

FREE SPACE DETECTOR

PROJECT PROPOSAL



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Table of content

- Identification of the Problem
- Survey Results
- Technical Feasibility
- Product Architecture
- Initial and finalized sketches of the product enclosures
- Marketing ,Sales and beyond
- Project Budget with BOQ (Bill of Quantities)
- Progress report
- Task Allocation
- Reference

Identification of the Problem

Problem description

- Libraries and other public spaces that offer a peaceful and productive environment for people to engage, work and study can be in high demand. However, if visitors arrive only to find that there are no available seats or study areas, it can be frustrating and result in wasted time.
- We discussed within our team members and realized that each of us have faced such a problem when we go into the University library. Many times, we have noticed and have experienced students walking into the library without realizing there are no available seats.

Identifying the problem

- We conducted a survey and found that this is a problem for many individuals who value their time and dislike having to loiter around.

Solution

- To address this issue, our team proposes a device which can provide real-time information about the number of available seats and spaces, helping visitors plan their visit and avoid frustration.



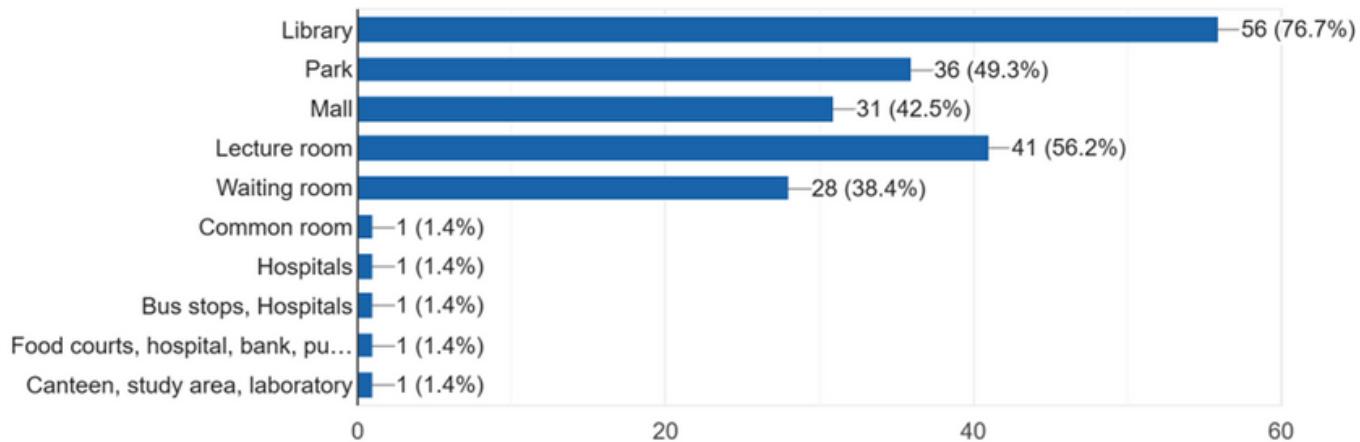
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Survey Results

Below shows the responses of a survey we conducted regarding the issue mentioned above.

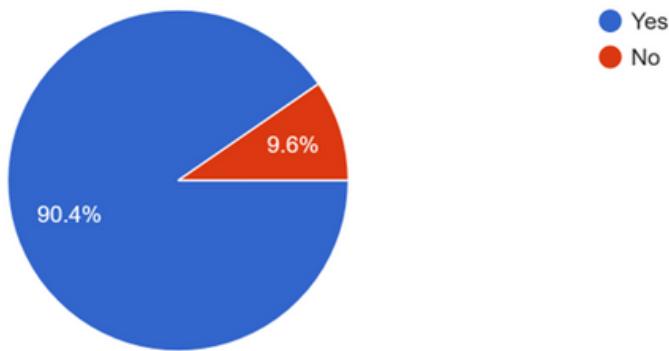
What types of public areas do you typically visit that have seating available?

73 responses



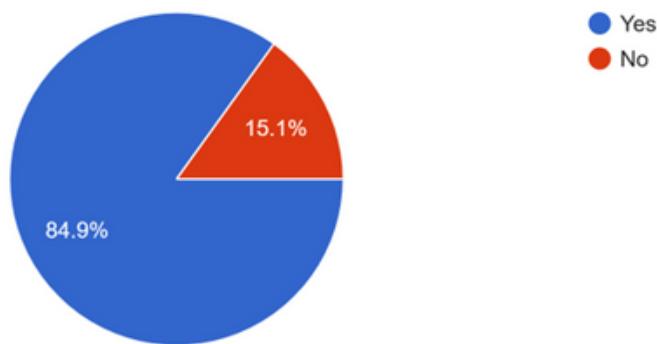
Have you ever entered a public area and not found any available seats?

