

Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

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| Title of Project:Library Sensor |
| Group Name: Sensing |
| Group Members: 1)Kho Yuan Zu 102 2)Raphael Toby Lauw 1P3 3)Khoo Wei Quan 102 4)Kevin Quah Shi Yang 102 |

1.Problem Finding

(The beginning...)

Identify a problem you would like to solve. You may want to brainstorm for problems using different approaches e.g. thematic, survey or general brainstorming etc.

1 A Document a list of problems you have identified. Your documentation should show clearly how your group came up with the problems.

1)Ambience of the library

2)Wear and tear of a bicycle tire

3)Forgetting to bring and wear a mask out.

1 B You should have selected a problem based on some considerations. Identify and justify these considerations.

- 1) In public libraries, many people talk at an acceptable volume in libraries. Therefore librarians need to remind them constantly, increasing the manpower in the library just to ask them to quieten down so the other people in the library can concentrate. We want to invent something that can help to reduce the workload of this librarian, by automatically asking the irresponsible people to quieten down in a way. if the volume is above a certain limit. Thus we reduce the workload and also the manpower needed.**
- 2) If you're an avid cyclist you would know that tires can wear out quite quickly in certain conditions and changing the tire may be quite troublesome for some. We wish to invent a detachable tire that is cost efficient and easy to fix in so that tires can be changed easily.**
- 3) During this COVID 19 pandemic wearing mask in public areas is a norm and not wearing it may result in legal consequences. Some of us may forget to get a mask before leaving the house, and might get "stormed". We want to create a system and invention that can remind the user to wear a mask every time he leaves the house and dispenses one too.**

1 C List some problems your group would like to solve. List also the considerations for selection of problems in the evaluation grid below. Score the considerations, against the problems, with points 1 (least significant) to 4 (most significant). Sum up the total points for each problem. Identify that problem you would like to solve.

Problem Evaluation Grid

*add more columns and rows where necessary

| Considerations for Selection | Problems | | |
|------------------------------|-----------|----------|-----------|
| | #1 | #2 | #3 |
| Feasibility / difficulty | 2-medium | 1-lowest | 3-highest |
| demand / applicable | 3 | 1 | 2 |
| Cost / time needed | 1 | 2 | 3 |
| Total Score | 6 average | 3 lowest | 8 highest |

1. Define the Problem (This is one...)

Now that the problem has been identified. It is important to gather information on the extent of the problem and/or evaluate the usefulness of existing solutions based on *some criteria*. You may need to conduct surveys and research on existing solutions.

2 A Extent of problem (Research and discuss the problem and write down the problem statement)

The first issue is the most common and if solved would have the largest impact. We would have to apply C++, a programming language and use a breadboard that we are not familiar with, making it difficult for us to carry out the project. The cost would also be the highest as we can get neither of this in school and have to cash from our own pocket and most time consuming

The second issue is self derived, and would have the least impact. We will need to use the 3D printer we have in school which we are not familiar with. It would require the least amount of money and least time consuming.

The third issue is second common and applicable in the current world due to covid 19 pandemic and will not be of much use after this pandemic. However it would be useless in the future. It is costly as we cannot get the material required from school.

2 B Compare and contrast the existing or similar solutions.

1)According to what we have witnessed and surf online, we are the first to come out with a system that helps to keep the library quiet.

2) According to the internet this product has been invented thus we opt not to pursue this choice.

3) According to the internet there is a mask dispenser but not an automatic that works by A.I. and the sensor that we planned .

2. Your BIG IDEA[#]

(Developing the idea....)

Write down your proposed invention and why you want to do it. State also how you think your proposed invention is better.

3 A Describe your proposed invention.

My invention consists mainly of using a sound sensor and a motherboard, with the help of coding, programming the system such that when sound detected is unacceptable, a bulb would blink and a piezo buzzer starts buzzing. The incessant buzzing and blinking of bulbs hopefully remind the culprit to lower down their volume..

