Ir Range Sensor Calibration

The built-in calibrations in `IRRangeFinder` are only approximate. Eventually, you'll need to calibrate sensors yourself.

You can write a simple little program like `maslab.orc.IRCalibrate` to help you collect the data. Eventually, you'll need a table of values, with distance in column 0 and voltage in column 1. This file can be loaded in MATLAB.

Note that the script looks for the voltage maximum and discards all readings at shorter ranges than this maximum.

The MATLAB script I used is:

```
function [Xd Xm Xb]=optimizeir(data)

[maxvolt, maxvoltidx]=max(data(:,2));
fprintf('discarding samples less than dist=%f \n',data(maxvoltidx,1));
idx=find(data(:,1)>=data(maxvoltidx,1));
data=data(idx,:);

opts=optimset();
%opts=optimset('display','iter','maxfunevals',10^7,'maxiter',1000);
init=[0.008 .6 -.01 0 0];
[x, err]=fminsearch(@(x) optimizeir_fun(x, data), randn(1,3), opts);
Xd=x(1);
Xm=x(2);
Xb=x(3);

fprintf('err: %f\n',err);

figure(1);
clf;
hold on;
h1=plot(data(:,2),data(:,1),'b.');
invnum=1./(data(:,2)-Xb);
h2=plot(data(:,2),(Xm*invnum+Xd),'r.');
legend([h1 h2],'Measured','Fit');
xlabel('voltage');
ylabel('distance');
```

```
function err=optimizeir_fun(x, data)

Xd=x(1);
Xm=x(2);
Xb=x(3);

invnum=1./(data(:,2)-Xb);
errs=data(:,1)-(Xm*invnum+Xd);
err=sum(errs.^2);
```

Here's an example data file, which can be loaded using `load -ascii` *filename*. This data was obtained from a GP2D12.

```
.050  1.7920195315480278
.100  2.6758220798046843
.150  1.841458762493324
.200  1.3864347295338368
.250  1.1432059205004959
.300  0.955214770733196
.350  0.8245975432974746
.400  0.7214465552758068
.450  0.6475928892957962
.500  0.5932707713435569
.550  0.5575646601052873
.600  0.5212481879911498
.650  0.4922560463874266
.700  0.46417944609750517
.750  0.4507515068284123
.800  0.42481116960402837
.850  0.4083314259555 9624
.900  0.409246967269398
.950  0.408941786831 4641
```