The aim/goal of this project is to improve upon the design of the traditional backpack by focusing on reducing the load transferred to the wearer, under conditions where heavy loads are carried for long periods of time.

**Model**

The single degree of freedom system can be modeled as a suspended mass (backpack) being harmonically excited by a base (the wearer).

This system can be described by the second-order, non-homogeneous ordinary differential equation:

$$F = k(x - y) + c(y - v) = -m\ddot{x}$$  \hspace{1cm} (3.72)

From Eq. (3.67), Eq. (3.72) can be written as

$$F = m\ddot{x} = F_{r}\sin(\omega t - \phi)$$  \hspace{1cm} (3.73)

Knowing the oscillatory frequency, and amplitude of vibration of the forcing function as well as the mass of the suspended load among other things; we can solve for the inertial forces imparted to the wearer at any given combination of $k$ and $c$ which was done using MATLAB.

**Testing**

**Accelerometer Data**

- Average Unsuspended Acceleration: 1.82 m/s²
- Average Suspended Acceleration: 1.06 m/s²
- Reduction: 42%

**Electromyographic (EMG) Test**

**Raw EMG Data**

- Peak Output: Average
- 101 Suspended
- 27% Walking
- 8% Resting