CM50304: AI Challenge
Department of Computer Science
University of Bath, UK

Air quality monitoring using an AI-based device

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8th May 2020

Contents

1. Summary

[*Briefly describe the goal of the project.*]

2. Problem definition and background

2.1 Problem specification

[*This section should state the challenge, motivate why this challenge is important and explain how it relates to AI.*]

2.2 Literature review

[*This section should review the existing solutions for this challenge and critically analyse ethical issues related to them. It is maybe the case that there are no existing solutions for the chosen challenge. In this case this should be clearly stated and analysed why it is so. If applicable, existing solutions for related challenges may be reviewed here. For example, if your solution is based on solutions for other challenges you should review and critically analyse them in this section.*]

2.3 Proposed solution

[*This section should explain your ambitious solution and why it requires or why it benefits from the interdisciplinary approach. If the solution involves novel research the section should explain why you believe that this research is likely to be successful in the foreseeable future (see above).*]

3. Air quality monitoring device

[*Describe the engineering part of the project.*]

3.1 Hardware

3.1.1 Sensor

Background
Blah Blah Blah some background

Design Specification

Table 3.1: Add caption

Requirement	Wish/Deman	Importance (1 low, 5 high)	Engineering Specification	Target Value
Sensors open to atmosphere	D			
Water Proof	D		IP67	
Long battery life	W	4	Self powered + battery capacity.	1 week battery life
Easy to set up	W	5		
Durable	W	4	Sustain accidental drops from height	0.5m
Low cost	W	3	Component and raw material cost	£200
Recylable	W	2		
Transparent	W	4		
Easy to charge	W	2	Clear acess to charging port	
Cheap to manufacture	W	3	Manufacture and assembly cost	£30
Small form factor	W	3	Overall dimmensions	30x30x30cm

Long Battery Life (4):
To ensure regular air quality measurements minimum intervention with the device is required. The most involved element is the charging of the device, therefore this should be kept to a minimum by having a long battery life.

Easy to set up (5):
Crucial to ensuring a citizen science approach to monitoring air quality is maintaining a very simple set up of the sensor. As stipulated in the background the device must be portable and thus require 'packing up' and 'setting up'. Therefor both of these processes must be intuitive (completable without any training or instruction).

Durable (4):
Due to the protable nature of the sensor, and to ensure longevity, the device must be durable to general wear and tear. This has the added benefit of reducing the cost of the airmonitoring system by extending the useable life of each sensor.

Low Cost (3:)
In line with the with the goals of a low cost widely distributed sensor network, the manufacture and component costs must be kept to a minimum to ensure affordability of the device.

Recylable (2):

Transparent (4):

Easy to charge (2):

Cheap to manufacture (3):

Small form factor (3):

Concepts

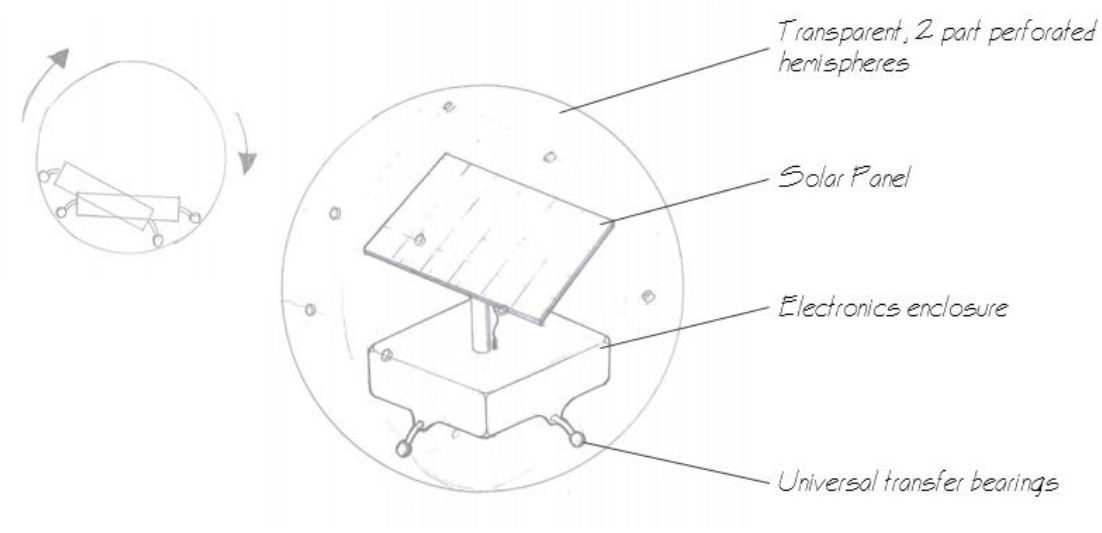


Figure 3.1: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [**?**].

