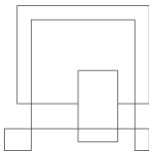

Venue Environment System

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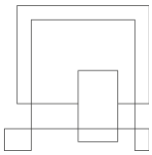
Software Technology Engineering

Semester 4

25/02/2023



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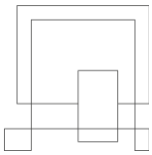
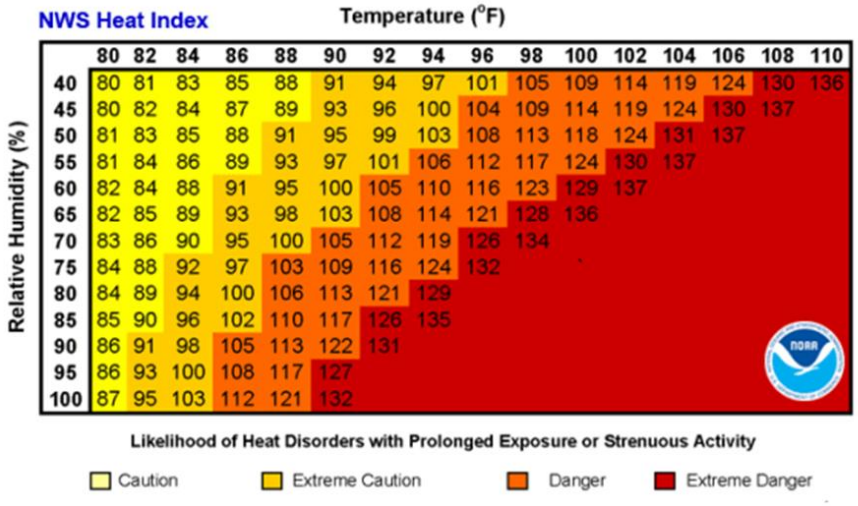


1. Background Description

“Environmental pollution is a major cause of disease, disability, and premature death worldwide. Annually, 9 million deaths (i.e. 16% of all deaths worldwide) are caused by environmental pollution alone.” (1) This pollution is especially relevant for indoor social gatherings where not enough measures are taken to improve the air quality. Due to other factors such as second hand indoor smoking (2), high density of people combined with increased humidity levels due to sweating (3), clubs become hazardous to people’s health.

A national club chain named OTWO which has been gaining popularity since COVID regulations have been lifted is interested in acquiring an efficient solution which will aid in the improvement of visitor experience. There have been multiple cases where high temperature, increased humidity levels and lack of oxygen would interfere with the guests’ enjoyment and chance of revisiting. The more popular the place becomes, the harder it is to maintain a safe environment for everyone which means additional safety measures have to be taken.

Clubs are known to exceed various checks, one being humidity levels. It is known that exposure to high humidity can lead to health endangering risks, such as dehydration, fatigue, fainting and heat stroke. Humidity is one of the key factors for heat disorders, which can be seen in the chart provided below. (3)

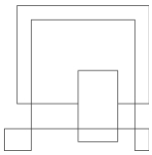


Furthermore, identifying excessive humidity levels and taking action towards regulating them can prevent mold from spreading across the venue. Moldy environments can possibly affect the health of people in the venues in various negative ways (CDC, 2022).

Another risk that should be taken into account is the exceeding Particle Matters concentration according to the WHO guidelines. Indoor particle matters are affected by activities inside the club such as people moving, smoking and volume occupancy. (4) “CO2 levels are also well correlated with relative humidity (*rs* 0.534–0.625) and occupancy due to human exhalation and perspiration during moving.” (5)

Moreover, CO2 measurements in the venue can show how well the venue is ventilated. Ensuring proper ventilation, can help eliminate the spread of airborne disease during social gatherings (Adzic et al., 2022) as well as prevent various health issues that could be caused by CO2 itself, such as fatigue, headaches and even vomiting with dizziness (Saini et al., 2020).

