

# Hardware Review 1

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## **ME 486C KinSculp 18F25**

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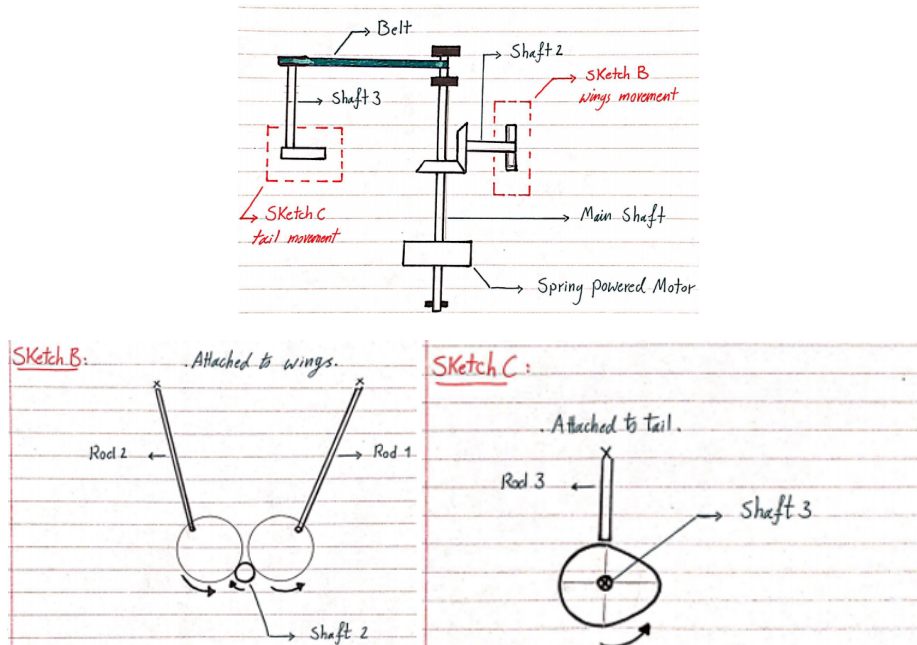


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## Summary

### Working

As the project is to make the kinetic sculpture and we have finalized our design for the project. Our design is based on a bird with two wings and a tail. Our design consists of spring powered ratchet gear with the shaft attached to a big bevel gear to a smaller bevel gear having it connected to wing rods moved by an acentric and centric movement. There is a v-belt attached with a small shaft connecting to an acentric wheel to move the tail. Final basic sketch of the design is shown below in the figures;



**Figure 1:** Basic Sketch of Final Design

As there is a main shaft attached with the gears system and the main shaft is connecting with the self-made spring gear. Therefore, the power will be supplied to the spring. The spring will start the movement and the main shaft will be rotating. When the main shaft rotates, it will rotate the bevel gears attached to the main shaft and there is a small bevel gear interlocked with a bigger bevel gear in perpendicular form hence the interlocked gear in perpendicular position start rotating as well. There is a shaft attached with the later gear and it will start rotating, and the other edge is also connecting to two gears interlocked with the shaft, so it will rotate those two gears and at the end a rod will cause the wings to move. This is the main functionality of wings. There is a tail which moves through another shaft connected to the v-belt.

The spring powered motor uses the power at the start to compress the spring then the compression causes the energy storage which release during the expansion and provide the rotation to the shaft which is known as harmonic motion. Interlocking of gears helps in rotating each other, as the teeth of both gears merge into each other as the teeth of one gear comes successively after the teeth of second gear so this interlocking position rotates together and when

the first gear rotate it push the second gear and the next teeth interlocked with each other. In this way interlocking of gear rotates all the gears together.

### Build Materials

In order to build the project, different materials were used such as acrylic, plastic, steel and wood. Acrylic is used to build the box, plastic is used to build the gears with a 3-D printer, wood is used in building the bird, steel is used to build the shaft, PEX pipes is used to create the hinge for the wings.

3-D printed gears have been designed and printed from the Northern Arizona University Library. The rods where ordered from Amazon. Wood was purchased from a local supplier and will be shaped using a cutter and power tools and the wooden parts will be joined for the final design using hinges, bolts and nuts. Gears will be connected using specific dimensions made in Solidworks in order to connect the shaft through the bore hole. As for the spring motor, a ratchet gear is used in order to have a constant linear or rotary motion in one direction and preventing motion in the reverse direction. The ratchet gear is 3-D printed as well. Acrylic will then join using glue to keep the joints strong. Steel shafts will be installed using bolts that will keep the shaft rotating without failing. Belts for transferring power were bought through Amazon. The v-belt is going to be connected to a smaller rod and that moves the tail.

### After Assembly

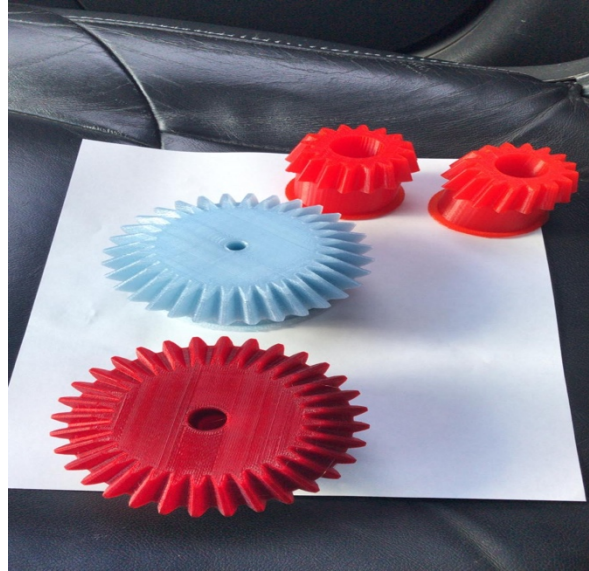
The team is working on building the project and till now parts have been organized and the assembling process for the mechanical part of the project will begin after receiving the last 3-D printed gear. After assembling the project, the team will be monitoring the mechanical system, and will be observing the changes in the system in regard to stability, fatigue, gears and shafts movement and spring motor. After observing, the team will check if any calculations or measures are needed in the case of a failing mechanical part. If a part will be malfunctioning, then it will be replaced with a new part. The project will be continuously observed at each step to make sure it is operating well. Overall, the project is going well, and the team is currently awaiting the last 3-D printed gear to start the building process. The below figures the materials ordered and gears printed;



**Figure 2:** The wood that will be used.



**Figure 3:** Metal pipes that will be used for shafts along with plastic PEX pipes that will be used to create the hinge for the wings.



**Figure 4:** 3-D printed gears