73 responses



Have you ever left a public area because there were no available seats?

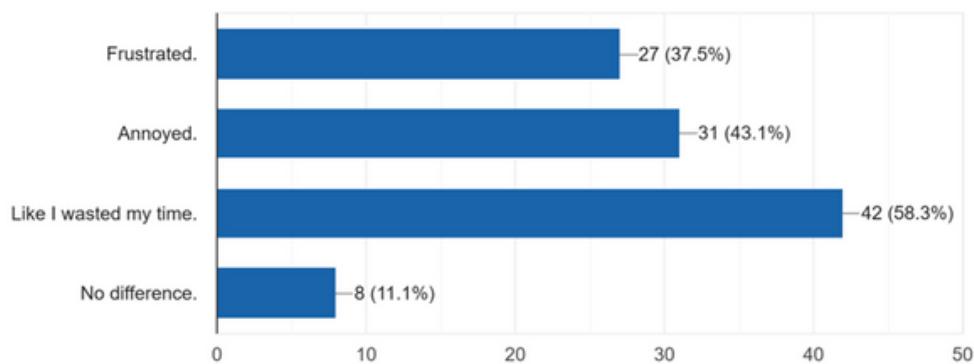
73 responses



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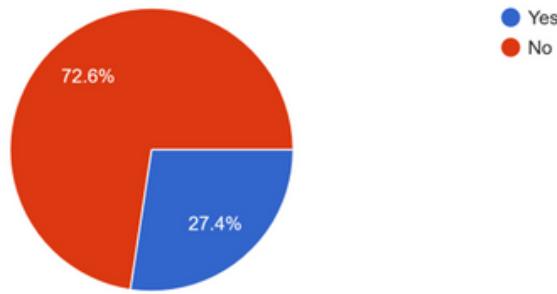
If you were faced with a situation described above, how would it make you feel?

72 responses



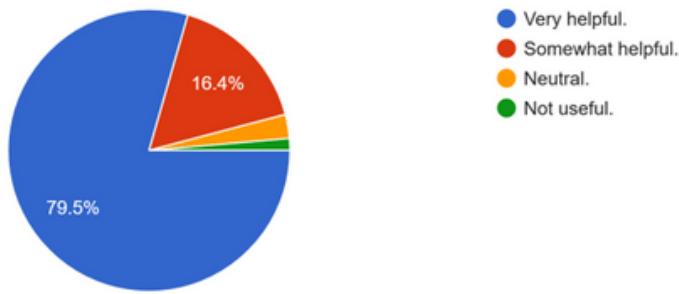
Have you ever used a service to find unoccupied seats in public areas?

73 responses



How helpful would you think it would be if there was an indicator showing whether there are available seats and how many available seats there are?

