MEG 440
Fall 2014
Project 2

Design the vertical stage (Y-direction in Figure 1) for a low-cost rapid prototyping machine. Power transmission should be through power screw. Here are some suggested design steps:

Specifications:

- Mass of the payload is 500 grams.
- Travel of the payload is 10 centimeters.
- Maximum velocity is 0.5 meters/second

Design Steps:

i. Select power/lead screw(s) from a supplier. The length of the screw should be related to the total travel.
ii. Perform all force calculations needed for this screw. Ensure that it is self-locking and calculate its efficiency.
iii. Select a nut for the screw. Ensure that stresses in screw and nut are within allowable limits.
iv. Calculate the rotational velocity of the motor based on the velocity of the payload.
v. Select a motor that fits within your load and speed requirements.
vi. You are to choose materials and dimensions such that the machine will not fail due to any possible combinations of stresses. *Note:* Design for dynamic loading
vii. Use the rapid prototyping machine to create a model of your design (full-scale).

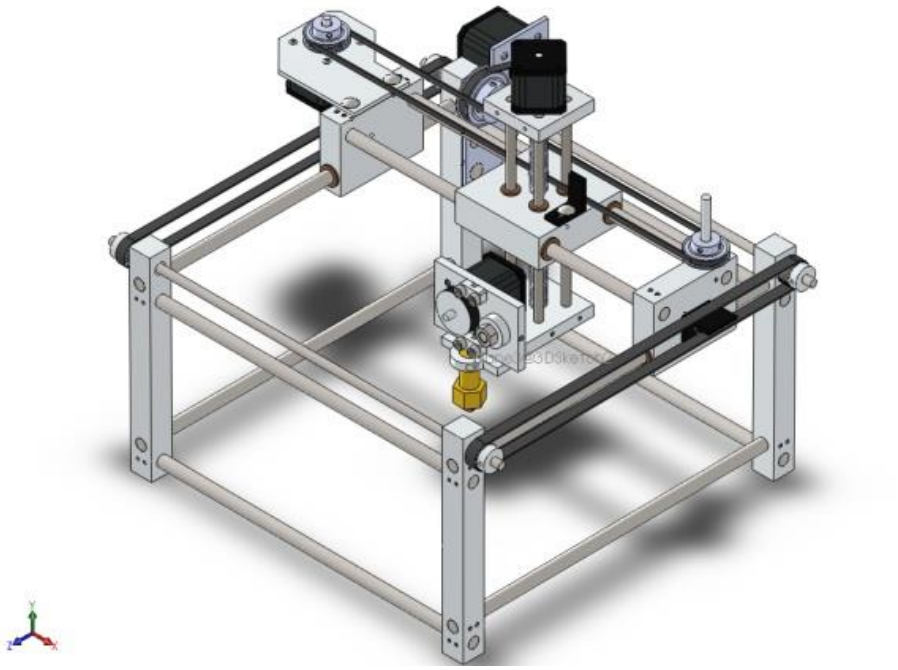

Figure 1. Rapid prototyping machine http://www.paradigmjhc.com/rapid_prototyping