Hardware Summary 1

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PORTABLE CARRIER B

ME 486C - 003

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Summary of what we did

The team constructed a prototype of the tank to be used as a portable carrier. An estimation was made that a force of 20lb which will be used to push the device up the stairs. The original design was comprised of 6 motors which we realized did not have enough torque to go from a standstill nor enough power to climb up the stairs. During testing it was noted that there was a need for additional 10lb of force so that it could move up the stairs. Another option was to increase the number of motors so as to increase the amount of torque and power or to use fewer motors that had a lot of power. The design used tires instead of tank trends and this proved to be a bit challenging since there was not enough ground clearance and the tank stopped halfway due to lack of momentum. Also, during testing of the tank, one of the wheels broke since it was not strong enough. However, when the tank is placed on the ground it moves at an appropriate speed when it is fully loaded. The only problem arises when climbing the stairs.

We also build the tank treads out of wood. In this case a piece of the belt was glued with a loop around it to be used as the tread. There is also the inclusion of a tensioner on the belt so that it is able to supply enough pressure hence avoid the wheels from losing traction while in operation. However, the trend material used for the inner portion is able to work well with wheels or gear which have matching teeth. A major challenge is that the material is quite slick hence there will be poor traction especially is it is used on the outer portion of the tread that will be touching the surface of the ground or stairs. Another challenge linked with this design concept is the fact that while the tank is climbing up the stairs the only contact will be the edged of two to three steps. this is quite challenging since the surface area involved is small hence poor traction. In addition, there is the problem of the treads staining the carpet or any other kind of materials it comes into contact with.

However, the team made a choice of using lightweight motors so as to provide a good amount of torque. In this case the original design of using 6 motors was underpowered hence making the tank not to climb the incline from a standstill position. There was a need to provide assistance by use of a hand. This means that the problem could be solved through the addition of an additional six motors to facilitate efficient climbing without any form of assistance. The original idea of gluing two pieces of tread back to back did not work as it was intended to and as a result there was a need to purchase connectors specially designed for this kind of belt. These new connectors are made up of metal, but the major challenge associated with them is where to get them. Since the only company which supplies them is located in Germany.

Activity for each individual

Every team member was assigned a task to complete and details are as discussed below.

Ahmad

He was given the role of searching the appropriate motors for the project and then select the most suitable one. In this regard, he will be required to do an individual analysis on the gear motors ratio and how it works. In addition, he is also tasked with increasing the number of motors from 6 -24. The number of motors will correspond to the number of wheels. This increase is tripled and is of great significance since it will increase the torque and power of the device which will in turn make it have the energy to move up the incline.

Abdullah

He was given the role of developing a CAD model for the wheel as a parametric design until an accurate tank thread that was going to be used was achieved. In this case he will carry out an analysis of the teeth both at the bottom and above the wheels so that it will match the conveyer belt selected.

Abdalaziz

He concentrated on designing the hand that was going to be used in getting the device in and out of the car trunk by use of a crane. Details of the electric arm are presented in the diagram below.

