IoT Platform: Contribution to the Promotion of Mental Health and Wellbeing

António Carlos Correia [1],*, António Marques [1] and Javier Pereira [2]

[1] Psychosocial Rehabilitation Lab, Polytechnic Institute of Porto, 4200-392 Oporto, Portugal
[2] Centre for Information and Communications Technology Research, University of A. Coruña, 15001 Coruña, Spain
* Correspondence: antoniocarloscorreia@hotmail.com; Tel.: +351-929091883.
† Presented at the 2nd XoveTIC Conference, A Coruña, Spain, 5–6 September 2019.

Abstract: The research intends to gather on a IoT Platform, a set of data existing in the ecosystem - in the universe of things, from sources and types of diverse origin coming from messages, devices, sensors, etc. These structured and related data allow us to generate indicators of anxiety about which we intend to act, either preventively or proactively, through information for an individual's awareness and self-regulation.

Keywords: internet of things (IoT); quality of life; happiness; anxiety; wellbeing

1. Introduction

The purpose of the present study is to provide an online Platform based on the Internet of Things (IoT) concept, which allows to collect, structure and relate a diverse set of data that influences and affects personal mental health conditions. Several sets of events in the global ecosystem generate anxiety, distress and mood disorders; from diverse causes such as individual, social, professional, behavioral, ethical, environmental, among others, with levels of importance relative to each person.

The result of this information aims to generate for an awareness that allows to contribute to the process of cognitive self-regulation, which is, in the first instance, the control vehicle of anxiety for a better mental health and wellbeing of the individual. Improving dynamic self-regulation may be a potential therapeutic method for treating the neurological symptoms of patients with anxiety (Guo Z. et al., 2018) [1].

The holistically structured data are processed in algorithms in order to generate information on a set of health and disease conditions. Such information allows recommendations and forecasts of health states, which contribute to the awareness of the actors.

2. Solution Description

Cognitive-behavioral therapies are techniques recommended by the scientific community (Kropotov J., 2009) [2], and described as treatment in specialized organizations, such as APA [3] and Medical News Today (Felman A., 2018) [4]. In addition, research initiatives with cognitive-behavioral therapies based on the Internet, demonstrate efficacy in the results with significant improvements (Hedman et al., 2011) [5] & (Owens V. et al., 2019) [6].

To achieve this goal, we propose an IoT Platform, with the existing and emerging technological resources for the Internet of Things. The potential of this system allows collecting data from a universe of "things", with a huge amount of information, in permanent growth and that is related multilaterally, analyzed and processed in real time, and finally, securely.

New trends and challenges with Industry 4.0 promote the production of systems, devices, objects and "things" integrated with Wireless Sensor Network (WSN), which benefit from IoT

protocols and their heterogeneity. Increasingly, electronic devices integrate APIs—Application Programming Interfaces—with attributes for interoperability and portability between systems. The APIs are the window for the new ecosystem (Iyer B. & Subramaniam M., 2015) [7] and the best way for data to be shared as a service ("Standards for APIs", 2018) [8] in which they stimulate the emergence of innovative groups that, without being clinical, create value tools (Huckman R. & Upallaru M., 2015) [9].

The dynamic IoT ecosystem enables the collection, mapping or processing and distribution of information from a universe of existing data on devices, sensors, software, online services and app's through api's or sdk's and other existing artifacts. These raw data, properly organized and intelligently processed, report the states of health, tension, anxiety, mood, and well-being states of the individual person.

In order to obtain and process these diverse data volumes with an exponential growth, we intend to use a flow-based programming tool for the Internet of Things (IoT), called Node-Red (Figure 1), which supports the features of the IBM Watson Cloud IoT Platform. Node-Red, developed by IBM, allows you to connect, process, and distribute data from diverse systems, devices, sensors, software, online services, messaging in a variety of ways, and execute instructions and functions a broad spectrum of automated, scalable implementations that deliver real-time results.
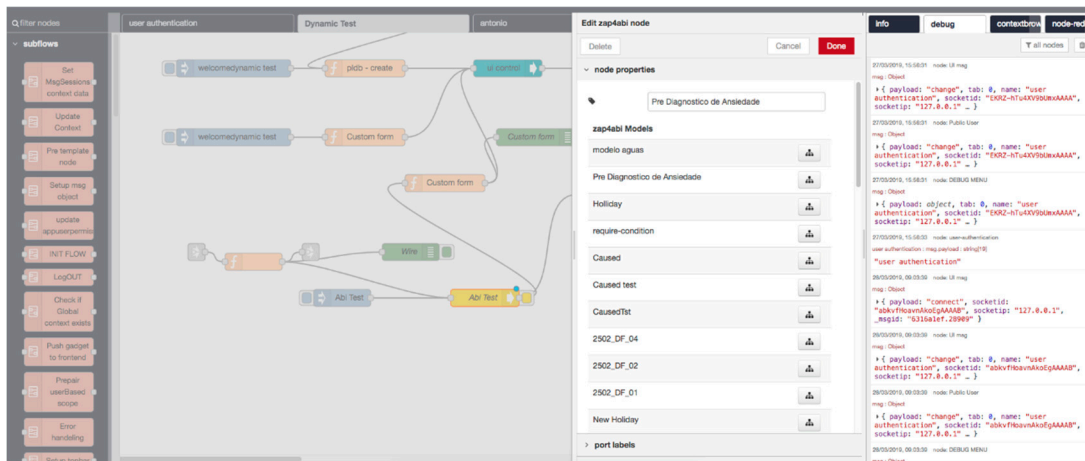