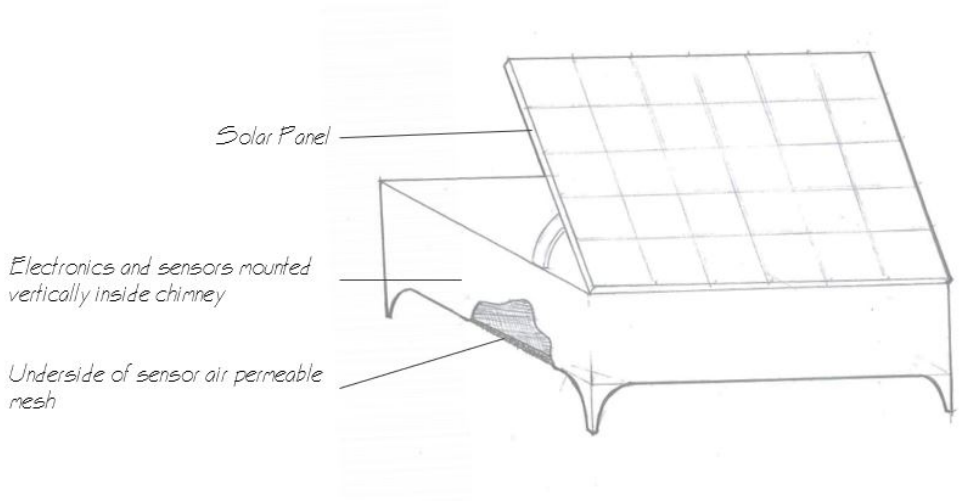


Figure 3.2: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [?].

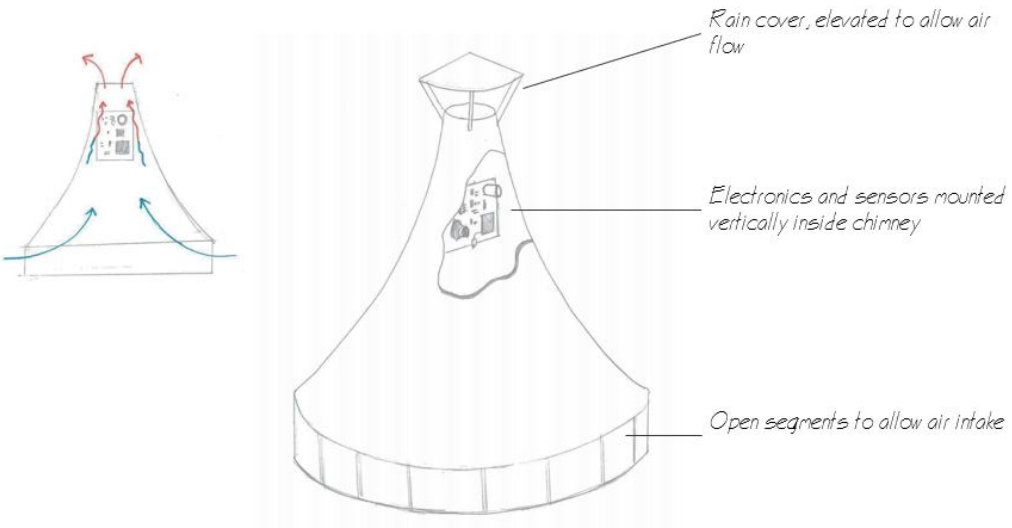


Figure 3.3: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [?].

