Stellar Motion

This code loads the data and defines measurement parameters.

```
load starData
```

```
Error using load
Unable to find file or directory 'starData'.
```

```
nObs = size(spectra,1)
spectra
lambdaStart = 630.02
lambdaDelta = 0.14
```

Step 1

The `spectra` data were collected at evenly-spaced wavelengths (λ), and we know the starting wavelength (λ*start*), the spacing (λ*delta*), and the number of observations.

`lambdaEnd` (λ*end*) contains the value of the last wavelength in the recorded spectrum. We can calculate `lambdaEnd` with the equation

$$\lambda start + (nObs - 1)\lambda delta$$

Then we use `lambdaEnd` to make a vector named `lambda` (λ) containing the wavelengths in the spectrum, from λ*start* to λ*end*, in steps of λ*delta*.

```
lambdaEnd=lambdaStart + (nObs-1)*lambdaDelta
lambda=lambdaStart:lambdaDelta:lambdaEnd
```

Step 2

Each column of `spectra` is the spectrum of a different star. The sixth column is the spectrum of star HD 94028. We extract the sixth column of `spectra` to a vector named `s`.

```
s=spectra(:,2)
```

Step 3

Ploting the spectra (`s`) as a function of wavelength (`lambda`) using point markers (`.`) and a solid line (`-`) connecting the points.

```
plot(lambda,s,".-")
xlabel("Wavelength")
ylabel("Intensity")
```

Step 4

Creating two variables, `sHa` and `idx` that contain the minimum value of `s` and the index where the minimum value occurred and using `idx` to index into `lambda` to find the wavelength of the Hydrogen-alpha line. Store the result as `lambdaHa` (λHa).

```
[sHa idx]= min(s)
lambdaHa=lambda(idx)
```

Step 5

The point (`lambdaHa`,`sHa`) is the location of the Hydrogen-alpha line. Adding the point to the existing graph.

```
plot(lambda,s,".-")
xlabel("Wavelength")
ylabel("Intensity")
hold on
plot(lambdaHa,sHa,"rs","MarkerSize",8)
hold off
```

Step 6

If we zoom in on the plot, we can see that the wavelength of the Hydrogen-alpha line of HD 94028 is 656.62 nm, which is slightly longer than the laboratory value of 656.28 nm.

Using the Hydrogen-alpha wavelength of the star, we can calculate the *redshift factor* (the speed of the star relative to the earth) using the formula

$z=(\lambda Ha/656.28)-1$.

We can then calculate the speed by multiplying the redshift factor (z) by the speed of light (299792.458km/s).

```
z=(lambdaHa/656.28)-1
speed=z*299792.458
```

```

```