Figure 1. modeling in the Node-Red.

Regarding the proposed technology for the development of the IoT Platform, it is proposed to design in Node.JS [10], through the Node-Red framework [11], which ensures flexibility in allowing to deal with devices that communicate in different ways. Node-Red comes into this system with an API Master that consumes, collects and processes information from any type of data source: apps, web services, sensors, devices, artifacts and Node-Red itself.

In this research context involving multidisciplinary knowledge, with a technical and human dimension, with several possibilities of experimentation, a flow-based programming system such as Node-Red facilitates the interaction between the analyst, programming and the population that interacts with the system. This provide efficiency gains in the scientific progress of testing, trial and error elimination for validation. This condition enables designers and production specialists to be freed, to focus on creativity and innovation, to create new connections, new events and interactions with the "world of things".

The use of IBM Watson IoT Platform [12] will serve in the first phase for concept validation and testing of identified services. The AI (Artificial Intelligence) capabilities provided by the IBM-Watson cloud are certainly of high potential, high availability and security, being an excellent infrastructure for hosting and managing this research project.

3. Conclusions

The great contribution of this research project does not end with the fulfillment of this work plan. Once completed, it will be an important contribute to the continuous advancement between an artificial intelligence relationship with human and emotional intelligence. However, it will be the beginning of a system, potentially open to the environment, with potential of scale horizontally or vertically, with global diffusion, with instruments and functionalities for the integration of new concepts, new scientific production, researchers and specialists.

References

1. Guo, Z.N.; Lv, S.; Liu, J.; Wang, Z.; Jin, H.; Qiu, Q.; Sun, X.; Yang, Y. Compromised dynamic cerebral autoregulation in patients with generalized anxiety disorder: a study using transfer function analysis. *BMC Psychiatry* **2018**, *18*, 164.
2. Kropotov, J.; Quantitative, E.E.G. *Event-Related Potentials and Neurotherapy*, 1st ed.; Elsevier: London, UK, 2019; p. 559.
3. APA, Anxiety and Sadness May Increase on Anniversary of a Traumatic Event. Available online: https://www.apa.org/helpcenter/anniversary (accessed on 25 March 2019).
4. MedicalNewsToday. What to Know about Anxiety. Medical News Today. Available online: https://www.medicalnewstoday.com/articles/323454.php (accessed on 26 March 2019).
5. Hedman, E.; Andersson, G.; Andersson, E.; Ljótsson, B.; Rück, C.; Gordon, J.; Asmundson, G.; Lindefors, N. Internet-based cognitive–behavioural therapy for severe health anxiety: randomised controlled trial. *Br. J. Psychiatry* **2011**, *198*, 230–236.
6. Owens, V.; Hadjistavropoulos, H.; Schneider, L.; Gullickson, K.; Karin, E.; Titov, N.; Dear, B. Transdiagnostic, internet-delivered cognitive behavior therapy for depression and anxiety: Exploring impact on health anxiety. *Internet Intervent.* **2019**, *15*, 60–66, doi:10.1016/j.invent.2019.01.001
7. Iyer, B.; Subramaniam, M. The Strategic Value of APIs, *Harvard Business Review,* **2015**. Available online: https://hbr.org/2015/01/the-strategic-value-of-apis (accessed on 26 March 2019).
8. The Standards for Apis. Promoting the use of Best Practices and Setting Standards for APIs. Available online: http://www.standardsforapis.org/ (accessed on 27 March 2019).
9. Huckman, R.S.; Uppaluru, M. The Untapped Potential of Health Care APIs, *Harvard Business Review,* **2015,** Available online: https://hbr.org/2015/12/the-untapped-potential-of-health-care-apis (accessed on 27 march 2019)
10. Node-RED. Flow-Based Programming for the Internet of Things. Available online: https://nodered.org/ (accessed on 24 March 2019).
11. IBM Watson Plattaform. Available online: https://www.ibm.com/internet-of-things/solutions/iot-platform/watson-iot-platform (accessed on 24 March 2019).