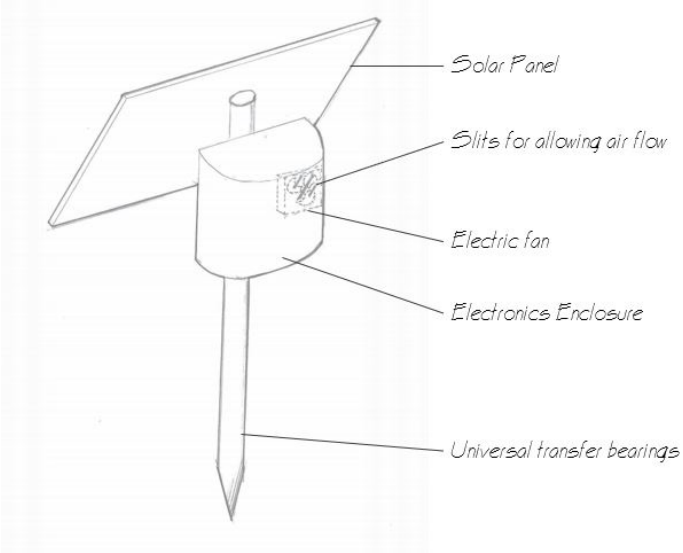


Figure 3.4: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [?].

Pair wise comparison: or just weighted scoring

Table 3.2: Add caption

	Concepts			
Spec No.	A	B	C	D
1	1	1	1	1
2	1	1	1	1
3	3	5	2	4
4	5	4	3	1
5	5	3	4	3
6	4	5	2	3
7	3	3	3	3
8	5	4	5	3
9	3	5	3	4
10	3	4	2	3
11	4	4	3	2
weighted sum	127	126	96	86

Prototype

Figure 3.5: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [?].

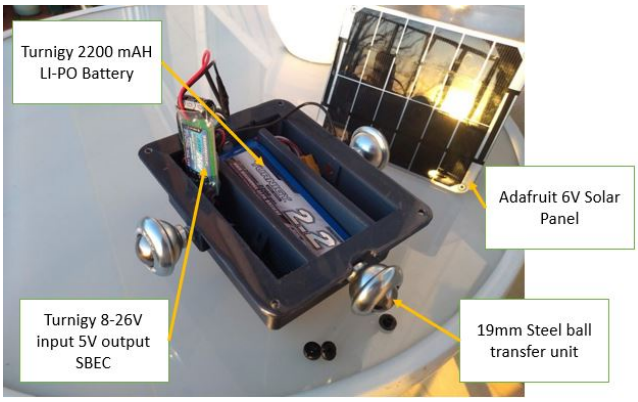


Figure 3.6: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [?].

