

Wind Sculpture

ENGR2330 Project II



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The Bio-Tree

1 Description

Thus spins the wheel of time, against the gust divine; amid the intersection of such metallic whispers lie the thriving leaves of green. In this curious coexistence there yet exists a recondite harmony: the completion of the cycle, in which what was begotten shall now sustain the weights of another.

The civilization was built upon the earth, and now it strives to preserve the environment – to undo the harms it has done. Indeed, the *Bio-Tree* serves as an apt metaphor for the progression of time with respect to civilization and nature; the sculpture bases itself on the soil and the soil, in turn, bases itself on the rack, which causes the sculpture to sag. Despite the strains it causes on the society, however, environmental awareness continues on in the hopes to remedy the society and the earth.

2 Technical Details

2.1 Structure

- Base Plate

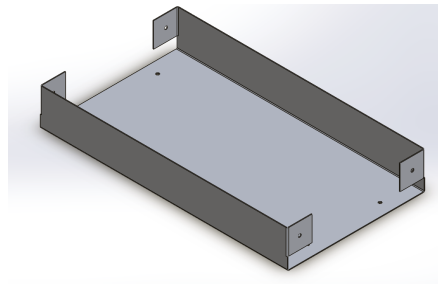


Figure 1: The sheet metal part served as the base plate, on which we placed the rest of the sculpture.

- L

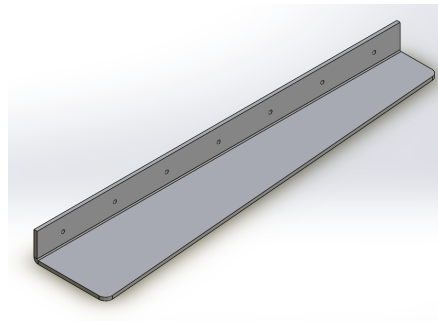


Figure 2: The L-bracket attached in front of the tree plate enhanced the stability of the sculpture.

- U

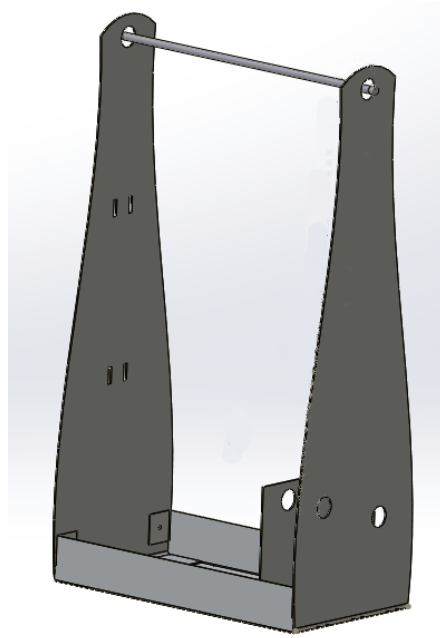


Figure 3: The base plate and the two tree plates together form a U-structure

2.2 Fasteners

- Screw

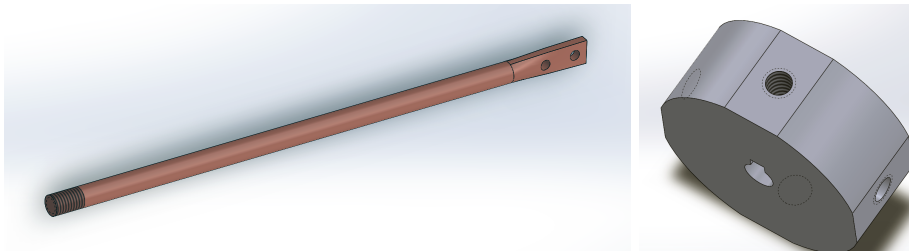


Figure 4: The ends of the branches are died to serve as a screw, which was then screwed into the branch hubs and reinforced by loctite.

- Spring Pin

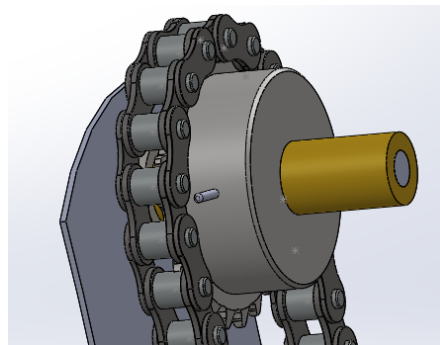


Figure 5: The spring pin is used to constrain the rotation of the shaft with the sprocket.

- Retaining Ring

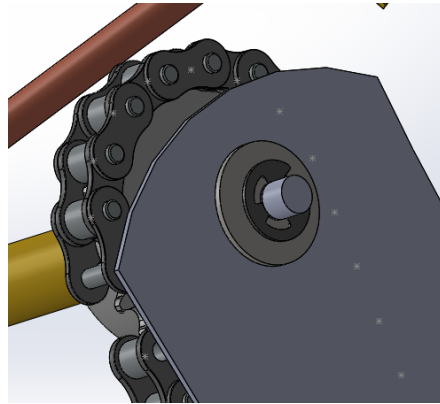


Figure 6: The retaining ring at the end of the top shaft prevents the cantilever-beam structure of the sculpture from shearing excessively.

