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Version history

Version	Date	Person	Note
V0.1	04-02-18	Jesse Bouwman	

1. Preface

This document is used to determine which batteries we need to have for Willy. It contains the calculations of the maximum energy consumption of Willy the garbage robot and the needed battery capacity. The dimensions in which the batteries should fit are also mentioned in chapter three. The final chapter is our advice to Art of Robotics for which batteries we should get for Willy.

2. Capacity

This chapter is about the energy use of Willy the garbage robot. To know how much capacity the batteries need it is needed to know which parts use energy and how much they use.

Energy consumption

There are several parts in Willy which use power to function. In the table below are the parts and their maximum energy consumption as well as the calculations to determine the maximum used power in total.

Part	Number of parts	Voltage(v)	Amperage(A)	Wattage(watt)	Total wattage(watt)
Motors	2	24	20	480	960
Computer	1	19	3.3	62.7	62.7

Part	Number of parts	Voltage(v)	Amperage(A)	Wattage(watt)	Total wattage(watt)
Arduinos	5	5	0.046	0.23	1.15
Duster	1	12	25	300	300
Stepper motors	2	12	1.7	20.4	40.8
Screen	1	19.5	3	60	60
Total:					1424.65

Battery capacity

The capacity of the batteries for the robot is depending on the time that Willy should drive. We estimated that it would be nice that Willy could drive for 6 hours before it needs to charge.

If the power consumption of the robot is 1424.65 Watt, it is 1424.65 Watt/24V = 59.36 Ah. The current batteries are 60Ah each. This means that if we want to use Willy for at least 6 hours, we need 6 batteries of 60Ah with a total of 360Ah.

3. Dimensions

There are several options for fitting the needed capacity in Willy. One of them is six batteries of 60Ah of which we could fit four in the rear-part of the frame and two in the box which is used for the current batteries. The battery bracket is 418*180mm. Most of the batteries for sale are at least 230*170mm so the only way two batteries will fit in one tray is to turn them 90 degrees. Even then the bracket of the frame must move about 50 millimetres to the front of the robot. The problem with this solution is that there will be no room for another set of two batteries unless we remove the current battery case. With that in mind the drawing underneath is made. The bracket is deleted and the current battery case has been removed. This way the six batteries of 60Ah each could fit inside the frame.

Another option is to use 180Ah batteries which are larger but only two batteries are needed. The

bracket in the frame must be (re)moved because of the 180Ah batteries being at least 500mm in length. When laying these down there is room for two batteries next to each other.

4. Advice

Both options are possible for Willy. Our preferred option is to go with six 60Ah batteries, because with six smaller batteries the layout of the design is more flexible. There is a possibility that the design changes and for that flexibility is important. Another reason to use the six batteries is that these could be placed lower under the frame. Our advice is to keep the batteries as low as possible in the frame because the centre of gravity is lower which increases stability during driving.

5. References

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