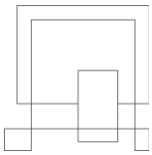
Excessively loud music is another issue that venues face. It could cause damage to the visitors and especially to the employees, who cannot just leave their workplace when they are uncomfortable, hearing and could cause other health issues like tinnitus (Basner et al., 2014). It is in the venue owners interest to preserve their employees and venue guests' health and comfort and implement sound control.



Another issue venue management is concerned about is the risk of burglary, theft and vandalism. During working hours, the venues are monitored by the security guards, but during off hours - it is not always the case. Although the number of reported burglaries in Denmark over the past decade was decreasing (Statista, 2021), Denmark still has one of the highest burglary rates in the world (Statista, 2023) and that is why monitoring against intruders is especially important in Denmark.

It could be noticed that the problems lay within the type of activities people engage in inside the venue, which causes the problems the client wants to tackle. The way this issue is being handled at the moment is not optimal for the company's future, as it is going to lose clients over time if the venues are not well equipped for a lot of people and if it cannot adjust the temperature, humidity, oxygen, sound and take action toward burglary prevention depending on the current situation.

While there are numerous products available that measure air quality, they're primarily marketed towards offices, apartments, and schools, leaving a significant gap for bars and clubs. Surprisingly, there's currently no product in the market that specifically caters to ensuring people's comfort in late evening entertainment facilities while offering to the facility management a peace of mind. This project aims to fill this gap by offering a specialized air quality measurement service/product, tapping into a vast market that has yet to be fully explored.



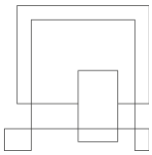
2. Problem Statement

Main problem

Nightlife clubs and bars around the globe do not have a reliable and convenient way of measuring the atmosphere within their venues, more specifically temperature, humidity and CO2 levels, which interferes with the enjoyment of guests.

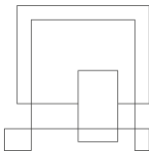
Sub-problems

1. What kind of data will be measured for the guests enjoyment/welfare?
2. How will the data be accessed by the users?
3. What events can the system trigger to adjust the atmosphere?
4. How much of the process is going to be automated?



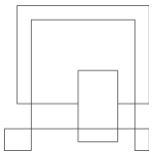
3. Definition of purpose

The purpose is to provide a way of ensuring proper temperature, humidity and CO2, sound levels inside venues, therefore creating a safe and comfortable environment for venue visitors.



4. Delimitation

1. Equipment kinds the nightclub possesses will not be included, instead, only an actuator that can react to the information in the system will be provided.
2. Health regulations and legal requirements will not be included for the limits.
3. The measurements are merely informative and the system won't take action against unsafe values.



5. Methodology

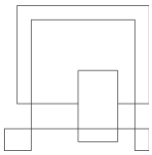
Due to advantages such as flexibility, frequent feedback and clearly defined goals, the group has decided to utilize the SCRUM methodology combined with Unified Process.

Adriana will take the role of Product Owner and Selina is going to act as the Scrum Master, while the rest of the group will be part of three development teams: IOT, Cloud and Frontend. All team members are expected to share the same amount of effort and hours put into the project in both development and documentation.

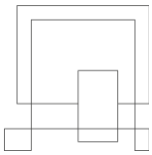
Because everyone's input is different in the team and it cannot be measured by the amount of work, the team is going to use a Story Point System instead of Time Estimation for User Stories.The reasoning for this is the fact that story points estimation is independent from the developer, which means that instead of measuring it by time, it is being measured by value. For example, given a task which is estimated at 3 hours, different developers will take different time to complete it: a junior dev might take 8 hours whereas someone with more experience could manage it in 30 minutes. Using story points could also aid everyone's productivity and task velocity with time.

The default sprint length is set at 7 days, or, to be more specific, 5 working days. Throughout the semester, 1 meeting per week is going to be held for Group 5 as a whole, where the 3 teams will close the sprint by having a Sprint Review and Retrospective, and a new sprint will be started with the Sprint Planning Meeting. Daily Sprint Meetings will be held within their respective teams to avoid confusion for the other teams. Moving forward, the meeting frequency will increase during the project period in May 2023. Planned meetings are divided into types such as sprint planning, daily standup meetings, sprint reviews and sprint retrospectives.

