

## **Indoor parameter monitoring system**

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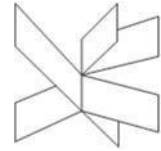
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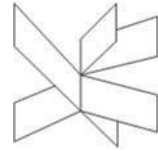
**[4<sup>th</sup> semester]**

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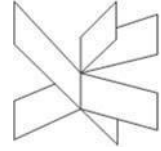


One of the most bothersome issues in a closed space is the fact that it may often become an unsuitable working environment. Human activities happen almost always in a closed environment. No matter if the activity relates to working or to studying, or just to relax, human performance and behavior is strictly related to indoor conditions regarding multiple factors such as: CO<sub>2</sub>, temperature, humidity etc.

The high concentrations of CO<sub>2</sub> are usually associated with impaired work performance and increased health symptoms. Drops in quality of air are correlated with indoor CO<sub>2</sub> concentrations as well as other air-pollutants where an important factor is the indoor-outdoor air ventilation. [1]

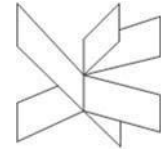
Along CO<sub>2</sub> level there are more factors to consider. *“For example, increasing humidity may reduce the incidence of common respiratory infections and provide relief for asthmatics. On the other hand, an increase in humidity may increase the prevalence of microorganisms that cause allergies. Criteria for indoor exposure must balance both effects.”* [2]

Considering the results of the studies stated above, there is a need to measure/monitor the overall conditions of indoor environment in general and specifically at VIA.



## **1 Definition of purpose**

The purpose of project is to create a device that will use sensors to monitor quality of air in a closed environment by measuring parameters such as CO<sub>2</sub> levels, humidity and temperature, store data on a dedicated server therefore to display it on an android device.



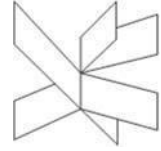
## **2 Problem Statement**

The system is one for measuring the CO<sub>2</sub> level from a closed environment and alarm the users if the level is too high. The system also measures the temperature and the level of humidity.

The system is one that will measure the quality of the working environment.

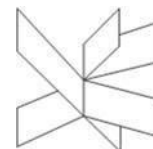
Various problems will be tackled:

- How to measure the quality of the air?
- How will the gathered data be stored for future analysis?
- How will the assessment for the gathered data will be made?



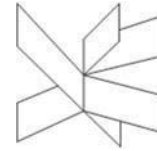
### **3 Delimitation**

- The system cannot be used in an outdoor-environment.
- The system will not provide automatic adjustments to the environment.
- The system will not send an automatic warning message.
- The system will not use more than one sensor-array.



## 4 Choice of models and methods

What Partial problem	Why This problem is related to the purpose	Which Level of outcome is expected	Which Methods/models/theories used	Who Is the main responsible person
How to measure the quality of the air?	In order to gather the data that will be later analyzed	Ambient quality parameters are assessed	Arduino Mega2560 MCU, LoRaWAN (IotNetwork), C	Liviu Lesan Alexandru Mircea Dima Ionut Iulian Boitan
How will the gathered data be stored for future analysis?	For the results to be valid in the long term, a average has to be calculated from saved data	Data is stored and ready to be processed	MongoDB,Sql, Power BI	Raul Andrei Pologea Alexandru Mihai Serb Mihail Alexandru Ciornea
How will the assessment for the gathered data will be made?	Average data and current parameters are interpreted according to certain limits and displayed on a mobile device	Data is processed and displayed	Android framework, Java, Google Material design	Ilie Putina Dumitru Rares Bunea



## 5 Time schedule

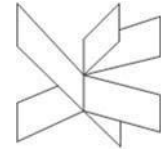
For this project, each member of the group must work around 7 hours in every project day. This equals to a required 140 hours per student and 1400 hours for the whole team. These hours will be distributed among the different tasks and split according to the future sprints.

The project started on the 7<sup>th</sup> of February when we had to form the project group. In the following days we had to write the group contract to ensure that all the team members agree to a set of rules and a working schedule. The first deadline our team had was on the 13<sup>th</sup> of February. It consisted of delivering the “project idea” to our supervisors. The second deadline was on the 27<sup>th</sup> of February, when we had to present our “project description”. The rest of the hand-ins are going to be fulfilled by the team in the future of the project. The final hand-in of the project will be on the 15<sup>th</sup> of May.

The main milestones are estimated as shown in the image below.

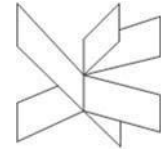






## 6 Risk assessment

Description	Likelihood	Severity	Risk mitigation	Identifiers	Responsible
Lack of knowledge	2	5	Keep working as a team on every exercise	Impossibility of creating the system	The entire team
Bad time management	2	4	Agreeing on reasonable windows in our schedules	Not finishing our checkpoints on time	The entire team
Lack of communication	1	3	Understanding our strong points	Misunderstanding each other	Individual members
Losing part of / all data	1	4	Storing all the information online	A member's computer breaks down	Depends on the event



## 7 Sources of information

1. Huttunen, K. (2018) 'Indoor Air Pollution', in *Clinical Handbook of Air PollutionRelated Diseases*. Cham: Springer International Publishing, pp. 107–114. doi: 10.1007/978-3-319-62731-1\_7.
2. Sterling E.M., Arundel A., Sterling T.D., (1985) *CRITERIA FOR HUMAN EXPOSTORE TO HUMIDITY IN OCCUPIED BUILDINGS*. Available at: [www.pro.net/sterlingiaq.com/html/photos/1044922973.pdf](http://www.pro.net/sterlingiaq.com/html/photos/1044922973.pdf) (Accessed: 21 February 2019).
3. Rice, S. A. (2002) *HEALTH EFFECTS OF ACUTE AND PROLONGED CO 2 EXPOSURE IN NORMAL AND SENSITIVE POPULATIONS \**. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.464.2827&rep=rep1&type=pdf> (Accessed: 21 February 2019).
4. Jonny Peters (2013) *The Importance of a Positive Working Environment / Leadership / Business Chief Australia*. Available at: <https://anz.businesschief.com/leadership/143/The-Importance-of-a-Positive-Working-Environment?fbclid=IwAR0sJdNDTBS6VFmsHWrVWwflZQmFTWSbajalzCN1fv1w9JNVx2D2VI2Qaw0> (Accessed: 21 February 2019).