

HW5 - summary of eight submissions that looked “reasonable”

#iter	pnt	obs	rms	x0	y0	foc	k1	k2	p1	p2
5	51	440	0.416	-17.035	-9.28	4438.154	0.0244	-0.0052	0.8454	1.1495
10	32	298	1.261	-30.016	-40.014	4401.461	0.0303	-0.0101	1.5259	10.722
5	30	294	0.641	16.319	-16.12	4463.716	0.0259	-0.0102	-7.3309	4.8872
5	48	362	0.452	0.549	1.513	4456.687	0.0281	-0.0091	-3.207	-0.0961
5	30	162	0.218	-0.18	-9.158	4455.387	0.0268	-0.0087	-3.0073	2.6509
5	55	494	0.421	3.168	27.444	4458.305	0.0262	-0.0074	-2.8432	-3.1012
5	31	286	0.307	-15.824	-8.468	4446.471	0.0247	-0.0054	-0.2	0.8742
5	35	322	1.091	-3.697	-5.958	4449.453	0.0236	-0.0053	-1.791	-1.726

Comments

- More variability than expected in x0, y0, p1, p2, why?
- Measurement corrections (RMS) seems quite good
- Condition number x.xxe+011 seems a bit high, why?
- Multiple independent measurements & results makes a nice experiment

$$\Sigma = \begin{bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} \\ \sigma_{21} & \sigma_2^2 & \sigma_{23} \\ \sigma_{31} & \sigma_{32} & \sigma_3^2 \end{bmatrix}$$

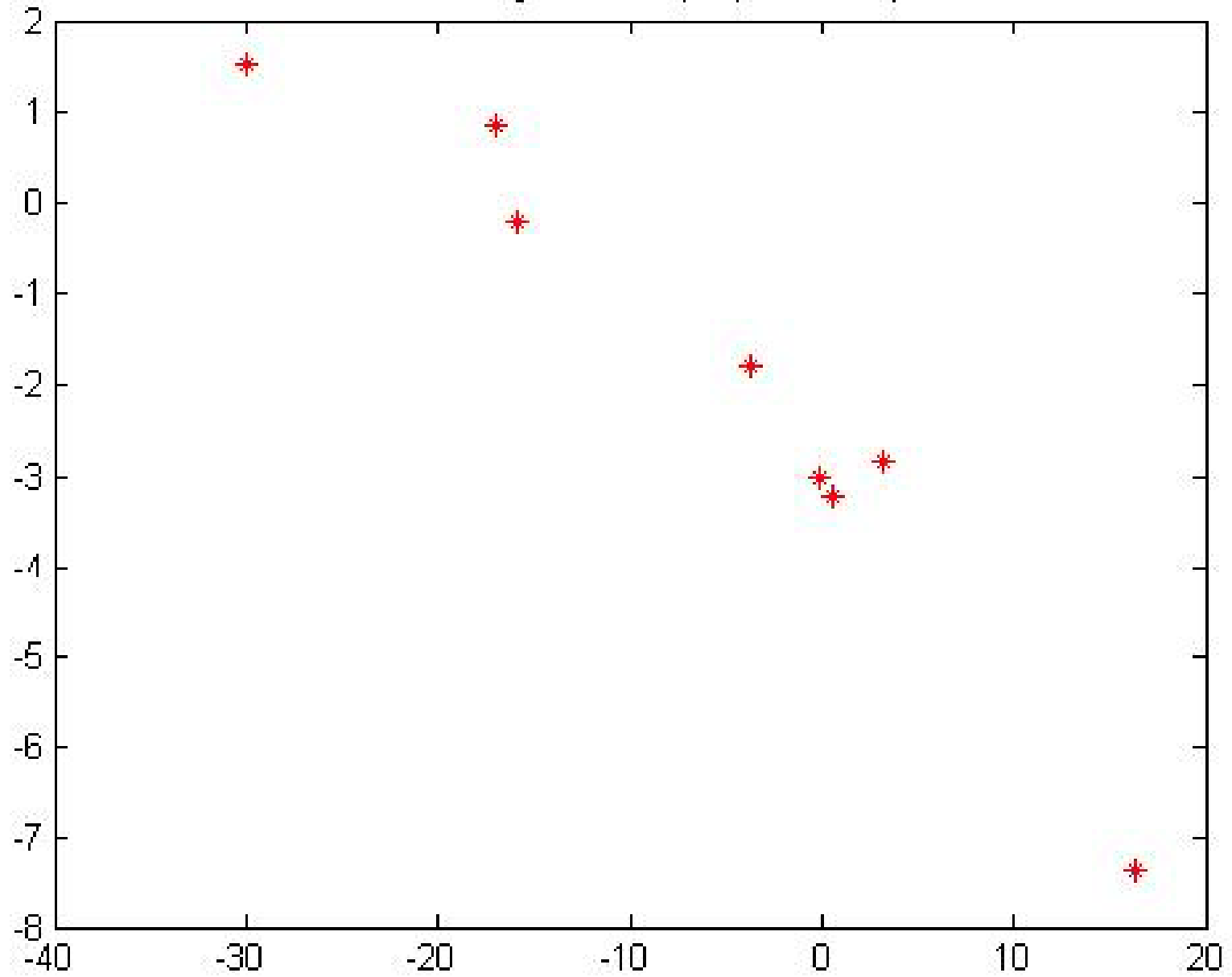
$$\rho_{ij} = \frac{\sigma_{ij}}{\sigma_i \sigma_j}$$

$$\begin{bmatrix} \sigma_1 & \rho_{12} & \rho_{13} \\ \rho_{21} & \sigma_2 & \rho_{23} \\ \rho_{31} & \rho_{32} & \sigma_3 \end{bmatrix}$$

