Evaluation of the Goiânia accident from the perspective of new mobile technologies

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Abstract. The learning acquired by radiology professionals, and society in general, can suffer a great impact with the emergence of new technologies, which can also affect actions during a nuclear or radiological accident. The search for more agile solutions leads to the development of skills and technical training that find new technologies a strong ally in an emergency. In this context, the objective of this article was, from the analysis of the situations faced by rescuers in the first records of the accident in Goiânia in 1987, through a historical review, to highlight aspects related to reaction time, location of events and reactions of the population, in order to simulate what the response would be like today, with the use of new mobile technologies. The aim is thus to accurately confront and discuss the relevance of new technologies in the face of possible events, always taking into account the complexities of new scenarios, also bearing in mind the fact that these technologies are within reach of the population.

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1. Introduction

The learning acquired by radiology professionals, and society in general, can suffer a great impact with the emergence of new technologies, which can also affect actions during a nuclear or radiological accident. The search for more agile solutions leads to the development of skills and technical training that find new technologies a strong ally in an emergency.

Thus, the technical and human aspects, which involved the accident in Goiânia, stand out when trying to draw a parallel between what is available in terms of technology, use of information and data speed nowadays and what there was in the 80's.

One wonders, for example, whether the 15-day period that occurred for the communication or confirmation of the violation of the Cesium capsule (as occurred at the time), or a little dissemination of information or radioactive sources deactivated without constant control, could have occurred in those times of GPS, database and mobility?

It can be said that nowadays, through new technologies, it is possible to have more agile solutions from a simple mobile device, whether for communication with the public or for the performance of rescuers.

In this context, the objective of this article was, based on the analysis of information about the accident in Goiânia in 1987, to simulate what the response would be like today, with the use of new mobile technologies.

2. Materials and Methods

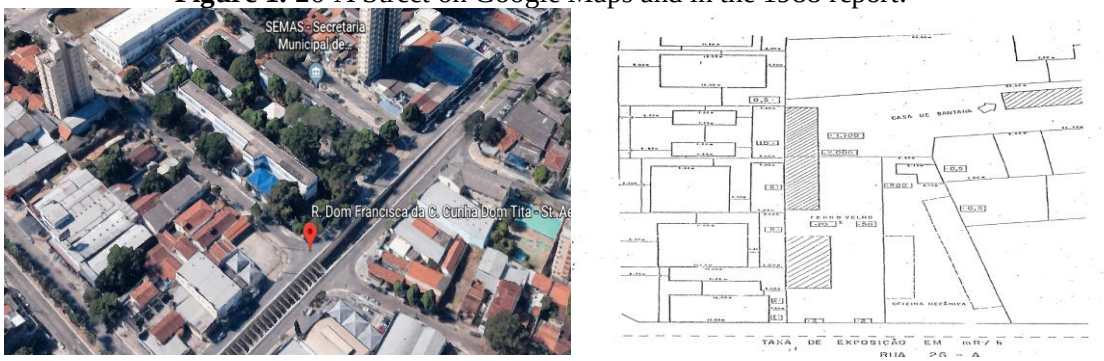
Thus, from the analysis of the situations faced by rescuers in the first records of the accident in Goiânia in 1987, through a historical review [1] based on documents and testimonies of technicians who worked at the time [2-11] highlight aspects with regarding reaction time, location of events and reactions of the population, to simulate what the response would be like today, with the use of new mobile technologies. Thus, on the one hand, the situations documented and experienced by those who worked in the operations were confronted, and on the other, the technological solutions available today, with a focus on mobile phones that represent the greatest technological revolution in relation to the speed and accuracy of information and are available to all society as a third industrial revolution.

3. Results and Discussion

3.1. GPS location mapping of the Accident

Nowadays, on mobile devices, it is possible to optimize the time for disseminating information, obtaining greater accuracy in terrestrial positioning and especially the sharing of data in real time, which are the comparison parameters used as an analysis tool whose evolution can be shown in figure 1 which shows the same region described by the 1988 report and seen on the mobile device in the localization program [12].