73 responses

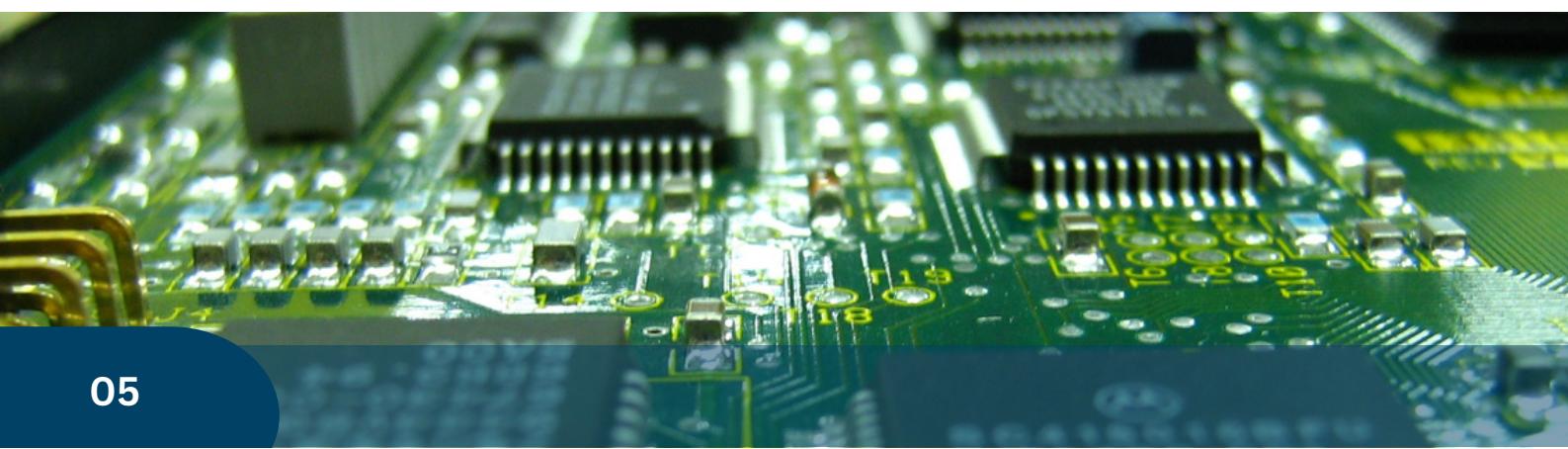


Conclusion of the survey

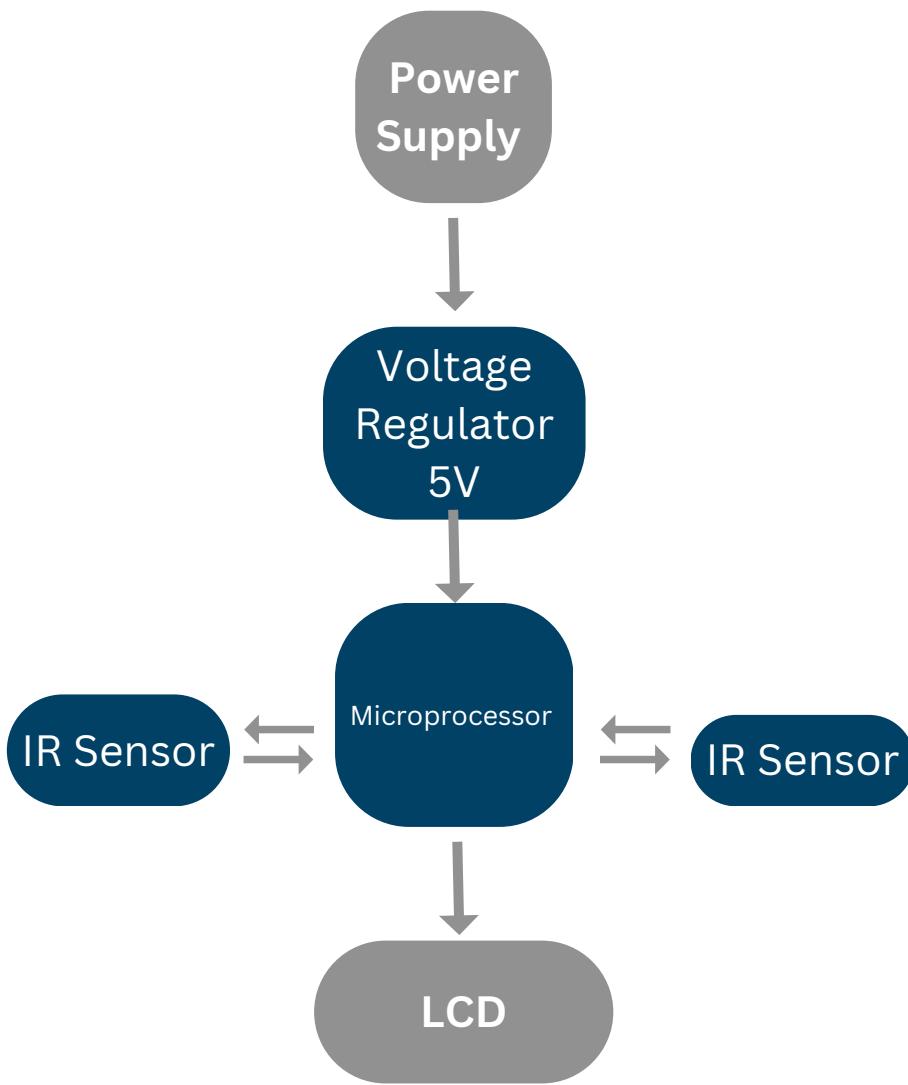
- The above survey results show that most people who took the survey have a problem finding available seats in public space.
- Many people face such situations frequently and have negative feelings. There for the problem the free space detector would resolve is a common issue to many.
- The survey also display that many would consider an electronic device displaying the available seats would be a good solution.

