



TECHKRITI'24



ROBOGAMES 2024

Robowars

Date: - 29/01/2024

TEAM INFO

Team name: **METAL BRAWLERS**

Team leader's name: **CHRIS MORANG**

Contact details of team leader:

Contact no.: **8724808140**

Email ID: **chris.morang.official@gmail.com**

Number of members in the team (max 6): **6**

Weight Category: **15Kg**



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MEMBERS:(other than leader)

S.no	Name	Tech Id	Email Id	Contact no.
1.	CHRIS MORANG	2401800	chris.morang.official@gmail.com	8724808140
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Introduction

(in about 300 words)

We started with exploring various kinds of various weapons possible for our bot. First we thought of a bot which lifts the opponent by using some spring mechanism. But it was discarded because of its poor defence mechanism. A lot of vulnerable parts were getting exposed. We then considered many different possibilities such as an external hammer with a bot, a flipping bot





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which can attack from both upside and downside. But again each of them had some technical vulnerabilities, so had to discard them. Finally we decided to go with the vertical spinners because of its few major advantages over others. Firstly, it'll be a very compact bot with very little part exposed for the opponent to attack on. Second, its centre of mass will be pretty low and most of its part will remain attached to ground. Due to that, the movement of the bot will be more stable and hence easier to control. Next major advantage of the bot was that in most other options we considered, the weapon was a different external piece that was attached to the body of the bot. But in that case, the weapon was a part of the bot itself and there was no chance of the weapon getting disattached from the bot.

Component Details and Specifications:

(List all the components used in construction)

A. MECHANICAL (WEAPON)

Our weapon system belongs to the category of '*Vertical Spinners*.' It is an asymmetric weapon with its axis of rotation passing through the centre of mass.

The choice of using an asymmetric weapon is inspired by the fact that while symmetric weapons are similar to the enemy's weapons and attempt to outmatch and overpower them, asymmetric weapons engage the enemy on terms that maximise one's own advantages while minimising the enemy's relative size and technological advantages.

The Moment of Inertia of our weapon is, $I_{zz} = 5.773E+06 \text{ g.mm}^2$, which is a balanced value, in the sense that, it is neither too high for the motor to reach its maximum rotating speed nor too low for itself to store enough energy. A design with low moment of inertia and high angular velocity is used to transfer large amounts of kinetic energy to the opponent bot, making it an excellent Combat Robot.

It is constructed using hardened *EN24 STEEL*. The choice of material and design of the weapon makes it lightweight yet sturdy.

The weapon is fitted to the shaft using Tight Screw fit.

A pulley system is used to connect the weapon to the motor as it provides better space management and allows the outer armour to take damage keeping the internal components protected.

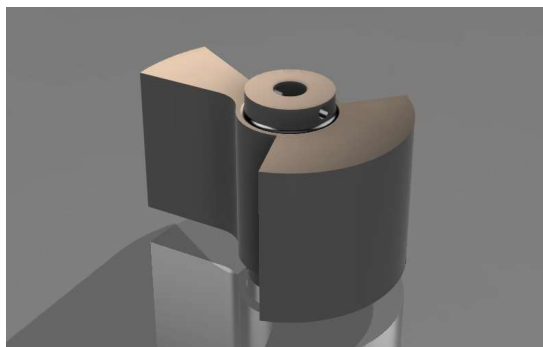
The weapon has a locking bar which prevents it from moving when not in the arena.

Other Specifications:

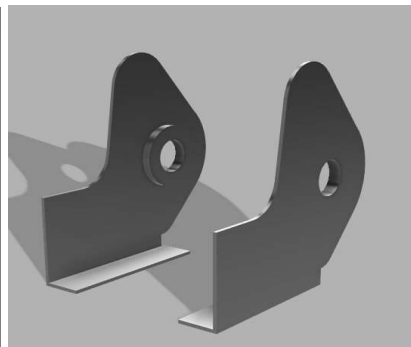
Mass: 3323.916 g

Volume: $4.234E+05 \text{ mm}^3$

Physical Material: EN 24 Steel



Weapon Image



Weapon Sub-system



WEAPON MOTOR

Given the weapon design, we chose a *550 kv rating BLDC motor* to provide the optimal balance between torque and rpm to the weapon.

