Project Milestone 1: Spicy Killa Bytes

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1 Model and Dimensions of Robot

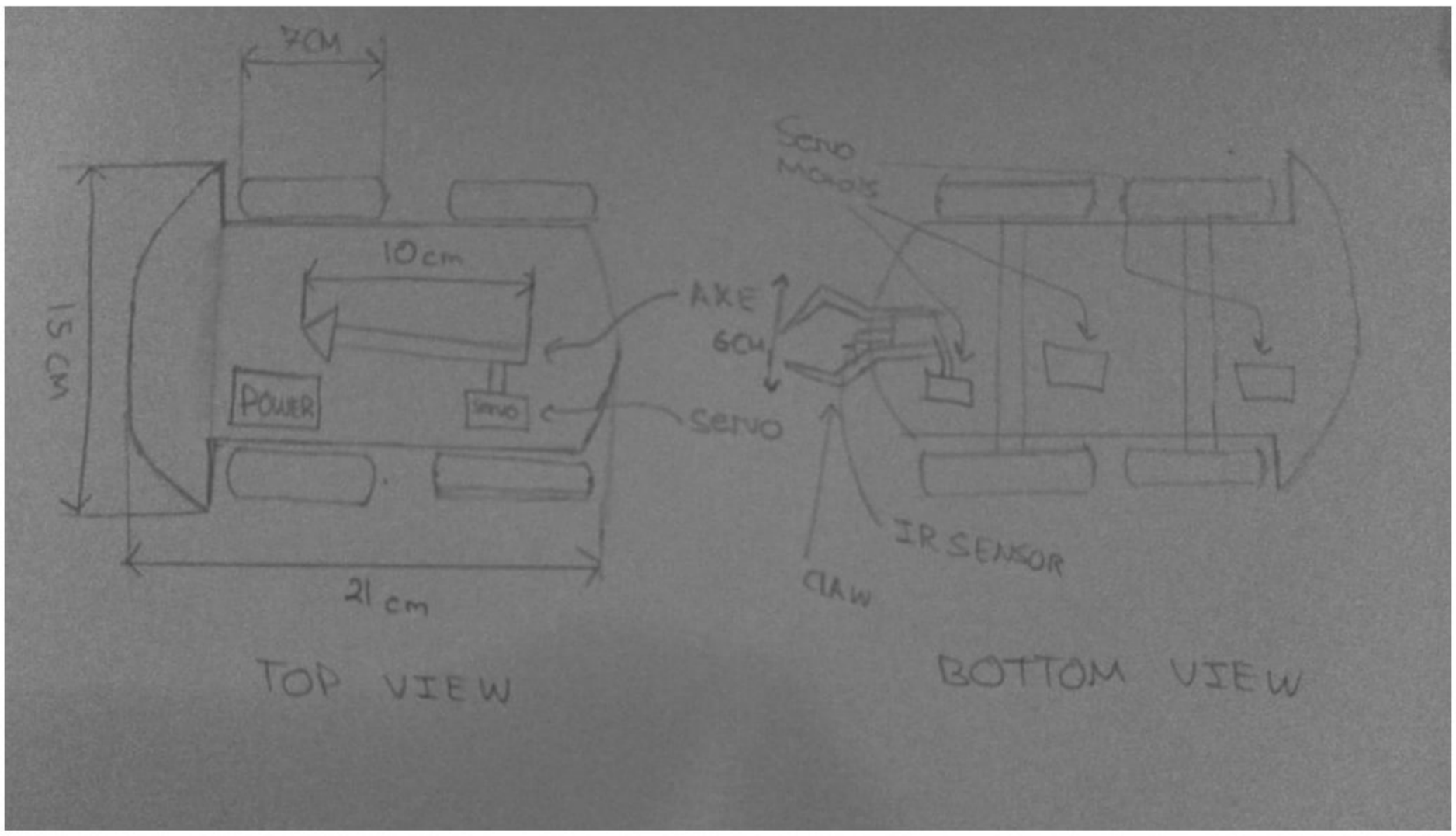

Figure 1: Model of Robot

2 Specifications

2.1 Mobility Mechanisms

The mobility of our robot will be the area that it excels in most. Our robot will essentially have a sturdy and compact frame which will provide it with the stability and force necessary for an aggressive game plan. We intend to be lightweight and agile to avoid enemy attacks. The system will consist of four wheels each driven by a motor, able to provide sufficient speed as well as enough power to push a comparably sized vehicle (to increase mobility even further, the wheels may be independently powered). Moreover, the axle will have an axis of rotation so the robot will have multiple options of what direction to move in. Our robot will also be equipped with sensors so that it can navigate the arena with ease. To achieve a feasible sensor system, all electronic components are evaluated and the most effective sensors are chosen. Another aspect that will add to the mobility of our robot is that the robot will be modular so it can discard any module mid-fight if we see fit to decrease the weight of the car.

