Team 09

Design Robustness

Through prototyping the rescue robot's individual components, the design seen in ***Figure 1*** was determined as sufficiently robust to address the design challenge. Initially our robot arm utilised a scooping mechanism, however we opted for a claw instead, consisting of two parallel "wall-like" 3D prints moving together to have a more reliable hold on the tennis ball victim, shown in ***Figure 2***.

Further, the final wheels' robust design is the result of prototyping multiple wheel sizes and configurations to ensure the robot could clear the uneven terrain without damaging its components. The Arduino, other electronics and 3D printed claw mount are secured to the acrylic base with screws.

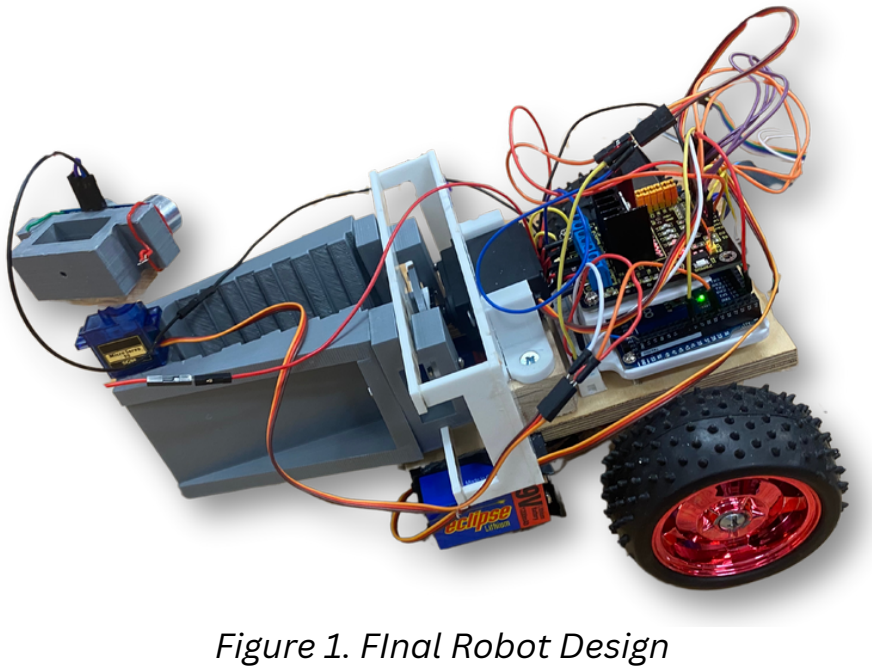

Figure 1. FInal Robot Design

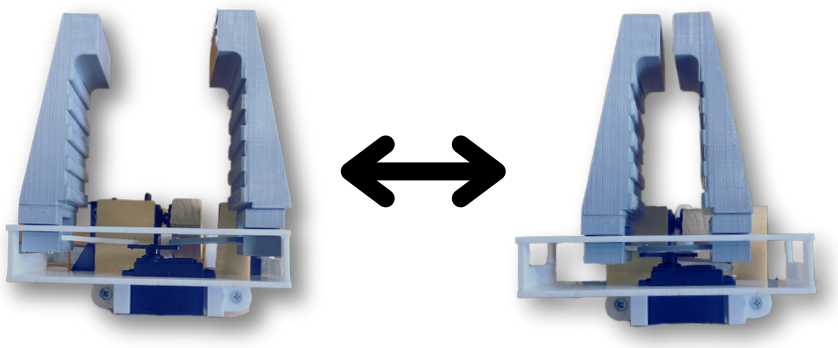

Figure 2. Open/Closing of Claw System

Engineering quality

The robot incorporates a range of components to fulfil the design challenge in a functioning and cohesive manner, while remaining just below the size constraint of 250mm in height and diameter. The two simplistic wheels were implemented as opposed to treads or other methods of transport to reduce overall costs. To compromise the loss of climbing ability, relatively large wheels powered by stronger motors were opted for.

Moreover, the claw mechanism of ***Figure 2*** can be rotated down for victim collection, then returned upwards to safely lift the victim off the ground without dragging them, improving victim safety and robot durability.

Finally, an ultrasonic sensor mounted on the robot's front side enables object detection through the visual aid of a radar, ***Figure 4***. The information is provided to a remote operator for navigation of terrain and victim location.

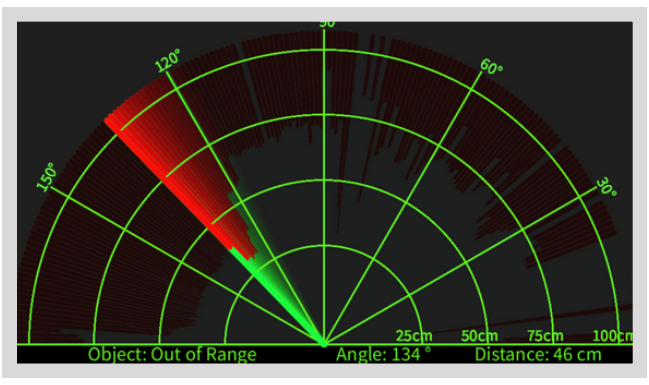

Figure 4. Ultrasonic Sensor Object Detection

Aesthetic Appeal

The design incorporates the shape theory in order to produce a robot with aesthetics centred on reliability, following the philosophies of Bauhaus in which aesthetics is a support to function. The robot's components are mainly cuboids and other geometric shapes, visible in ***Figure 1***, which are closely linked with stability, allowing the victim to find assurance in the visual appearance of the robot. The geometric shapes also partially contribute to 'cleaning' the aesthetics of the robot by defining the components of the robot in simple shapes.

The wheels of the robot feature unnatural hues of pink, see in ***Figure 3***, which adds to the flair of the robot whilst enabling the victim and other rescuers to easily find, and recognise the robot in the midst of the disaster. Furthermore, the colourful assortment of wires seen in *Figure 1* provide practicality in its aesthetics with instant recognition from the dusty surroundings.

Figure 3. Large Pink Wheels

Innovation

Our rescue robot improves upon the traditional four wheels found in regular RC vehicles, employing a unique mechanism to reduce the weight of our robot whilst enhancing functionality. At the front of the robot, a stepper motor controls a vertical shaft with 3D printed wheels. The shaft has a 180 degree angle of rotation, allowing for manipulation of the robot claw's angle in relation to the ground. This design allows the claw to reach and recuse the victim, then return to its original heightened position to ensure that the victim is not harmed during transit. Furthermore, the rotating shaft design allows the robot to change its angle of orientation when climbing stairs and obtacles ensuring that it does not get stuck no matter the size of obstacles.