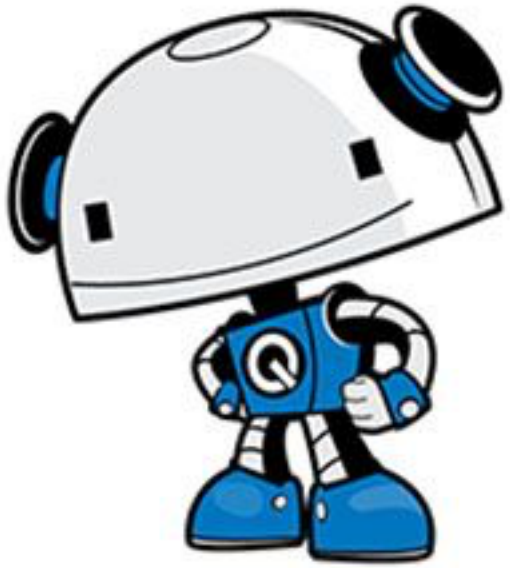
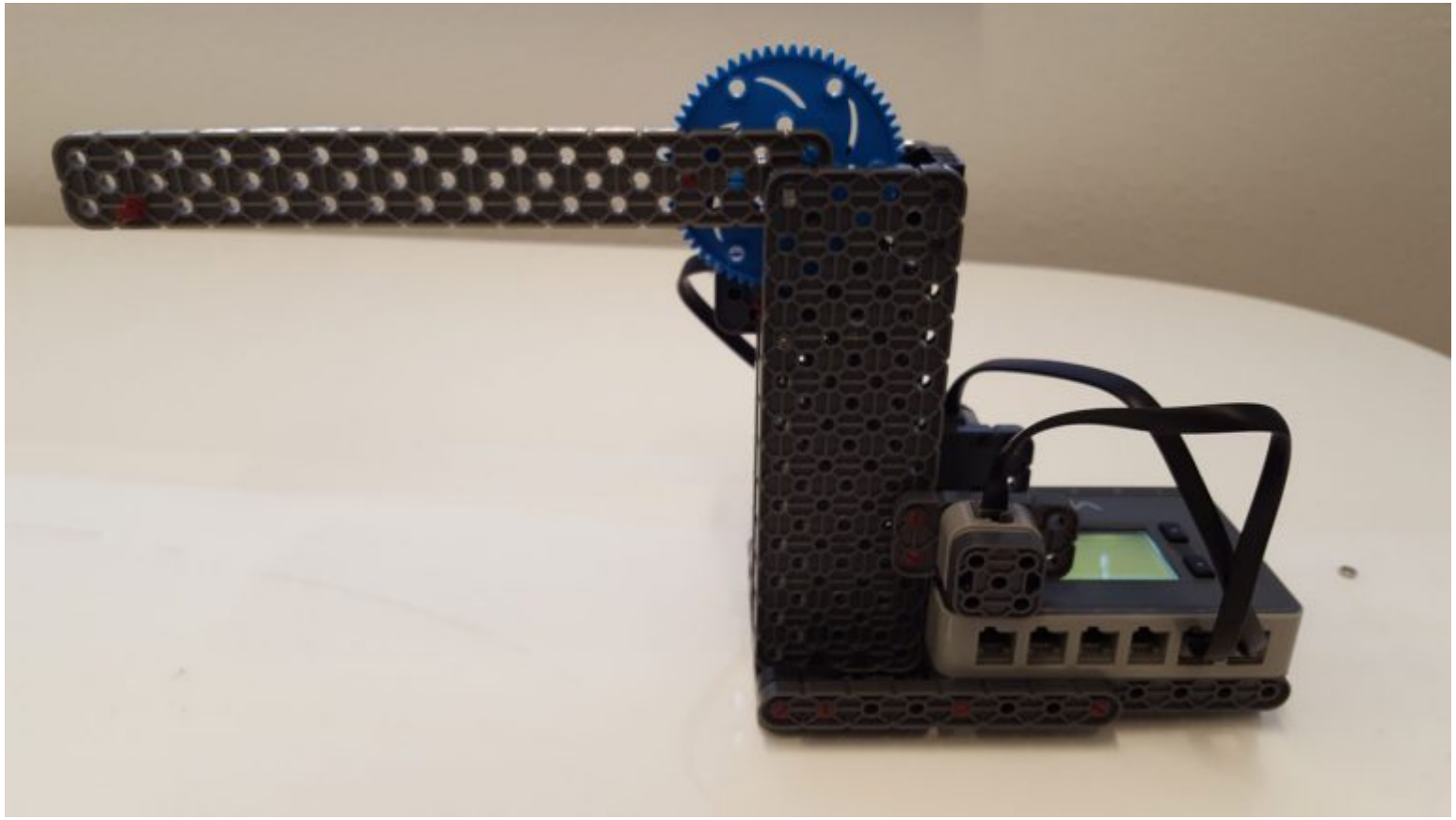