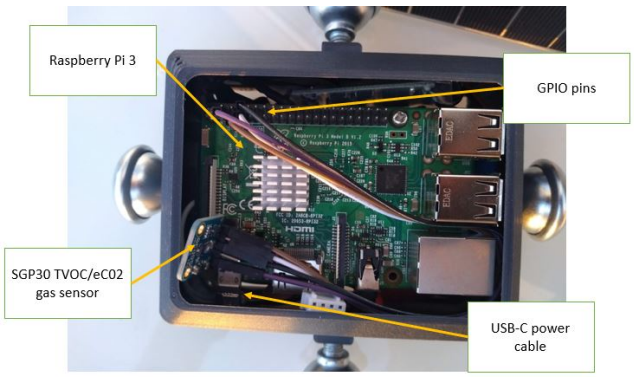
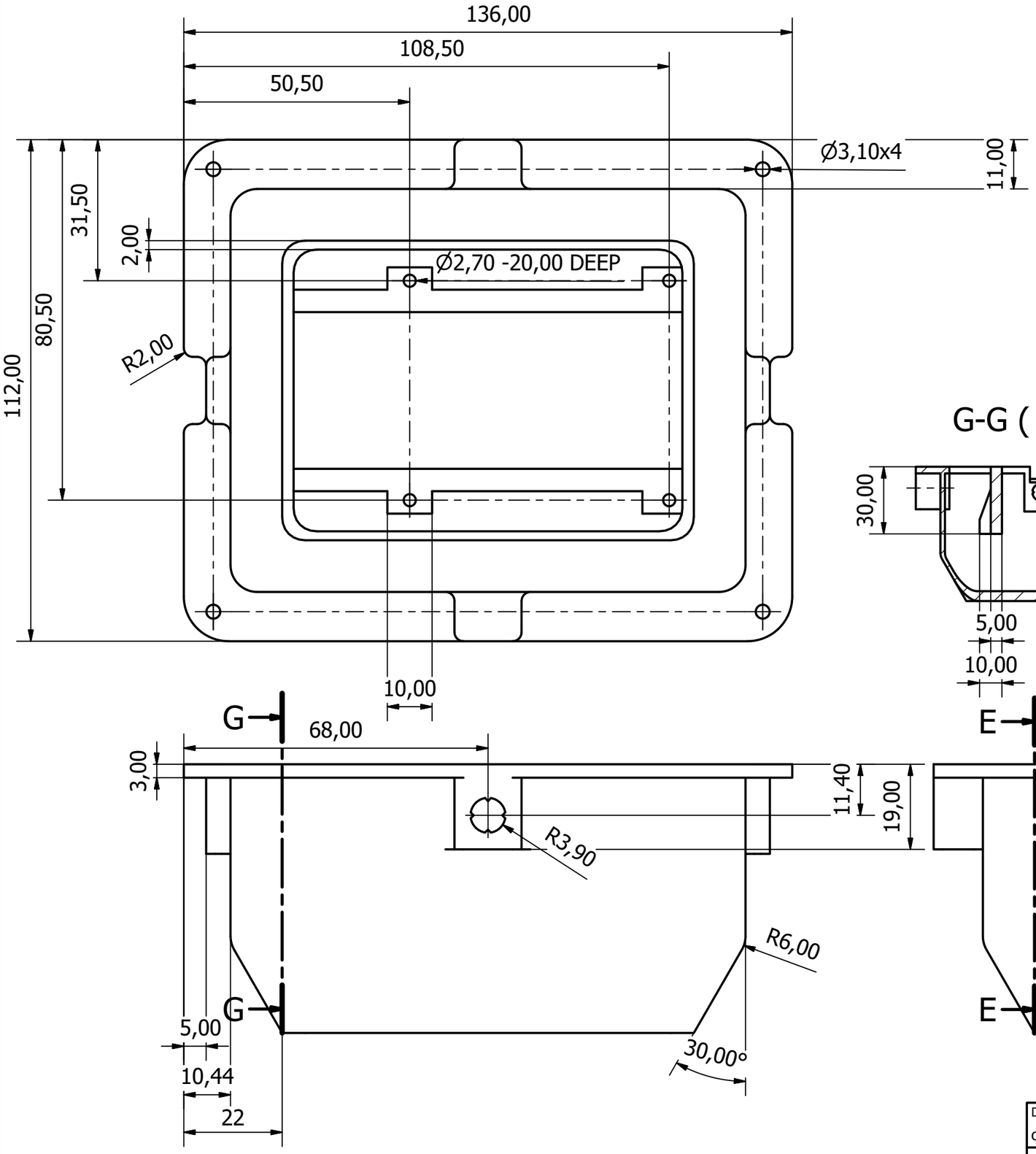
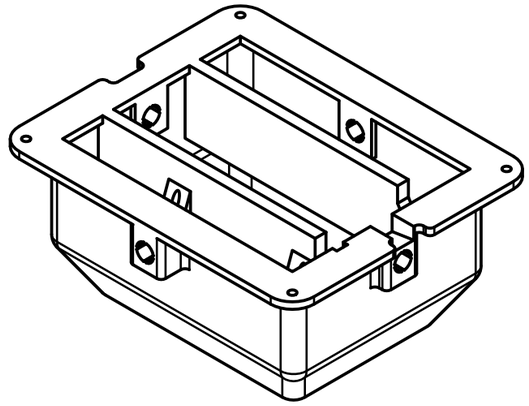


Figure 3.7: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [?].

