https://doi.org/10.25145/b.2COcommunicating.2020.029

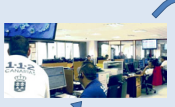
C. Pérez-González, M. Colebrook,
J.L. Roda-García, P. González Yanes,
T. González Dos Santos, V. Plaza Martín
TARO-ULL Research Group,
Universidad de La Laguna

C. Rosa Remedios
Centro Coordinador de Emergencias
y Seguridad 1-1-2 (CECOES)

Analysis of incidents registered by the 1-1-2 Canarias emergency services by using data science techniques with the R software

The study of alerts received in the emergency services is a very important issue in order to know different aspects of the time and spatial distribution of alerts in a given region. In particular, the Emergency and Security Coordinating Center (CECOES) 1-1-2 of the Government of the Canary Islands records detailed information about the incidents that are reported by the citizens through phone calls. Due to the high volume of information generated over the time in this process, it is needed to apply big data techniques to obtain statistical measures and results of interest. We have used the statistical software R and different libraries (Shiny, Highcharts, Highmaps) to present the data information in different interactive dashboards (time series charts to analyze the time evolution, geospatial representations of incidents density distribution, etc.). In this work we illustrate some of these charts that help the public authorities to study the incidents in the region during the last years.

The Emergency and Security Coordinating Center (CECOES 1-1-2) is a public service of the Canary Islands Government. In this service are received all the emergency calls produced in the entire region, that involve sanitary, safety, extinction or rescue alerts, which are managed in order to give an immediate and effective response.

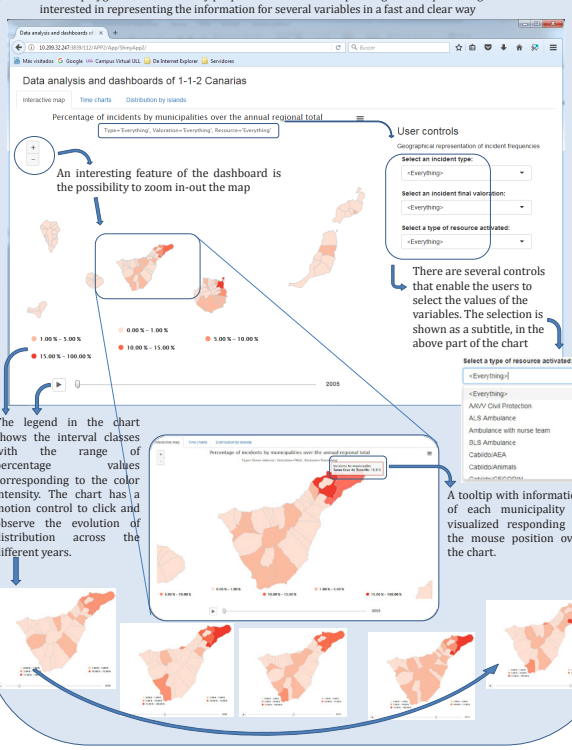


The platform show different results that can be crucial to help the CECOES in the coordination and optimization of the emergency services.

In the last years, the CECOES has collected a huge amount of data about the incidents, but scarcely used to both evaluate the possibility of analyzing the incidents distribution and to optimize the management of the resources.

In this project we used different computer programs typical in data science to process the information and a dashboard tool is developed to visualize and represent the results of interest.

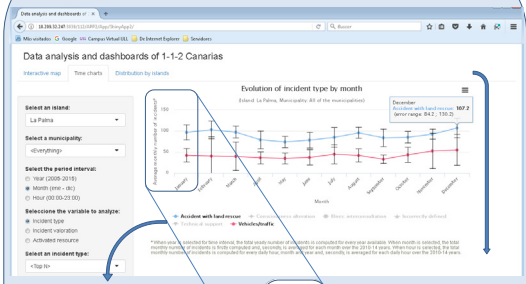
The first dashboard panel show the geographical distribution of percentage of incidents in the canarian municipalities. This type of charts is known as a choropleth map, where each county is represented as a colored polygon with an intensity proportional to the corresponding value of percentage. We are interested in representing the information for several variables in a fast and clear way



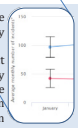
The legend in the chart shows the interval classes with the range of percentage values corresponding to the color intensity. The chart has a motion control to click and observe the evolution of distribution across the different years.