Technical Feasibility

- In case of **resources availability** even though the prices of electronic items have been increased we were able to find all the required electronic item form local market, within our budget limit. (Hardware components are ATMega 328 microcontroller, 2 sharp IR sensors , 20X4 i2c LCD display, and the power supply , wires)
- A **voltage regulator** is used for the safety and protection of micro controller and IR sensors. The PCB circuit and other modules will be inside the box and the protruding IR sensors will be covered to protect from rain, dust and sunshine. It is rather very durable.
- We will be using grid power as our **power source** therefore no need to change batteries in the future.
- We will be designing the enclosure by using **Solid works** and we will use **Altium** for PCB design.
- Our team will do the **PCB printing and 3D printing** by hiring local professionals, and will do it within our budget.
- **The material** we use for the enclosure will be able to withstand temperature changes, dust, and other environmental conditions while being an accessible product in the local market.
- **Time constrain** is another concern since we must finish the project before end of the semester. We plan to overcome this challenge by setting weekly goal and distributing the task among ourselves.



Product Architecture



Power supply

- We will be using grid power for the device

Voltage Regulator IC LM7805

- The voltage regulator ensures that the voltage supplied to the device remains within a specified range, even if the input voltage fluctuates.

Microprocessor

- controlling operations and executing instructions.
- ATmega 328P

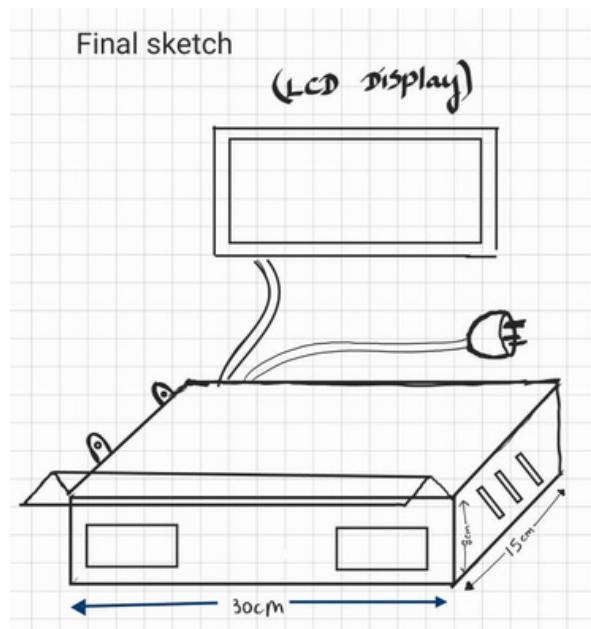
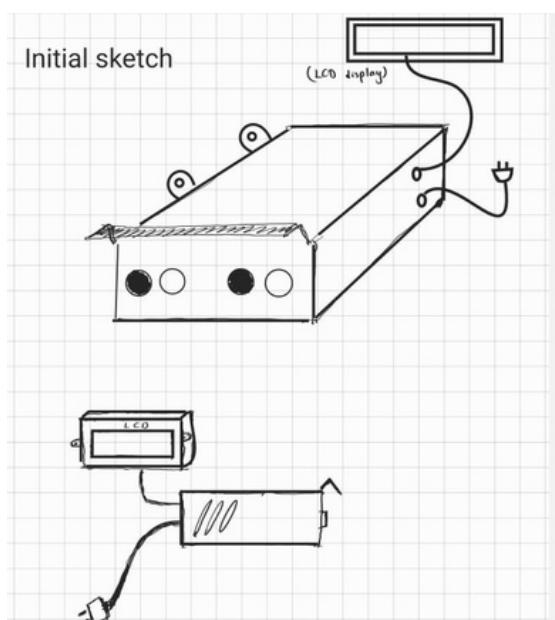
IR sensors

- Detects when a person walks across from it and sends a digital input to the microprocessor
- Sharp IR sensors

LCD

- Displays the number of seats available to visitors
- 20x4 Blue Blacklight LCD Display with an i2c module soldered onto it

Initial and finalized sketches of the product enclosures



Marketing ,Sales and beyond

Marketing plan

- Since we mainly focus government offices, social control institutions, public spaces management authorities and other institutions, we will be targeting these groups individually through emails, visits, and other means.
- We will create a website regarding the device and ask for customer reviews which can boost our sales.
- We will be using social media platforms such as Facebook, Instagram and Youtube to promote our product to a wider market.
- We will create separate official accounts on YouTube, Facebook, and Instagram once we have reached a market.
- Eye-catching flyers, posts and videos about the free space detector will be shared through our social media platforms.
- Introductory videos comparing our product with the similar products in the market will be created and shared.