3 B Explain the purpose of your proposed invention and the potential benefits to users.

Our product target audience is the library authorities. Our product helps to keep the library quiet. This reduces the staff workload, thus lesser manpower is required to maintain the library's ambience therefore lesser pay has to be rolled out.

3 C In what ways would your proposed invention be different and/or better than existing solutions, if any.

The only other solution I have seen in Singapore is to put up signs and increasing manpower to ask users to quieten down. The signs are useless from what I witness and increasing the manpower means that is needed to sustain the library staff.

3 D What are some problems you expect in the course of your proposed invention?

The process of coding programming languages as we are amateur in that field. Transmitting data from one location to another.

3 E What and when are the major milestones (project timeline) in your invention?

| Time: | Event: |
|----------------------|---|
| On February 20th | we formed our project idea. |
| During late February | we research on the feasibility, result: positive |
| On we March 5th | we registered our mentor and my team on ISP |
| Since then | we researched on the material needed |
| Till June | we found and wrote all the things we need |
| 7 June | we wrote down all the problem we have to solve |
| 15 June | we drew an analysed diagram of how the product might look |
| By July | we ordered the items |
| at the end of July. | we received all the items we ordered |
| 1st August. | we completed the model |

#must be able to be constructed based on current / emerging technologies, must not violate the laws of Science or go against the laws of nature.

3.Construction or Modelling Process*

70-(This first... then that...)

You are now onto the fabrication of your prototype/ product. You need to select material and understand how to put them together so that your prototype/ product can perform its function.

4 A Explain how and why the materials were chosen for the prototype/ product of your invention

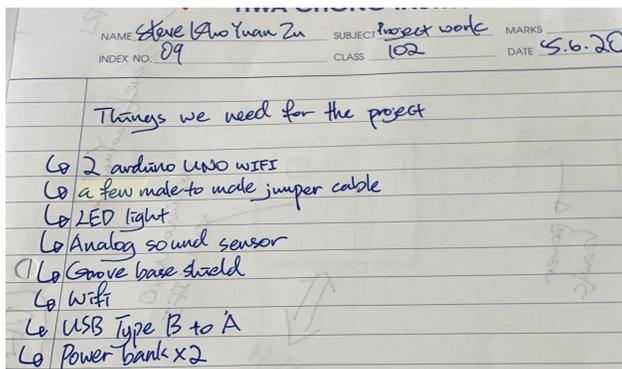
We have a few criteria for the material chosen. It must be cost efficient, readily available in Singapore, light yet strong. We surf the internet choosing from different online platforms and research on the parts requirement.

4 B. Explore these considerations that may guide the construction of your prototype/ product.

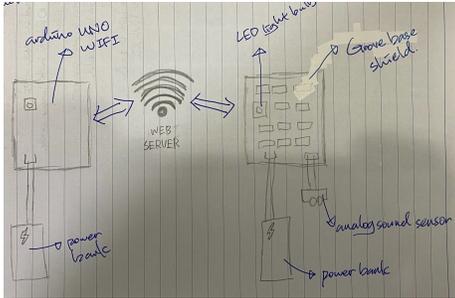
Our products are to be installed in multiple areas thus making it cost effective makes it more attractive to the eyes of the librarian authority. At the same time it can cut the cost needed to make the product. Our product shall be readily available so that the authority can even replicate one for themselves to try and also make asker for us source for the parts and query on it. It shall be light and strong so that the product can be moved around easily and not be too fragile preventing it from being destroyed upon being dropped.