A tooltip with information of each municipality is visualized responding to the mouse position over the chart.

This dashboard shows again multiple options to compare, in this case, the average number of incidents between different years, months or, even, the time in the day.

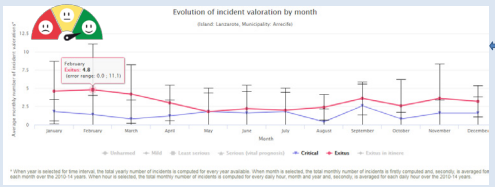


The chart represents several series but the user can select (over the chart legend) only those to be shown.
The time series charts allow us to detect changes or identify patterns, that is very important in predicting potential future demands of the resources or, even, changes in the usual type of incident in certain municipalities.

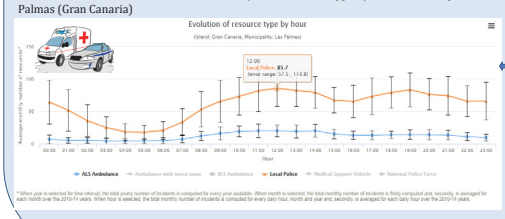


The margin errors around the mean (represented as intervals) provide the user a quick reference about the accuracy in computing the averages.
If the values are over dispersed, the average is imprecise.

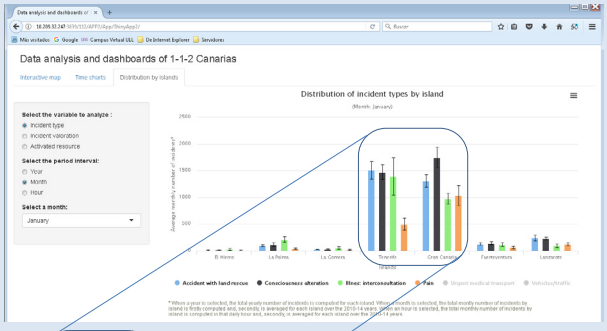
Let's suppose that we are interested to compare the monthly average number of incidents that were associated to critical or exitus assesment in Arrecife (Lanzarote)

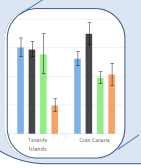


In this case, the example shows the average number of incidents along the day where the activated resources were ALS ambulances (advanced life support) and the local police in Las Palmas (Gran Canaria)



The last dashboard illustrates the comparison analysis between the different islands and how are distributed according to the typology and assessment of incidents as well as the resources activated in the alert.





The chart depicts again the average value (bar height) and the error margin (interval at top of bar). We can answer questions similar to the following:

- ¿Are there statistical differences between the number of incidents in January related with consciousness alteration and the incidents by consultation of illness?
- ¿How is the comparison between both type of incidents depending on the island?

Acknowledgments This work has been completely supported by the public company Management Services for Health and Safety in the Canary Islands, that is in charge of the operation of the Emergency and Security Coordinating Center (CECOES 1-1-2).

Bibliography

1. Arinchieri, R., Carello, G. and Morale, D. (2016) Supporting decision making to improve the performance of an Italian Emergency Medical Service, Annals of Operations Research, 236, 131-148.
2. Chang, W. , Cheng, J. ,Allaire, JJ. , Xie, Y. and McPherson, J. (2015) shiny: Web Application Framework for R. R package version 0.12.1, Available from: http://CRAN.R-project.org/package=shiny
3. Ryan J., Herbert, J. and Bennett K. P. (2016) Understanding Emergency Department 72-Hour Revisits Among Medicaid Patients Using Electronic Healthcare Records, Big Data, 3(4), 238-248.

Title:
Analysis of incidents registered by the 1-1-2 Canarias emergency services

Authors:
Colebrook Santamaría, M. [1]; González Dos Santos, T. [1] ; González Yanes, P. [1]; Pérez-González, C. J. [1]; Plaza Martín, V. [1] ;Roda García, J. L. [1]; Rosa Remedios, C. [2];
Affiliation:
(1) Grupo de investigación TARO-ULL (Universidad de La Laguna) (email: cpgonzal@ull.es) ,
(2) Centro Coordinador de Emergencias y Seguridad 1-1-2 (CECOES).