LIFT SYSTEMS

Single Bar Lift

The single bar lift systems is one of the most basic types of lifts which can be used in VEX IQ. Above is a sample single bar lift. The arm is connected to the driven 60 tooth gear, which is connected to a 12 tooth gear for an effective 5:1 gear ratio. Below is another picture of the same mechanism, but from a different angle.



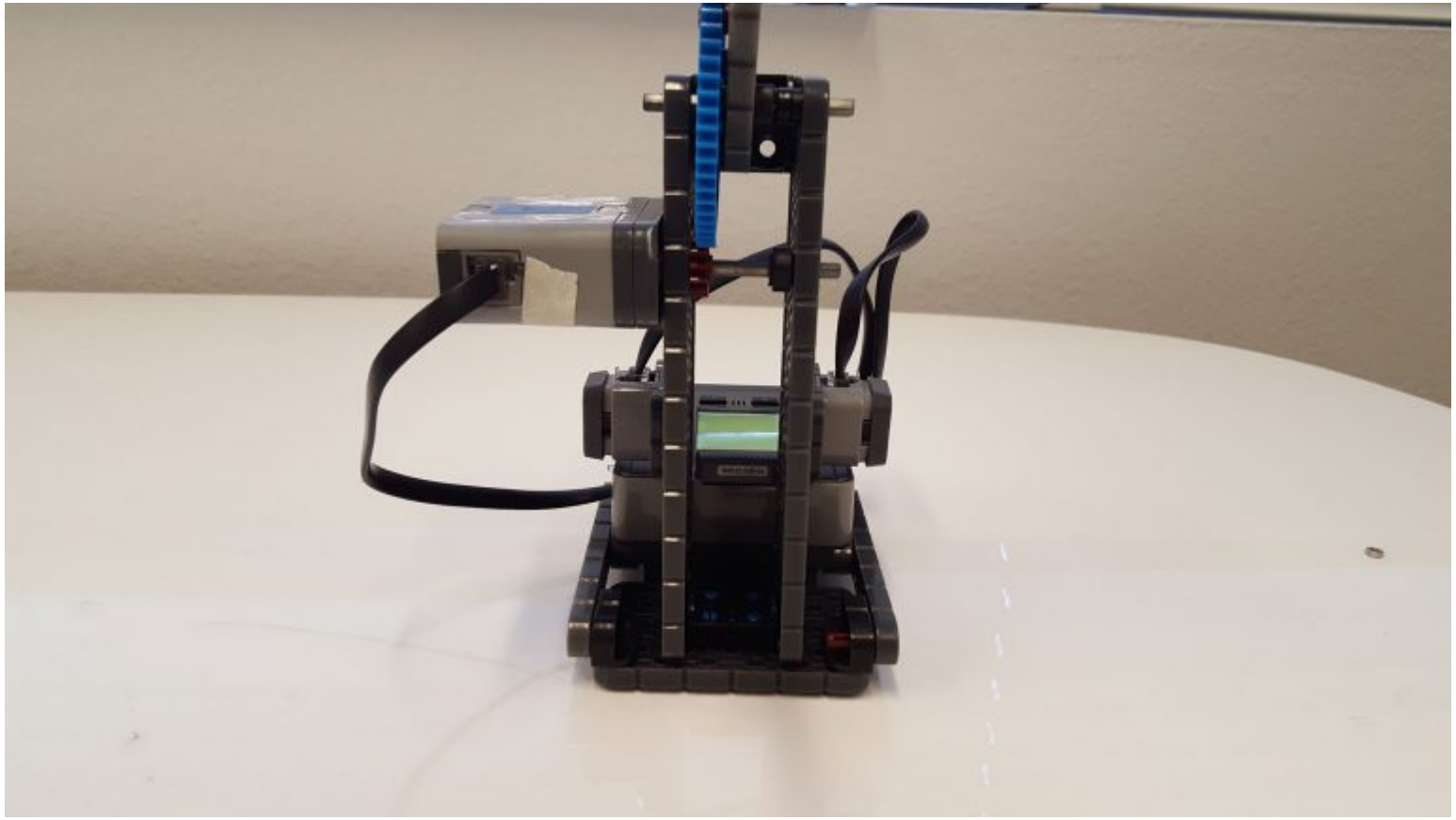
Single Bar Lift

Advantages

- Simple and easy to build
- Easy to fix/troubleshoot

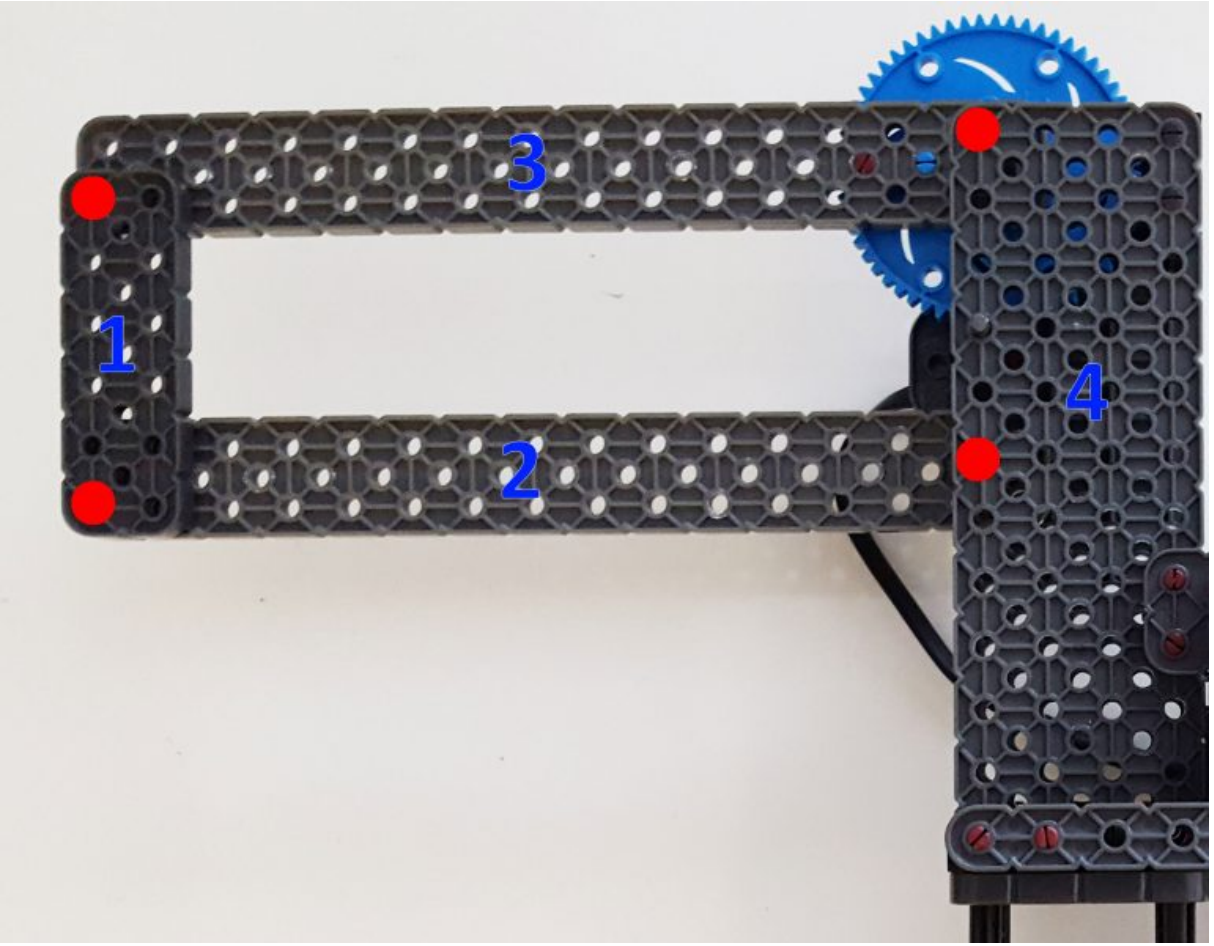
Disadvantages

- The simplicity of this design can sometimes limit your options for the rest of the robot



4-Bar Lift

The reason this lift system is called a four bar lift system, is because it utilizes 4 separate bars (labelled in the picture) to achieve lift. The red dots represent where there is an axle or peg, which are used to connect the bars together. To construct a 4 bar lift, the actual spacing of the bars is what is most crucial to ensuring your lift works well. Note that the vertical distance between the two sets of red dots must be equal. In the example shown, there are 4 open holes between the red dots on bars 1 and 4. Additionally, the horizontal spacing of the red dots on bars 2 and 3 must be equal to ensure bar 1 remains vertical. In this example, the dots are separated by 14 horizontal holes, and 1 vertical hole.(It appears as though the top-right red dot on bar 3 is in the top most row of peg holes, however the axle does in fact go through the center row of peg holes on bar 3.)