2.2 Attack Mechanisms

Our primary attack will be to destroy the wheels of the opponent rendering them unable to move. This will be done with the help of a servo motor to provide high torque, a claw-like attachment to 'bite' the opponent's wheels, and a proximity sensor to gauge when to attack. Another attack that is required to be developed is an axe attack in case the wheels are unable to be destroyed if the enemy does not use wheels or have protection. The axe attack will be driven by utilizing elastic potential energy stored in springs to be able to deliver a killer blow to the enemy robot. After the attack is done, the axe can be left within the enemy robot's body (if their robot has not already stopped working) and disrupt their center of mass or the axe can be rewound to its initial position to launch another devastating attack. The drawback of this axe mechanism is that it can increase the weight of our robot and also will have a longer reload time.

2.3 Defence Mechanisms

One of the aims is to identify the opponent's location and how to avoid them. All required information will be derived by the components chosen as proximity, distance, and range finder sensors. Until we disable this mechanism, the robot will automatically be avoiding the enemy by doing a 'tactical retreat'. The robot will then switch over to manual control (once the axe mechanism has reloaded) to be able to deliver a precise blow. With our robot being lightweight, it is prone to be flipped onto its back by the opponent. To combat this, we will have a spring-like attachment onto the top of the robot so it can flip back into its correct orientation.
Since our objective is agility in our robot, it will be able to dodge out of the way of any physical attacks. In case the opponent has a firearm, we will also have a shield attached to the front of our robot so it can deflect any projectiles launched at it.

3 Materials and Costing

All items that will be used in the construction of the robot should be cheap and easily manufactured. The materials of each part of the design are decided according to the density of the materials and their strength. Each part and its pin and connection members are also designed. The weight of the sensors, control unit, motors, and gears should be considered. Metal would be appropriate for the main construction of the robot especially because of its high resistance against attacks and strokes. However, it should be taken into account that metal use will also increase the unit weight. Therefore, Aluminum is chosen as the construction material of the body system. Aluminum would be the best material for our robot. It is very strong and has the lowest density of all of the common metals available. Another important subject is the properties and charge duration of the power supply. For our robot, we will be using rechargeable batteries. According to the battery charge's duration and the voltage values range, battery weights are changed. So the choice of the battery should be decided according to the current values of all electronic components.

Type	Attachment	Usage	Price
Sensor	Proximity Sensor	To determine how far the enemy robot is from our own and to launch our bite attack once the enemy is in the threshold	Provided by faculty
Sensor	IR Sensor and Remote	To be able to have manual control over our robot	Provided by faculty
Sensor	Gyroscope and Accelerometer (MPU 6050)	To determine if the robot is upside down	Rs.300
Utility (Defense)	Aluminum or Acrylic Shield	Protection from projectiles	Using from previous projects at Habib
Utility	Rechargeable batteries	To power the robot	Rs. 200 per piece (Amount of pieces is tentative)
Utility	Continous servos S3003	To rotate the wheels of the car	Provided by the faculty
Utility (Mobility and Attack)	Servo motors	To provide torque to the axe attack and control the direction of the wheels	Provided by faculty
Utility (Attack)	Axe and Claw	To be able to destroy our opponents with ease	Tentatively $\leq$ Rs. 500 (Will be built)

Table 1: Components of the Robot

4 Sustainability

Because of the continuous attacks from the opponent, some parts of the robot could be broken down. One idea to make sustainability a theme in our project is to modularize our robot which goes with our original design intention of making speed the base of our robot's capabilities. Whenever a module is disconnected and ejected during battle, the speed of the robot will increase which would be in our favor. Having modules that can disconnect from the main body of the robot would permit us to dismantle it with ease after the completion of this project.

5 Distribution of Tasks

Hamna: Documentation, Arena Volunteer, Control Logic
Mustafa: Sensors, Shooting Mechanism, Structure Hardware
Suleiman: Mobility, Integration, Testing

6 Arena Contribution

Our arena volunteer acquired the necessary spray paints and, along with four other volunteers, assisted in assembling and painting the boundaries of the arena as a way to contribute to its development.