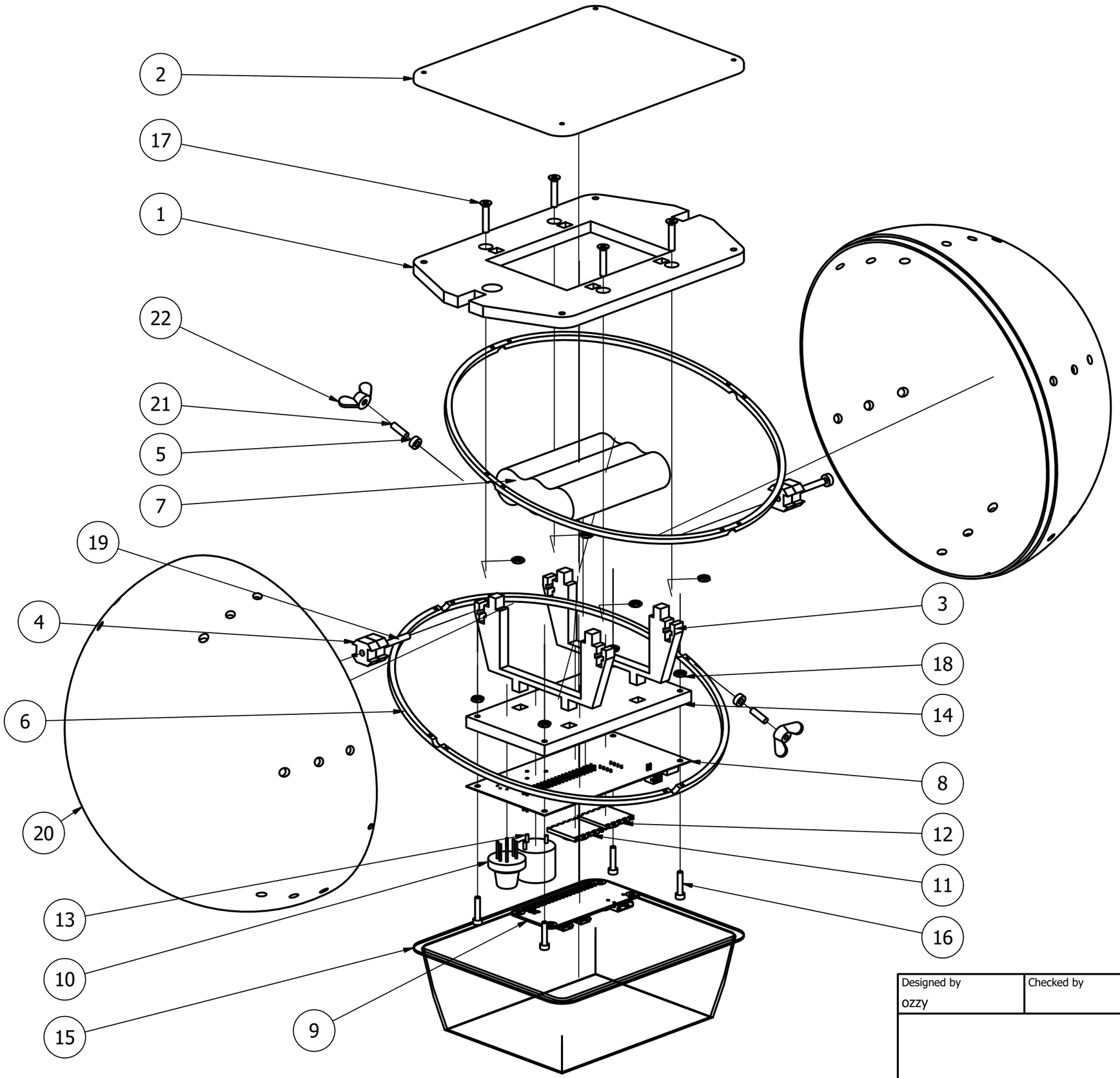




Designed by	Checked by	Approved by	Date		Date	
ozzy					02/05/2020	

prototype air quality monitor	Edition case	Sheet 1 / 1	

Discussion
Final Design



PARTS LIST		
ITEM	QTY	PART NUMBER
1	1	top_plate
2	1	2W_6V_solar_panel
3	2	vertical_support
4	4	shaft_support
5	4	Bearing MR63ZZ 3x6x2.5
6	2	clamp_inner
7	1	6600mAh battery
8	1	PCB
9	1	piZero
10	1	MQ131 Ozone Gas Sensor
11	1	3SP-CO sensor 1000pm
12	1	3SP-NO sensor 1000pm
13	1	GS NO
14	1	sensor_plate
15	1	weather_skirt
16	4	ISO 4762 - M2.5 x 12
17	4	UNI 5933 - M3 x 16
18	8	ISO 4035 - M3
19	2	Rod_3x17.5
20	2	dome
21	2	3mm threaded rod
22	2	CNS 4373 - M 3