Sales

- Since we mainly focus government offices, social control institutions, public spaces management authorities and other institutions, we will be targeting these groups individually through emails, visits, and other means.
- Our product will also be available for sale in local tech stores.
- Additionally, we intend to market our product on websites like eBay, Amazon, Daraz, and Instagram.

Maintenance

- We instruct our customers on frequent maintenance and we provide each customer a printed manual.
- A warranty period will be given of 1 year for each customer.
- If any major issues arise the customers can directly contact our maintenance team.



Project Proposal

Project Budget with BOQ (Bill of Quantities)

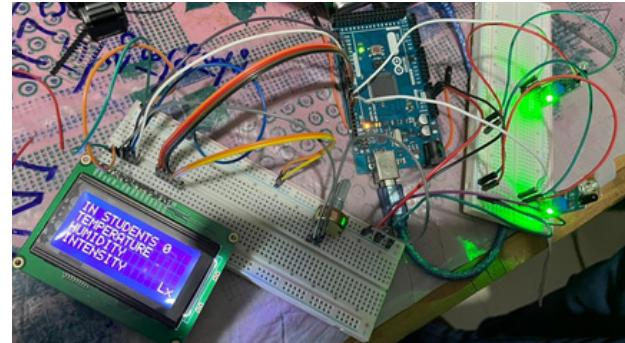
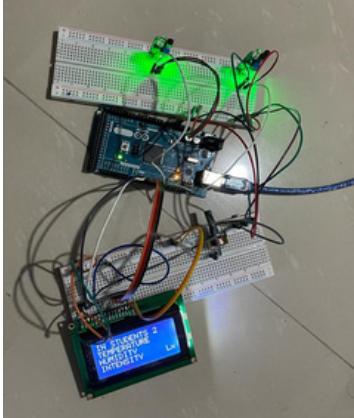
Module /Component	Number of Units	Cost per Units (Rs)	Total cost (Rs)
ATmega 328P Microcontroller	1	1400	1400
Voltage Regulator IC LM7805	1	60	60
Sharp IR sensors	2	1890	3780
20x4 Blue Blacklight LCD Display	1	1480	1480
IIC/I2C/TWI/SPI Serial Interface Board Module Port	1	300	300
Power Adapter	1	550	550
DC jack	1	40	40
470µF Capacitor	2	5	10
330 Ω Resistor	2	10	20
PCB	1	500	500
Enclosure	1	300	300
Total Cost			8440
Estimated Selling Price			9000

Project Proposal

Progress report

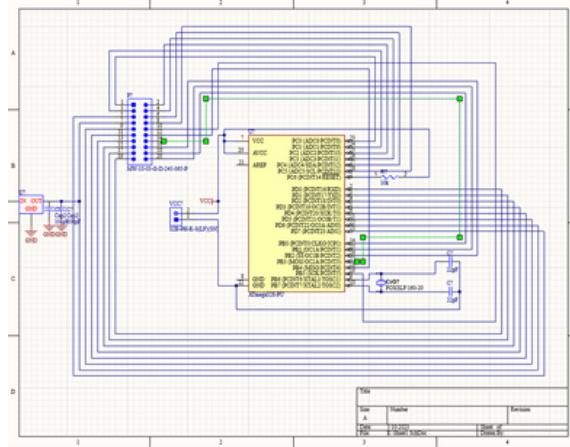
Circuit design

- Successfully tested the object detecting and counting circuit on a breadboard, using two IR sensors & two LEDs. (when one IR sensor is covered by a moving object one LED would light while the other LED lights up when the other IR sensor is covered, while displaying the count on a LCD.)



PCB design sketch

- We utilized Altium to design our printed circuit board (PCB) and are still in the process of finalizing it. While we do not have the completed design at this time, we can provide a rough sketch of our progress.



Enclosure design sketch

- Created a rough sketch and design of the enclosure for our device.
- The design includes holes where the IR sensors would protrude and where the LCD and power supply would be connected.
- It includes sufficient space for the PCB and other components.



Project Proposal

Task allocation among the group members

- 210212N Shaveen Herath- - Solidworks and enclosure design, Microcontroller programming
- 210215C Dasuni Herath- - Altium and PCB design, prototyping and testing
- 210216F Nipuni Herath- - Microcontroller programming, Solidworks and enclosure design
- 210433R Rajitha Niroshan—Altium and PCB design, prototyping and testing

References

- **Tronic.lk - Add a subheading**
- **Automatic passenger counting systems for public transport - <https://www.intelligenttransport.com/transport-articles/3116/automatic-passenger-counting-systems-for-public-transport/>**
- **Wikipedia - https://en.m.wikipedia.org/wiki/People_counter**