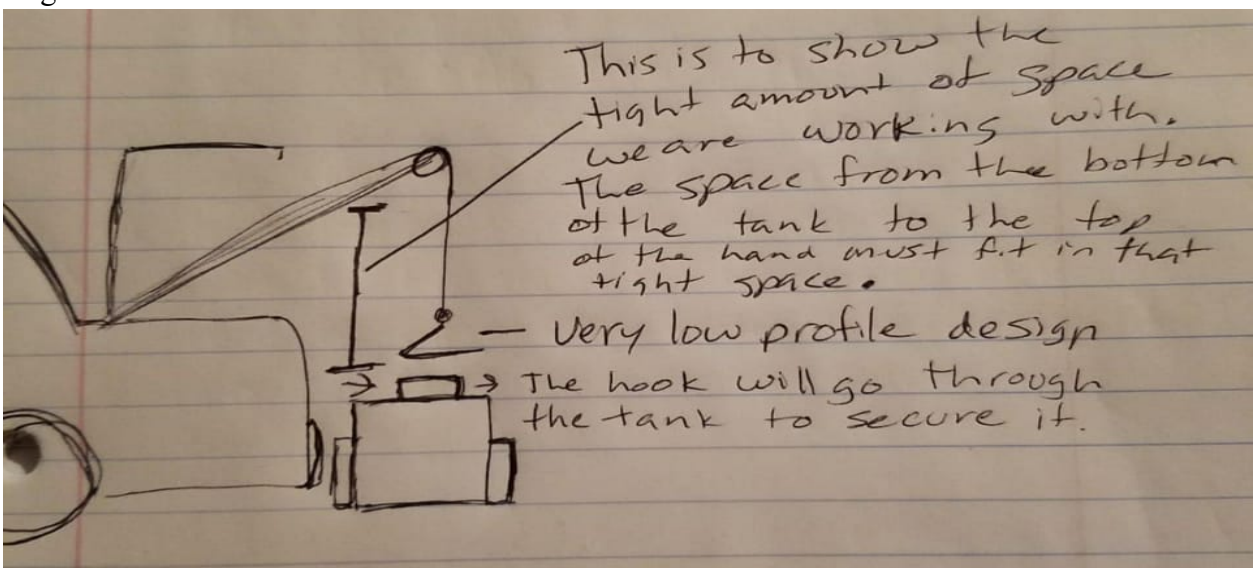

Figure 1: Electric arm

From the side view the hook appears skinny but the real appearance is evidenced when it is viewed from the top and it is 3". This width will enable the hook to be connected to a 3" wide tow strap. This width in both cases is appropriate enough since it will make the device to be stable. However, he will conduct an individual analysis of the electric arm to determine the effectiveness of taking the device in and out of the trunk. The motor which will be used in the winch will have a controller so as to facilitate smooth operation.

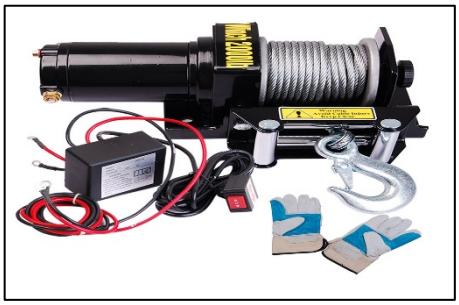

Figure 2: Winch

Saleh

His major task was linking the motors with a 12-volt battery and also, placing a button to power on the device. In this manner, he will ensure that the tanks ready for testing so as to determine its effectiveness. Areas which will require improvement will be identified and appropriate action will be taken.

Action items for each team member to reach hardware 2

Ahmad

After searching the appropriate motors for the project, Ahmad was required to do an individual analysis on the gear motors ratio and how it works. In addition, he is also tasked with increasing the number of motors from 6 -24. This increase is tripled and is of great significance since it will increase the torque and power of the device which will in turn make it have the energy to move up the incline.

Abdullah

In developing a CAD model for the wheel, there was a need for developing an accurate tank thread. The major action that Abdullah needed to conduct is conducting an analysis of the teeth both at the bottom and above the wheels so that it will match the conveyer belt selected. The wheels will be 3D printed and as result files required to conduct 3D printing will be made by use of a sample tank tread. Since the teeth of the bottom wheel are more open than the treads going around the top wheels, there is a need for redesigning the teeth so that they match. In this regard, the teeth at the edges will be minimized but at the center, the portion will have larger teeth. Specifically, the wheels will be designed so that they will be 2 inches in diameter. Also, instead of a straight hole, it should be designed in a ‘d’ shaped manner so that it is able to match the shape of the motors.

Figure 3: Design for the wheels

Abdalaziz

He concentrated on conducting an individual analysis of the electric arm to determine the effectiveness of taking the device in and out of the trunk. In this case, the arm needs to be strong enough so that it could lift the tank without breaking or collapsing. In this analysis the materials which will be used to construct will be analyzed to ensure that the required threshold is achieved. In addition, the arm will be controlled by the use of gears and hence the most appropriate gear ratio will be incorporated to ensure that lifting of the tank is appropriate.

Saleh

His major task was linking the motors with a 12-volt battery and also, placing a button to power on the device. In this case he will make an analysis on the right amount of current that will be appropriate to ensure that the motors operate in an efficient manner as possible. The number of motors that will be served by this battery are 24. In addition, Saleh will work with developing the controlling system for the entire device using remote control.