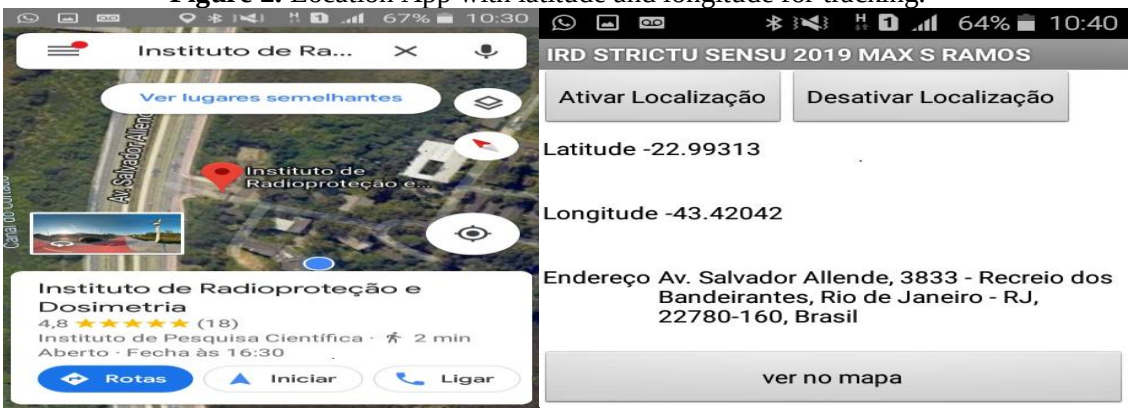
Figure 1. 26-A Street on Google Maps and in the 1988 report.



Source: [4;12]

Based on this information, a terrestrial localization system can be created using latitude and longitude data and a map of the region that would facilitate and optimize the time to locate the seven main outbreaks that were isolated in Goiânia in 1987 (Figure 2), with lower metrological uncertainty, associating radiation monitors and the localization system [12].

Figure 2. Location App with latitude and longitude for tracking.



Source: [12]

3.2. Remote Source Identification

With these data in hand, it is possible to make an immediate association, from the precise location with the latitude, longitude and address, with the count per second of a radioactive source on a monitor of the Institute of Radiation Protection and Dosimetry (IRD) (figure 3).

Figure 3. Location app associated with background count

Source: The author

3.3. Elaboration of a free App for calculation

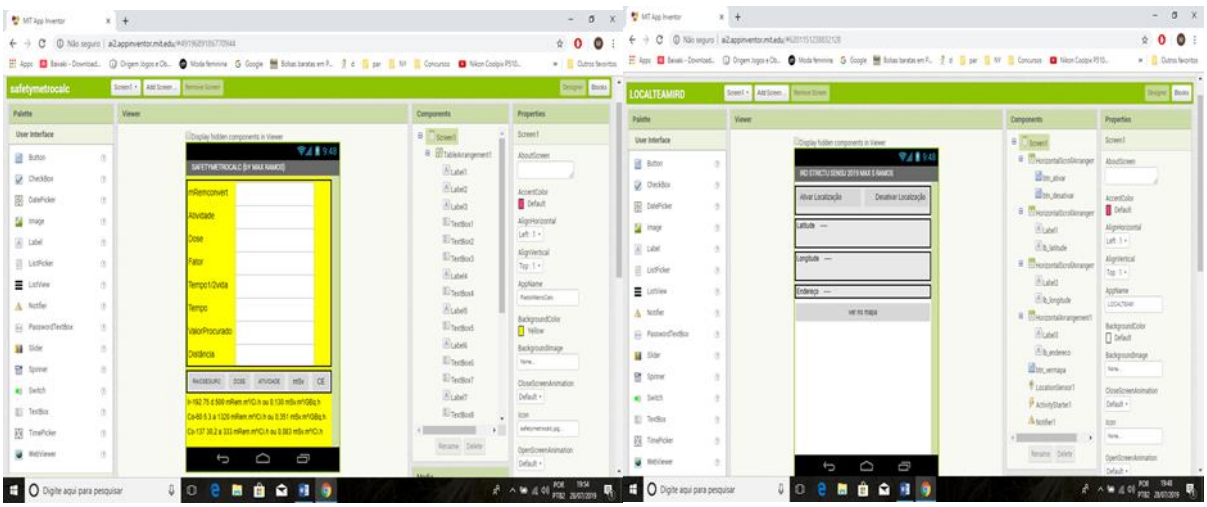
Some Apps could help the action of rescuers at the scene of the emergency. Among these, one can cite an open source App, in this case the App Inventor distributed by MIT, which makes it possible to calculate in real time the Activity and Dose of a given source [13].