Specifications:

Motor KV : 550 RPM/V

Weight : 378g

Max Continuous Current: 60A

Max Peak Current: 80A(2 seconds)

Max Peak Power: 4000W(2 seconds)

Drive Frequency: 8KHz



B. WHEELS

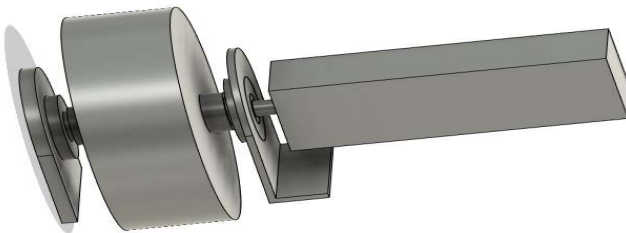
The wheel has a diameter of *14 cm*. It extrudes out a few centimetres from the top and base of the chassis, so that the robot functions even if it is upside-down. The wheels used have a shaft which is attached to them using a key. The shaft is then attached to bearings on its two sides, which are in turn attached to *Aluminium Clamps*. The shaft of the motor is



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attached to the wheel shaft using a coupler; hence the wheels are directly driven.



MOTORS

To get a rotational speed of 700-800 rpm, we choose an 800 kv rating BLDC motor along with gears of reduction ratio 20:1 for high torque and high spinning wheels.

Specifications:

Type- Planetary

Gear material Cold Rolled Steel

Reduction ratio 20:01

Nominal Voltage 24 V DC

Weight 595 Gram

Motor Size: 42.8 x45mm

KV: 800KV

Max watts: 1210.7W

Max Current: 58.6A

No Load current: 1.70A/10V



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C. ELECTRONIC SPEED CONTROLLER

Having the knowledge of maximum amperage draw, we select 80 amps ESCs for both wheels and weapon motors with the following

Specifications:

Burst Current: 100A

Constant Current: 80 A

Throttle signal refresh rate (Hz): 50 ~ 432

Weight: 93 gm

D. BATTERY

After selecting the motors, we choose an appropriate battery to supply power to the wheel and weapon motor. Considering the voltage and current requirements of the motors, an 8000mAh 6s 25c Lipo Battery is used for the purpose.

Specifications:

Capacity: 800mAh

Voltage: 22.2V

Maximum discontinuous charge: 25C

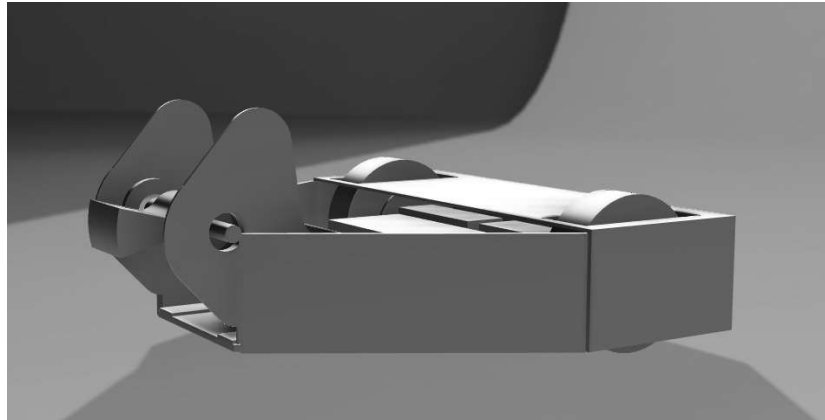
Weight: 1048 gm

Dimensions: 170*65*45 mm

E. CHASSIS

The robot is covered with sturdy armour made up of Aluminum. It has 2 wedges made of steel at the front end half-circumferencing the weapon, so that the opponent bot first touches our weapon and then the chassis which enables our bot to attack first and prevents the damage to the chassis.

Image of chassis:



F. RADIO COMMUNICATION SYSTEM

Flysky FS-iA6 is used as a receiver.

Specifications:

Operating Voltage (VDC): 4.0~8.4 V

No. of channels: 6

No. of Band: 140

RF Range: 2.4055-2.475 Ghz

Antenna Length: 26 mm





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Any information you would like to share

(E.g. discuss any other tournament/competition you have participated/won in any institute,etc.)

1. TECHKRITI' 23 (RANK 3)
2. TECHNICHE' 23 (RANK 4)
3. TECHFEST' 23 (PARTICIPATED)