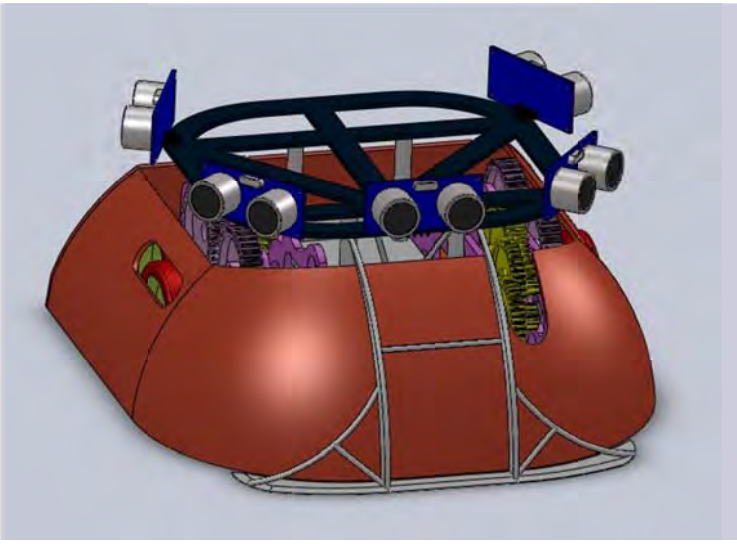
Sumobot Design Proposal

Dillon MacEwan 211285035



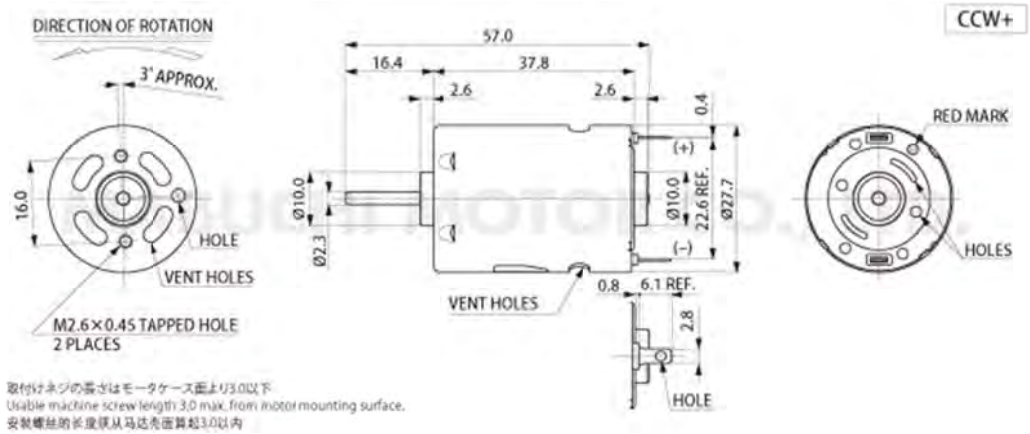
Materials:

The base, body and ultrasonic mounting plate are to be made from ABS, PP or Melamine plastics, sourced from recycled printers and plastic table ware – after comparing the densities of these plastics to aluminium, the weight difference was significant.

The battery box on which the Arduino Uno PCB and Popolu MC33926 (not illustrated) are mounted is to be 0.9mm sheet Aluminium. The Arduino was chosen for its ease of use, and the MC33926 for its higher current capacity.

The Motor and Gears have been appropriated from a Toy's R Us remote control jeep and are to be adapted for the sumobot.
The Motor is an RS 380 SH 3750:

Model No.	Main Performance									
	Rated Voltage	No Load		At Maximum Efficiency					At Stall	
		Speed	Current	Speed	Current	Torque	Output	Eff.	Current	Torque
	V	r/min	A	r/min	A	g.cm	W	%	A	g.cm
RS-380SH-3750R	9.0 CONST	16,500	0.45	13,966	1.96	85.2	12.67	71.68	14.67	700



3 reduction gears are used: 2x(12T/38T) and 1x(12T/40T) – which equates to a gear ratio of ~33.4:1, and which will reduce the ~14,000 rpm to ~420rpm, and increase the Torque to ~2.85kg.cm – the 2A running current per motor is the reason why the Popolu MC33926 motor shield was chosen.

The housing is to be fabricated from 25x50 x 3mm wall Aluminium section – the 3mm is what I have freely available, though I may opt for 2mm wall to reduce the weight. All the gear axles and bushes (not illustrated) are to be Delrin.

At ~420rpm, 50mm diameter wheels move the Sumobot at 1.1m/s, which is desirable. The wheels are to be made from HDPE or Delrin, and I'm designing for 6 wheel drive, with silicone tyres for extra traction – I'm also looking at experimenting with suction cup tape, provided there are no rules against it! Differential steering is to be used.

For the batteries I'm considering Energiser Ultimate Lithium – 3 or 4 in parallel, weight and budget permitting.

Line sensors will be IR units – either 4 or 6 – mounted at the perimeter of the base (not illustrated) – and 5 ultrasonic sensors mounted on top of the bot for obstacle/enemy detection.

The flipper is to be made from 1.5 or 2mm stainless steel rod and 0.33mm stainless steel sheet, and powered by an MG996R hobby servo, which can provide 10kg.cm torque (not illustrated). The flipper may be abandoned if I cannot make it work under the weight allowance.

So far the estimated weight of all the components listed comes in at approximately 920g – some items have been estimated, so may come in a bit heavier, and an accurate figure for all the small items of hardware such as nuts, bolts, screws, glues, LED's, switches, solder etc. has not been calculated. Given the motors being used are quite power hungry, it would be good to maximise the amp hours available by increasing the battery quota. Further weight loss may be possible though choice of materials or more perforation.

Much of the drive and body has been acquired as obtainium (stuff available for free), so most of the budget so far has been allocated to batteries and the motor shield. Spare motors will be also acquired, in case of motor failure.

Enable 3D View

Enable 3D View

Enable 3D View