Figure 4 shows the application building process. Figures 5 show the solutions for these operations that can be easily distributed through the links: https://drive.google.com/file/d/14waICCoZoS9dmo-NGqsBJxe3xdrE4Tuo/view?usp=sharing and https://drive.google.com/file/d/1dqxFPZ4WBk1wMYdq-EFhskpbMuS8dhRS/view?usp=sharing [13].

This application for converting radiological quantities can then be used for training users who are at the back of operations, and do not have operational experience in the use and conversion of metrological radiation units or for simultaneous registration of radiologically monitored citizens through the available databases for statistical analysis and debugging [13].

Developed using the Java language, the construction of the App was first modeled in spreadsheet form, where inserting the data of the most common quantities of radiological operation could be calculated. The results then appear in values with up to four significant digits displayed, providing a margin for taking decision in relation to the work areas, conversion of the values between the dose quantities and the activity of the sources through the date and their respective half-lives (Figure 4) . This App was tested during the practical classes of nuclear gauges and gammagraphy apparatus for radiometric survey, the module "Principles of radiological protection and regulatory control" of the specialization Course in "Radiation Protection and Security of Radiation Sources ", offered by the Institute of Radioprotection and Dosimetry (IRD), in partnership with the International Atomic Energy Agency (IAEA) [13].

Figure 4. App architecture for calculating the activity of a radionuclide and converting quantities.



Source: The author

3.4. Other Aspects

In the initial moments of the works in Goiania [2-11], when the selections of the monitored persons were carried out, the identifications followed random rules that make it difficult to date for the progress of some legal proceedings of the victims, which today could be done in real time using data from a

spreadsheet , while the tracking and processing of information would be easily managed by GPS location programs in addition to instant messaging.

In this way, the facts that stood out the most after the correlations between the events and the possible technological solutions were:

- Registration of monitored without using a data sheet;
- Terrestrial tracking using residents' testimonials;
-Use of pagers (Bips) for initial mobilization of emergency teams;
- Operations carried out simultaneously with the arrival of non-managed information;

Some relevant aspects that serve as criticisms of the proposals for new technologies were:

-In big events it is verified that the rate of information in the world wide web can interrupt the database clusters; and

-Disinformation can also be rapidly disseminated.

4. Conclusion

The investigations were carried out with a view to projecting the optimization and speed of the teams inserted in emergencies that require rapid mobilization, even without an empirical investigation with a relevant data sample.

The technological tools presented end up referring to discussions regarding the various aspects of an accident, as well as leading to new perspectives on learning that involve the evolution of the possibilities of an accident, together with society.

However, evaluating the testimonies of the professionals who worked at the time, it is observed that one of the main absences reported was the social assistance professionals for the reception of those identified with some degree of contamination.

According to one interviewee, “when the alarm went off, what was seen in the monitor was the need for comfort, which was not always possible”.

This, unfortunately, applications cannot simulate. But it is also possible to identify specialists in the field of health and law on the internet who can help in the recovery of those involved.

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