4 C Document the prototype/ product development stages. You may use drawings, photographs or videos.

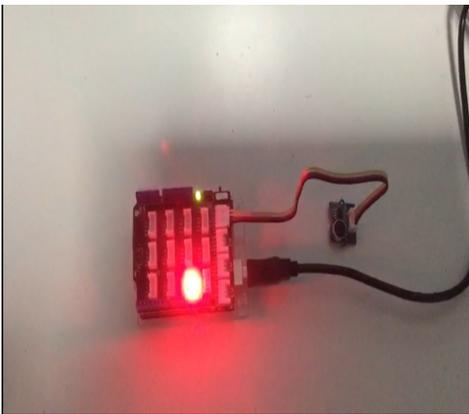
1. Firstly, we researched on multiple websites to find resources and various codes.
2. We chart down all the items we needed



3. We drew a diagram of how the product might look

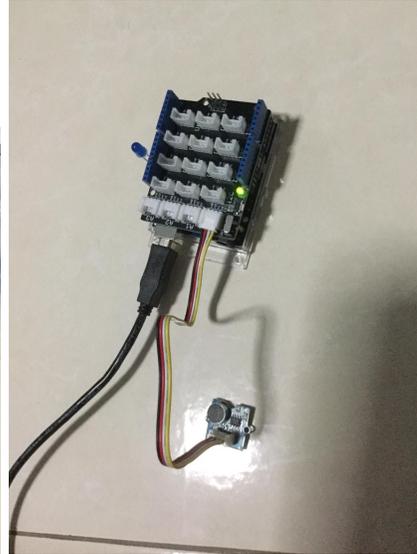


4. Next, we built a prototype where when it sensed a sound over a threshold value, the LED would light up.



Video: <https://www.youtube.com/watch?v=rJeoyUw6K-0&feature=youtu.be>

3. Next, we ran a simple web server to turn an LED on or off.
4. Lastly, we coded it so there are two Arduinos, one powered through the computer and the other through a power bank.



5. The first Arduino is equipped with an analog sound sensor while the second is equipped with a red LED light. Every 0.5 seconds, the analog sound sensor takes a reading of the surroundings.

Video: <https://www.youtube.com/watch?v=Uk9X-dqMTVs&feature=youtu.be>

6. When the surroundings are above a certain threshold, it would connect to the web server to send the request to light up the red LED. After 10 seconds, it would continue in reading the surrounding sound and the LED would turn off.

Video: https://www.youtube.com/watch?v=hOcO0GW_HHg&feature=youtu.be

Warning:

- *Video / animated simulation only if prototyping is absolutely no possible.*
- *Video / animated simulation must be logical and convincing that the invention works.*
- *Constraints must be clearly included in the logbook or the project will be heavily penalized.*

3. Modification and Evaluation

Upon the completion of your prototype/ product, you would need to see if it is working the way you want it to work. Check if your product has met the identified purpose and the user's need; and implement necessary modifications and improvements. This process may take several rounds.

5 A Write down your prototype/ product test criteria and check against it if it works. Identify areas of weakness for modification. Indicate the test iteration and date of test.

| Test Iteration: | Tick | | | Remarks |
|----------------------|------|------|-------------------|---|
| Test Date: | Pass | Fail | Potential Failure | |
| sturdy | no | no | yes | There are wires that may break apart from the Arduino. |
| Easy to use | yes | no | no | After the code is uploaded all it takes is one button to start the program. |
| Light and convenient | No | NO | Yes | If carried in a bag it would be convenient however if hand carried it might not be convenient as if it drops it might be destroyed. |

*Add more rows for more criteria

** Repeat table for next test iteration

4.References

Read <http://www.bibme.org/citation-guide/apa/> on how to cite references.

6 A Cite the references you have used for your project work. Your source of reference should come from different types (eg books, magazine, websites, journal articles, interview, photographs, product brochure, reviews etc.)

1)<https://www.arrow.com/en/research-and-events/articles/comparing-arduino-uno-and-raspberry-pi-3>

2)<https://maker.pro/arduino/tutorial/how-to-choose-the-right-arduino-board-for-your-project>

3)<https://www.arduino.cc/en/Guide/ArduinoUnoWiFi>

4)<https://www.elprocus.com/arduino-sensor-types-and-applications/>

5)<https://randomnerdtutorials.com/25-arduino-shields/>

6)<https://www.arduino.cc/en/Reference/WiFi>

7)<https://www.arduino.cc/en/Main/Software>

8)<https://components101.com/microcontrollers/arduino-uno>