Designed by	Checked by	Approved by	Date		Date	
ozzy					02/05/2020	

assembly-1-2_exploded	Edition	Sheet 1 / 1

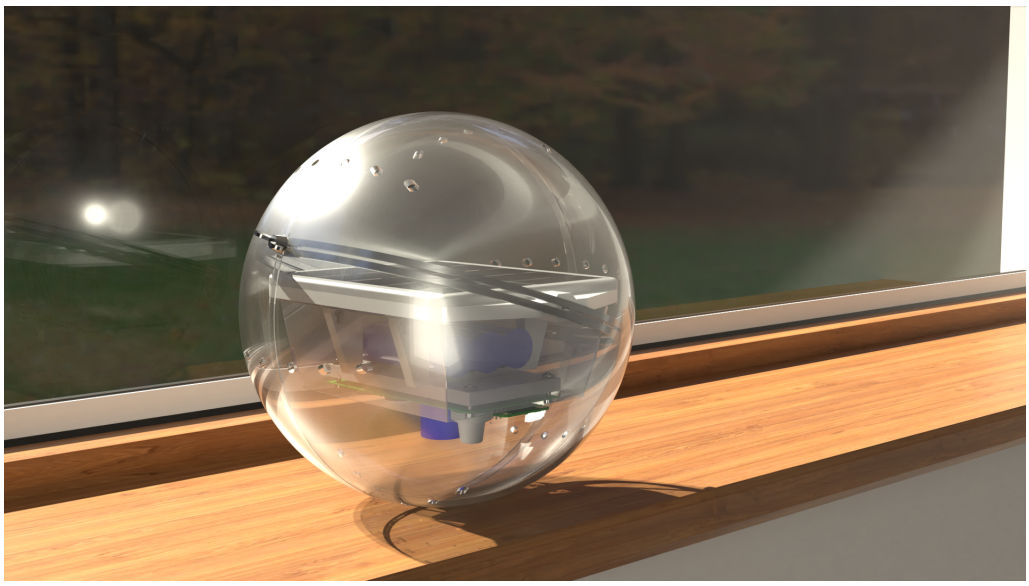


Figure 3.8: Inspection of Wagons during Operation "Davey Jones Locker" Showing 150mm Poison gas shell. From Arison III H. L. (2013) with permission [**?**].

Design for Manufacture

Design for assembly

Cost

cad designs

parts and cost break down?

images

review

Final Design Short comings of prototype FEA final design

3.2 Software

3.3 Prototype Description

[*This section should explain the scope of your developed prototype, explain how it works and how it relates to the whole solution. It should clearly demonstrate the interdisciplinary effort in this development. If interdisciplinary development was not possible (see above) it should be clearly stated in this section and explain why it was not possible to exploit some of the expertise from members of your group. This section should also reflect how the experience of developing this prototype has confirmed or questioned your whole solution and how it may have changed your view on the whole solution or possibly the challenge in general.*]

4. AI model

[*Describe the AI model in the project*]

4.1 Datasets

4.2 Methodology

4.3 Results

4.4 Etc

5. Social implications

6. Discussion

6.1 Critical reflection of proposed solution

[*This section should provide an analysis of how the proposed solution meets accountability, responsibility, transparency and other ethical concerns. It should honestly reflect both the positive and negative impact the solution may have. If the view from the ethical perspective on the solution has changed during the work on this project this section should describe that and explain why the view has changed.*]

6.2 Future work

[*This section should describe immediate and long-term steps after development of the prototype that should be made to achieve the whole solution. If during development of prototype or critical reflection of the solution you come to the conclusion that the proposed solution is not useful or not ethically responsible or the overall challenge should not be formulated in this way (see above), this section should clearly state this case and may omit description of future work.*]

6.3 Teamwork process

[*This section should describe how your group organised teamwork, what communication channels and collaboration tools you used, how you distributed the tasks, what process allowed you to learn from another discipline during this project.*]

6.4 Lessons learnt (project)

[*This section should reflect on the whole project from the teamwork perspective: what was done well, what could have been improved, what would you change if you were to work on another project in this group, what could you recommend for an interdisciplinary team.*]

6.5 Lessons learnt (per discipline)

[*Each member of the group should state what they learnt from another discipline during this project.*]

6.5.1 Person 1

6.5.2 Person 2

6.5.3 Person 3

6.5.4 Person 4

6.5.5 Person 5

7. Conclusions

8. Individual contributions

[*This section should briefly state individual contributions from each team member.*]

Appendix A: Code Etc