- Adhesive

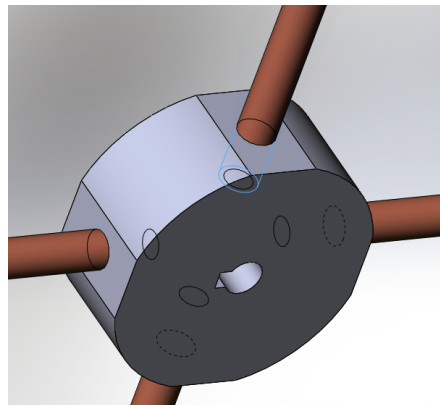


Figure 7: The loctite between the wing skeleton and the image holds the two pieces together.

- Rivet



Figure 8: The rivet, used throughout the sculpture, reliably holds together the many sheet-metal parts.

- Hose Clamps

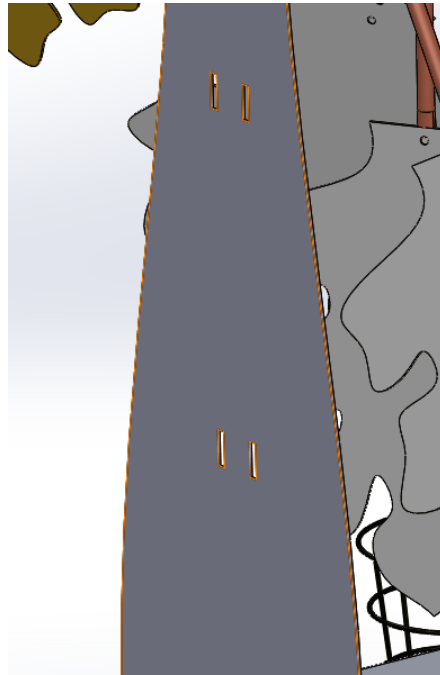


Figure 9: The sculpture itself is attached to the light pole by the hose clamp that ran through the four holes in the back plate, as shown in the figure.

- Key

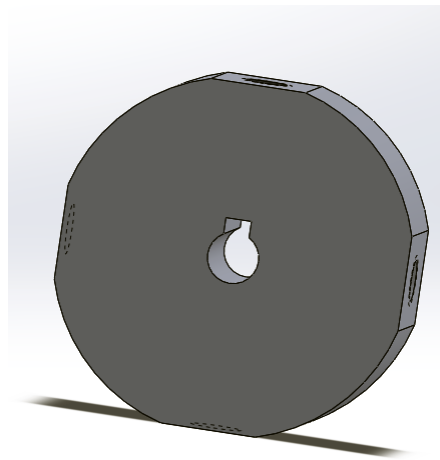


Figure 10: The branches transmitted power by means of the key, which constrained the rotation of the branch-hubs with the top shaft. In the figure, the keyed hole in the branch hub is shown.

- Welding

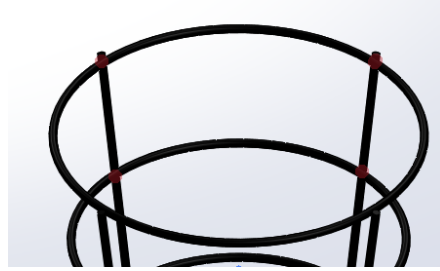


Figure 11: The wires in the rack are held together by spot-welding, which proved stable enough to hold six potted plants.

- Nuts & Bolts



Figure 12: In addition to the aforementioned fasteners, a pair of a nut and a bolt was used for one of the branches, as a rivet did not work.

2.3 Transmission

- Chain & Sprocket

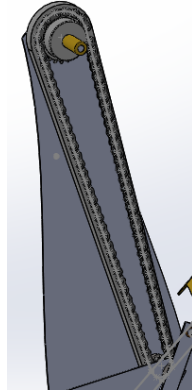


Figure 13: The chain that transmits the windpower collected from the branches to the bottom sprocket. Due to the absence of half-links, the chain couldn't be tightened to the desired length, causing unsteady motion. As a result, it was removed in the final design.

- GearBox

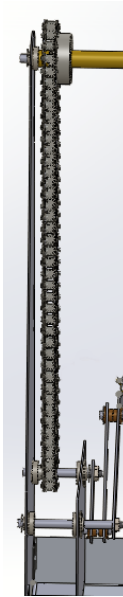


Figure 14: Vertical Clock-Cage Gearbox with a theoretical reduction ratio of approximately 9:1. In fabrication, the order was reversed; the ratio became 1:9 instead, resulting in violent and unsteady motion.

- 4-Bar Linkage

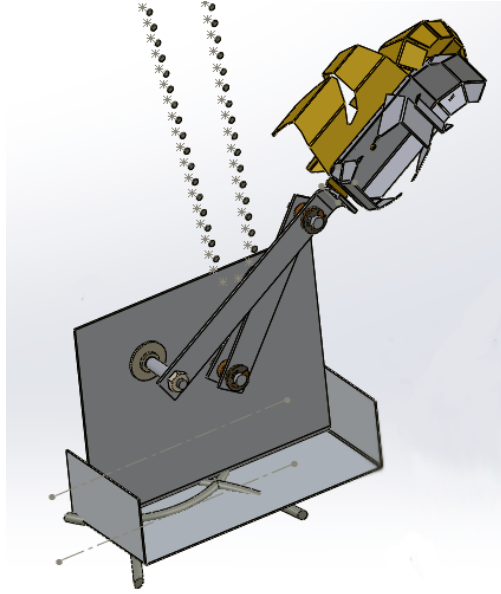


Figure 15: 4-bar linkages are actuated by the shaft constrained to the sprocket, which dictates the sideways motion of the squirrel. Due to interference with the branches, this component was removed in the final design.