Detachable Spacer

One of the most vexing part of constructing our VEX robot is placing spacers onto shafts. Whether it is assembling a roller, fixing a joint of an arm or installing wheels on the chassis, spacers are always the trouble. For instance, when all things attached to the shaft are fastened, it is impossible to add or remove spacers in between without unfastening and taking off a great deal of collars and other stuffs. Besides, inserting a shaft through spacers in narrow places is so difficult that it usually takes a dozen times - of seeing the spacer fall to the ground, screaming at it with despair, and picking it up again for another try – before we get one in the correct spot. Therefore, we created a detachable spacer to solve the problem.

The spacer consists of two identical parts, each being a semi-circular ring with two ends, one concave and one convex. When the two parts are clicked up together, a spacer is formed. This design allows us to insert spacers onto shafts without dissembling what has already been placed on there. It also minimizes the time of putting spacers around shafts in awkward places where fingers can hardly reach: just press one part against the shaft, position another on it with tweezers, then click them together with pliers. Since the parts, being semi-circular rings instead of cylinders, are easier to hold with tools such as scissors, tweezers and pliers, they are less likely to fall off when being inserted onto shafts, thus facilitating the assembling process. In addition, as the two parts of one spacer are the same, one can simply grab any two pieces to form a spacer.

We used Autodesk Inventor Professional 2019 to create the 3D model of the spacer. First, we drew two concentric semi-arcs with radii of 0.98 and 2.56 inches and connected their ends. Then we extruded the figure to form a three-dimensional shape. For each of its sides we drew a smaller rectangle, which would be extruded outwards on one side, and inward on the other. We extruded another two larger rectangles on top of the former cuboids. Finally, we used fillets to join the edges, so that it would be practically possible to connect two parts together. The rest is just importing the part into an assembly file and connecting it with a copy of itself.

One of the greatest things we have learnt from this project is communication. Throughout the activity, these questions were frequently considered: How do we accurately describe the 3D structure in our minds for someone else? How do we improve our ideas, making them more specific? How do we discuss and decide on which one should be our final choice? By seeking answers to these questions, we finally converted our mind-drawn blueprint into a final design. Of course, without the help of Inventor, we would not be able to present our ideas clearly for others to understand. Therefore, Inventor has been a very handy tool for the exchange of ideas and preparation for this challenge. Basic Inventor skill is also an advantage for us in the future, for that it provides a general idea of 3D design software, which will assist with our studies and works in engineering or other fields alike.