Overall, the team aims to conduct all of the meetings in person at VIA – University College campus in Horsens, but is ready to move over to digital spaces such as Discord, if the need to do so arises. This would help the team improve their communication and efficiency due to physical presence and the ability to talk to each other directly.



In general, the team will start with sprint planning where the product owner will be picking out user stories from the product backlog in their respective importance order. The development team will plan out tasks based on the picked user stories. These tasks will be estimated and worked on throughout the sprint period. During daily sprint meetings, the 3 teams are going to keep each other updated on what they are working on, to assure a productive work flow and provide help where needed. Once the sprint is over, the team will hold a sprint review to review their progress. Following after, a sprint retrospective will take place in the form of a discussion on what has been working well for the iterations, what has been not working so well and what other habits can be added to the next sprint.

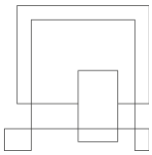


6. Time schedule

Throughout the semester, each student in the group must spend 10 ECTS points of project work, which is approximately 275 hours. As such, the total amount of hours spent on the project adds up to 2475 hours for 9 team members. Workload is split equally by all members on each phase of the project:

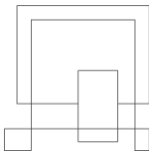
PHASE	AIM	DURATION	WORK & HOURS
Inception	Project Idea & Description, Requirements	15th of February - 1st of March	5 meetings x 2 hours 8 hours individual work
Elaboration	Requirements, Analysis & Design, Choosing a Team	March 8th - March 15th	3 meetings x 3 hours 6 hours individual work
Elaboration to Construction	Analysis, Design, and a bit of Implementation	March 16th - March 31st	4 meetings x 3 hours 12 hours individual work
Construction Part I	Developing features using Continuous Integration and Feedback	April 11th - May 9th	8 meetings x 4 hours 30 hours individual work
Construction Part II	Continuing with Development and Testing	May 10th - May 24th	6 meetings x 4 hours 90 hours individual work
Transition	Assembling the project	May 25th - May 28th	2 meetings x 4 hours 8 hours individual work
Additional Project Work			
Presentation	Creating and recording a presentation	May 29th - June 1st	2 meetings x 4 hours 4 hours individual work
Exam	Preparation for the exam	Until exam day	16 hours of individual and group work

Total workload: ~277 hours/student



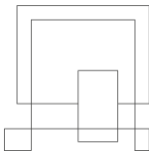
Moreover, the team has agreed on a set of deadlines, to help keep track of their progress and stay efficient throughout the whole period of working on the project:

Deadline	**Deadline**
Idea and group contract deadline	19th of February
Inception deadline	1st of March
Deadline for choosing teams	15th of March
Interface contract deadline	29th of March
Proof of concept	23rd of April
End of Project construction	24th of May
End of Project assembly	28th of May
Deadline for presentation	31st of May
Hand in	1st of June



7. Risk assessment

Risks	Likelihood Scale: 1-5 5 = high risk	Severity Scale: 1-5 5 = high risk	Product of likelihood and severity	Risk mitigation e.g. Preventive- & Responsive actions	Identifiers	Responsible
The battery of the IoT running out	3	4	12	Checking the battery	No data getting sent in.	Adriana
IoT device getting damaged	2	5	10	Mount the device on the wall and enclose it in a mesh.	No data getting sent.	Mikkel
Device is receiving no signal	1	4	4	Contacting the administration	No signal	Nerijus



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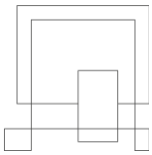

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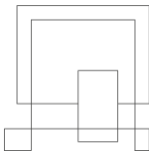

Appendices

- 01 Appendix - Group Contract SEP4 Group 5X