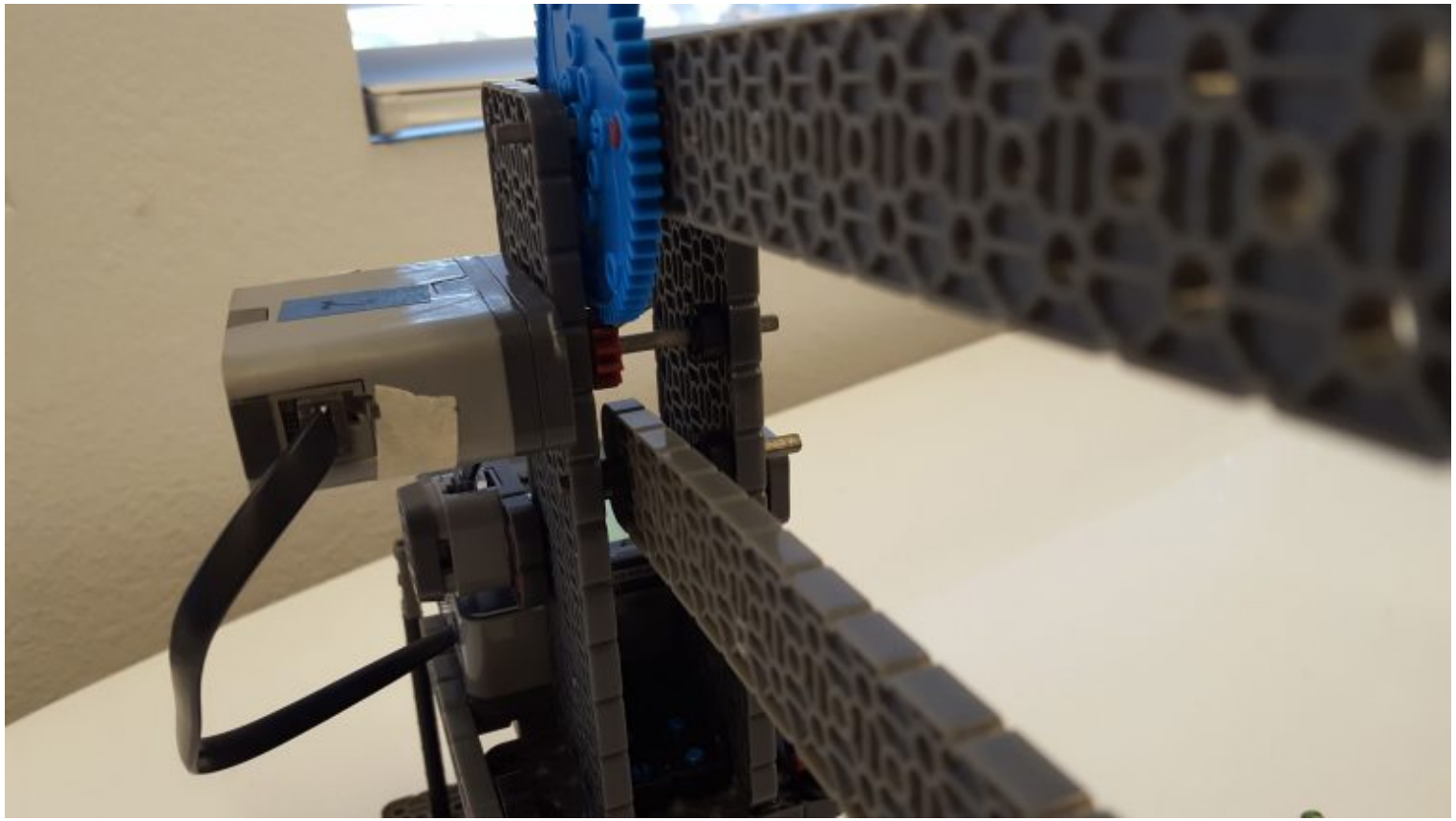
4-Bar Lift

Advantages

•Bar 1 will remain at the same angle throughout lifting process

Disadvantages

•Requires more vertical space to achieve same height as the single bar lift



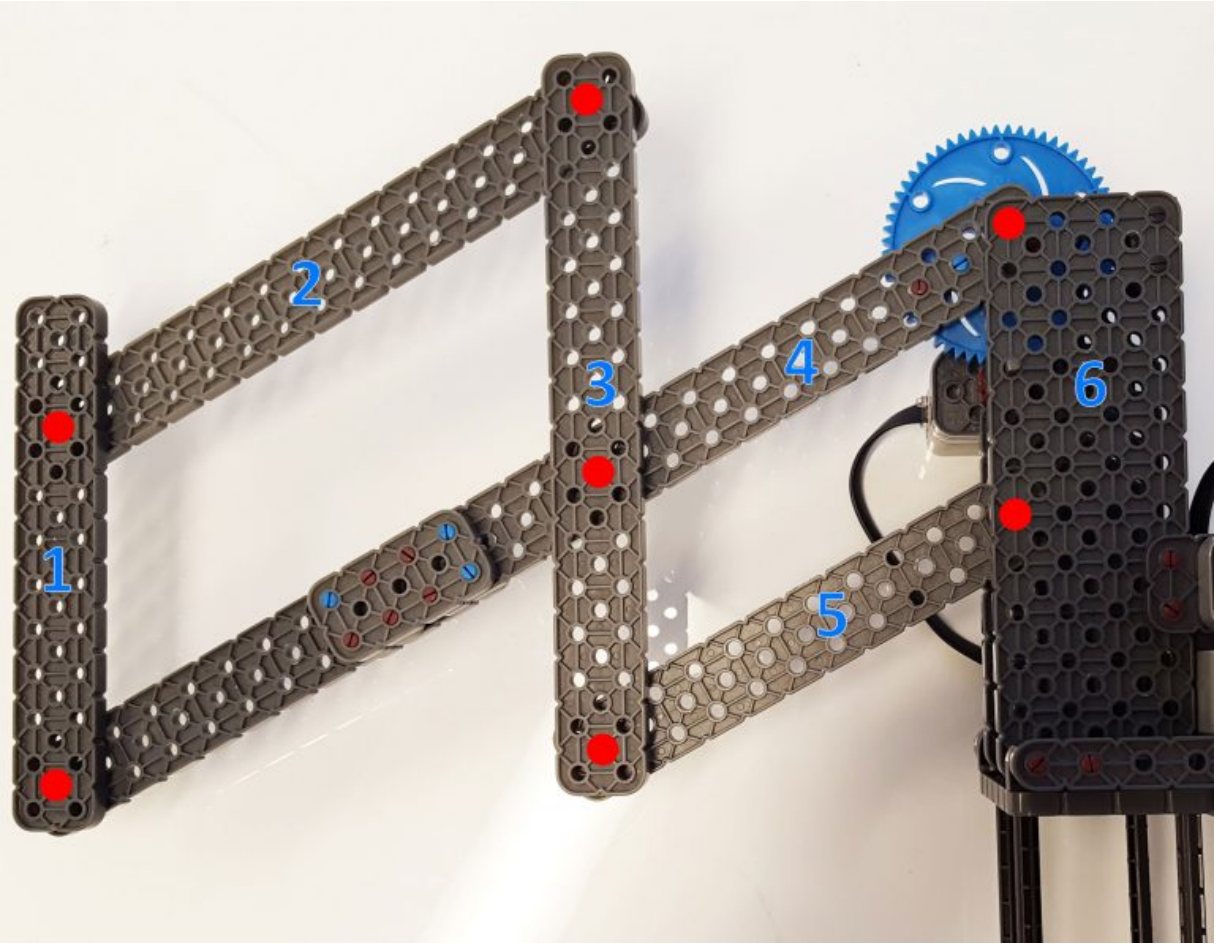
In terms of powering your lift, you can chose to power bar 2, bar 3, or both of them if you choose to. However please note that if you only power one of the two, the unpowered arm must be able to rotate freely. In this example, power is transmitted through arm 3, so therefore arm 2 should be able to rotate freely. In the second picture shown, you can see that arm 2 is only connected to bar 4 (the tower) via an axle, which allows it to rotate freely.

6-Bar Lift

The 6 bar gets its name for the same reason the 4-bar got its name, and that is because it uses 6 bars to achieve lift. Again, the red dots represent where the bars have been joined together, either by using pegs or an axle to allow for rotation.

Just like before, spacing is critical to ensuring your 6-bar lift works well. The vertical and horizontal distance between the red dots on bars 3 and 6 (which bars 4 and 5 are connected to) must be equal, and the same is true of the vertical and horizontal spacing of the red dots on bars 1 and bars 3, which connect bars 2 and 4.

Although it is recommended to keep the spacing of the pivot points(red dots) symmetrical, some teams have taken advantage of the fact that when you space the pivot points unevenly, the angle of bar number 1 will no longer remain constant. I encourage you to experiment with this and to be creative!



6-Bar Lift

Advantages

- Can achieve a higher maximum height than a 4 bar given the same initial starting height.
- Allows the front of the lift system to remain at a CONSTANT angle.

Disadvantages

- More complicated/harder to build than 4-bar and single arm lift systems.
- Can be unstable if not supported correctly.

Design Challenges

- Create a lift which will start below a vertical height of 12 inches, then expand to reach a maximum height of 18 inches.
- Create a lift which can lift 3 lbs of payload