machine, which allowed the development of a database in the cloud as shown in Figure 2.



Figure 2 Virtual Machine in Oracle Cloud
Source: Own Elaboration

One of the necessary configurations of the virtual machine created through Oracle is the installation of the Vesta interface (Figure 3). Because, it allows to enable the necessary ports for the execution of the database through phpmyadmin. [2]



Figure 3 Installation of vesta
Source: Own Elaboration

The entity-relationship (ER) model was developed to facilitate the design of the DB as shown in Figure 4, as it allowed the creation of a schema that represents the overall logical structure of the database.

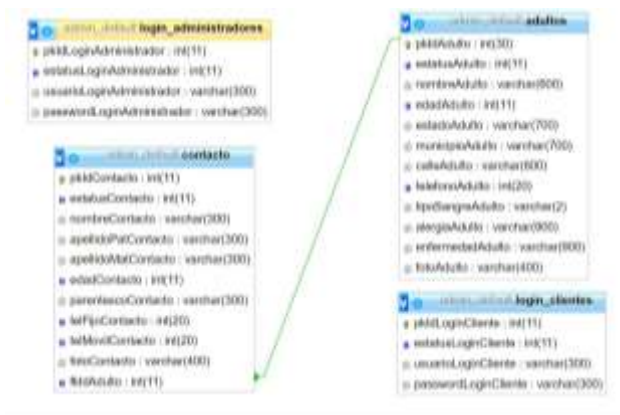


Figure 4 ER Diagram
Source: Own Elaboration

Methodology

The project is being carried out through the following stages depicted in Figure 5.

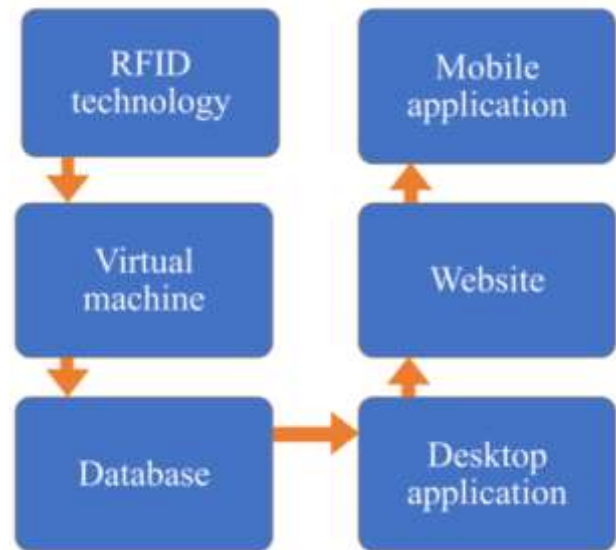


Figure 5 Diagram of stages
Source: Own Elaboration

RFID technology

ESP32 connection with Wiegand 26 reader [4].
Detection of the RFID identification number. [5]

Virtual machine

Configuration of phpMyAdmin in Vesta.
Entity-relationship diagram.
Creation of tables in phpMyadmin.

Database

Oracle cloud.
Vesta.

Desktop application

Java programming.
Connection with the database.
Creation of the database.

Web page

Requirements analysis.
Design of digital screens.
HTML programming.
PHP and JavaScript programming. [9] [10]

Mobile application

Design of digital windows.
Database connection.
Programming in Android Studio and creation of the interface. [8]

Results

Development of the desktop application for administrators to control information.

Figure 6 shows the main screen of the application, where the administrators will have to log in with their username and password to access.

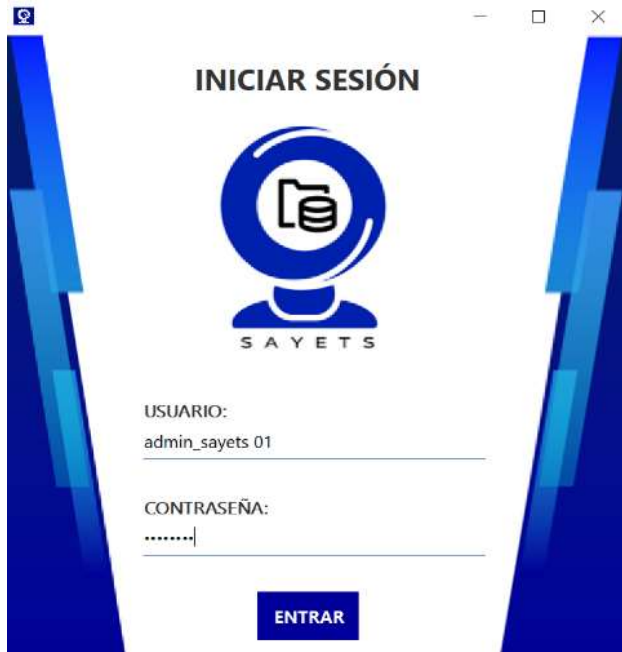


Figure 6 Login screen Source: Own Elaboration

When registering a new senior citizen, administrators can carry out this process by entering the person's data in the fields, as shown in Figure 7.



Figure 7 Registration of older adults Source: Own Elaboration

The registered seniors will be displayed in a table as shown in Figure 8.

Figure 8 Table of registered older adults Source: Own Elaboration

Website aimed at the general public and RFID technology owners, for the consultation of their own data. Figure 9 shows the home screen of the site, where you can log in and also consult some sections.



Figure 9 Website homepage Source: Own Elaboration

It has a validation, in case the parameters entered for the login are incorrect (Figure 10).

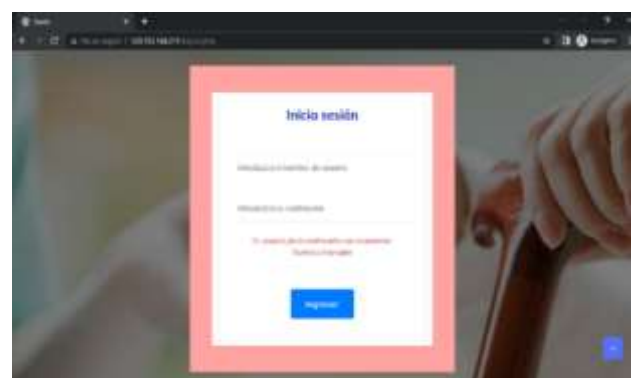


Figure 10 Login error Source: Own Elaboration

Emergency contacts can be viewed, added and even deleted as shown in Figure 11.

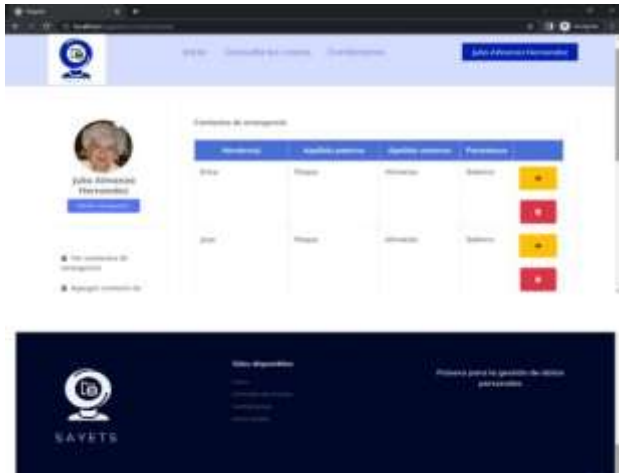


Figure 11 Consultation of emergency contacts
Source: Own Elaboration

The site also has a personalisation section for users, where they can change their photograph (Figure 12).

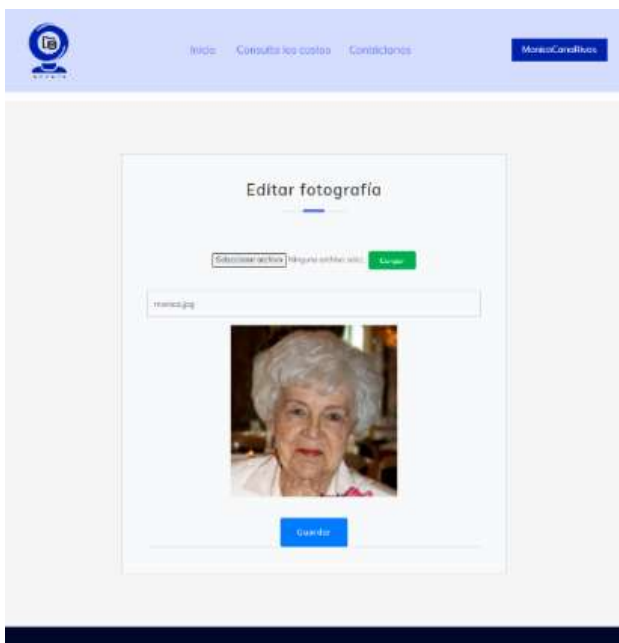


Figure 12 Edit photo
Source: Own Elaboration

Mobile application aimed at users to control their information.

Like the website, the main screen is the login screen for users (Figure 13).



Figure 13 Main login screen
Source: Own Elaboration

The user will have three main options to view their data, review emergency contacts and add new contacts, as shown in Figure 14.



Figure 14 Main menu for the user
Source: Own Elaboration

Emergency contacts can be viewed by the user as shown in Figure 15.



Figure 15 List of registered contacts
Source: Own Elaboration

Emergency contact information can be viewed and updated (Figure 16).



Figure 16 Detailed contact information
Source: Own Elaboration

The user will still be able to edit his or her photo as shown in Figure 17.

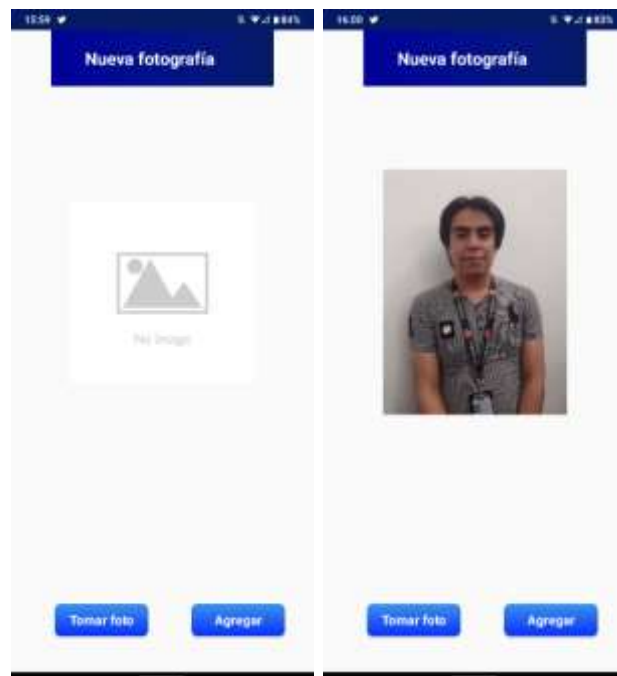


Figure 17 Screen to add photo
Source: Own Elaboration

Figure 18 shows the main screen, where the elderly person's personal information and emergency contact details will be displayed.



Figure 18 Health and safety sector page
Source: Own Elaboration

The following diagram shown in Figure 19 was used for the connections of the RFID reader to the ESP32.

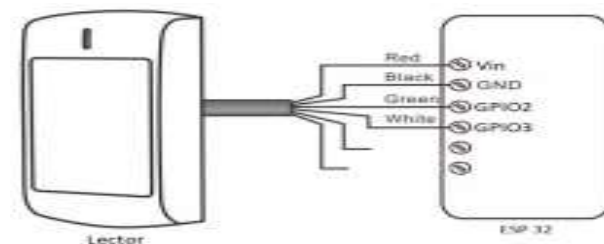


Figure 19 Connections
Source: Own Elaboration

The connections made are for the detection of cards with RFID tags through the Wiegand 26 reader. The coupled circuit can be seen in Figure 20.



Figure 20 RFID circuit coupling
Source: Own Elaboration

Figure 21 shows the implementation of the connections in the diagram shown above.

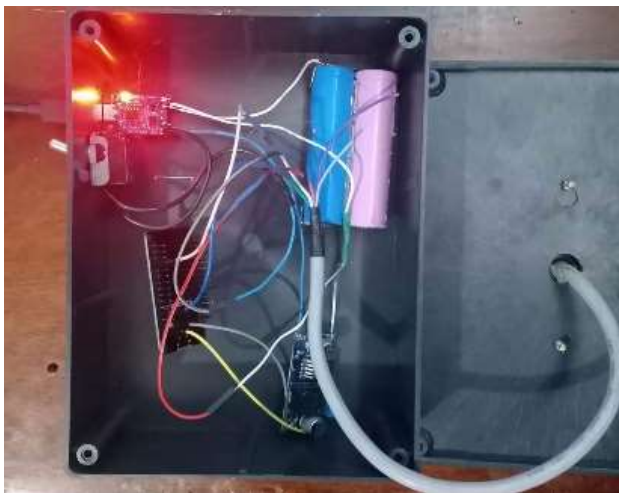


Figure 21 Internal view of the RFID circuit
Source: Own Elaboration

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Conclusions

SAYETS is an applied project for the management of data from the elderly, through the development of a system consisting of a web page, desktop application and mobile application; it will also allow access to the information of the emergency contacts designated to each registered elderly person.

The health and security sectors will have access to the information stored by users through RFID technology applied to the registered wristbands.

References

- [1] Arce Valdez, J. L., Aragón Banderas, O., Rodríguez Alvarez, J. L., & Instituto Tecnológico de Durango. (2021). SISTEMA DE APOYO PARA FAMILIARES Y PERSONAS AL CUIDADO DE ADULTOS MAYORES (KANAN). *ELECTRO*, 43(1), 37-43. <http://electro.itchihuahua.edu.mx/revista/2021/C-Sub15.pdf>
- [2] B, G., & B, G. (2023a). ¿Qué es MySQL? Explicación detallada para principiantes. *Tutoriales Hostinger*. <https://www.hostinger.mx/tutoriales/que-es-mysql>
- [3] Barillaro, S., UNLam, Carnuccio, E., Casas, N., & Volker, M. (2017). *Sistema de monitoreo y alarma para personas adultos mayores ambulantes* (1.a ed., Vol. 1) [Digital]. UNLaM - SECyT.
- [4] Beningo, J. (2020). Cómo seleccionar y usar el módulo ESP32 con Wi-Fi/Bluetooth adecuado para una aplicación de IoT industrial. *DigiKey*. <https://www.digikey.com.mx/es/articles/how-to-select-and-use-the-right-esp32-wi-fi-bluetooth-module>
- [5] De Ceupe, B. (s. f.). ¿Qué es el RFID? *Ceupe*. [https://www.ceupe.com/blog/que-es-el-rfid.html#:~:text=RFID%20\(identificaci%C3%B3n%20por%20radiofrecuencia\)%20es,tarjetas%20transpondedores%20o%20tags%20RFID](https://www.ceupe.com/blog/que-es-el-rfid.html#:~:text=RFID%20(identificaci%C3%B3n%20por%20radiofrecuencia)%20es,tarjetas%20transpondedores%20o%20tags%20RFID).

[6] Dolatabadi, E., Zhi, Y., Flint, A. J., Mansfield, A., Iaboni, A., & Taati, B. (2019). The feasibility of a vision-based sensor for longitudinal monitoring of mobility in older adults with dementia. *Archives of Gerontology and Geriatrics*, 82, 200-206. <https://doi.org/10.1016/j.archger.2019.02.004>

[7] Elsa, G. P. (2017). *Diseño de un sistema de control perimetral en recintos enfocados a la población infantil con tecnología inalámbrica RFID*. <http://tesis.ipn.mx/handle/123456789/20742>

[8] Introducción a Android Studio. (s. f.). *Android Developers*. <https://developer.android.com/studio/intro?hl=es-419>

[9] *PHP: ¿Qué es PHP? - Manual*. (s. f.). <https://www.php.net/manual/es/intro-what-is.php>

[10] Ramos, R. (2023, 28 junio). ¿Qué es JavaScript y para qué sirve? *Rafa Ramos - Agencia de Marketing Digital en Sevilla*. <https://soyrafamos.com/que-es-javascript-para-que-sirve/>