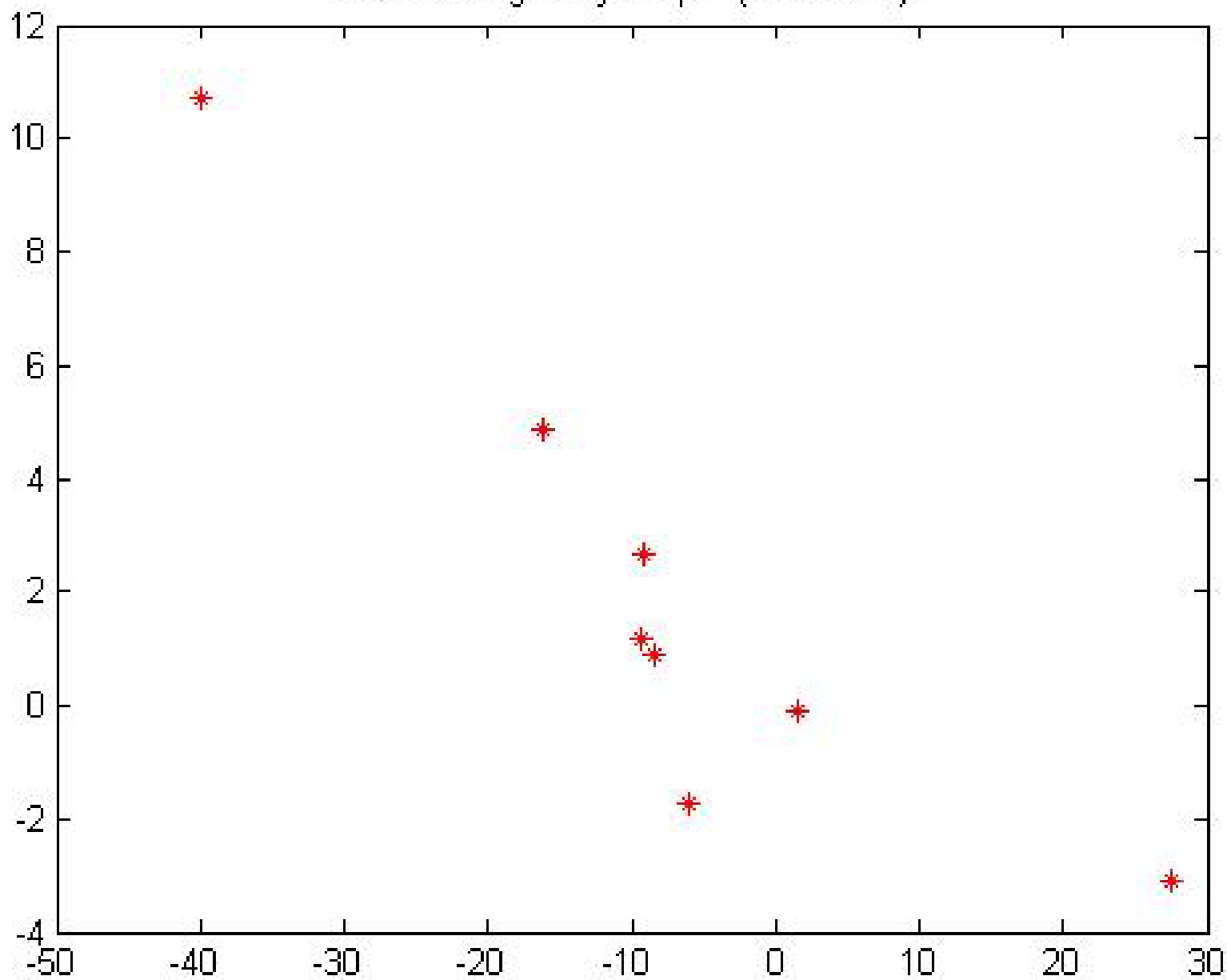
150.5483	6.7343	-1.8607	0.0035	-0.0050	-31.2706	1.5633
6.7343	69.1020	24.6185	0.0024	-0.0036	-1.9283	-11.4566
-1.8607	24.6185	63.3804	0.0052	-0.0080	0.6060	-2.6366
0.0035	0.0024	0.0052	0.0000	-0.0000	-0.0007	-0.0004
-0.0050	-0.0036	-0.0080	-0.0000	0.0000	0.0010	0.0003
-31.2706	-1.9283	0.6060	-0.0007	0.0010	7.0366	-0.1883
1.5633	-11.4566	-2.6366	-0.0004	0.0003	-0.1883	2.9088

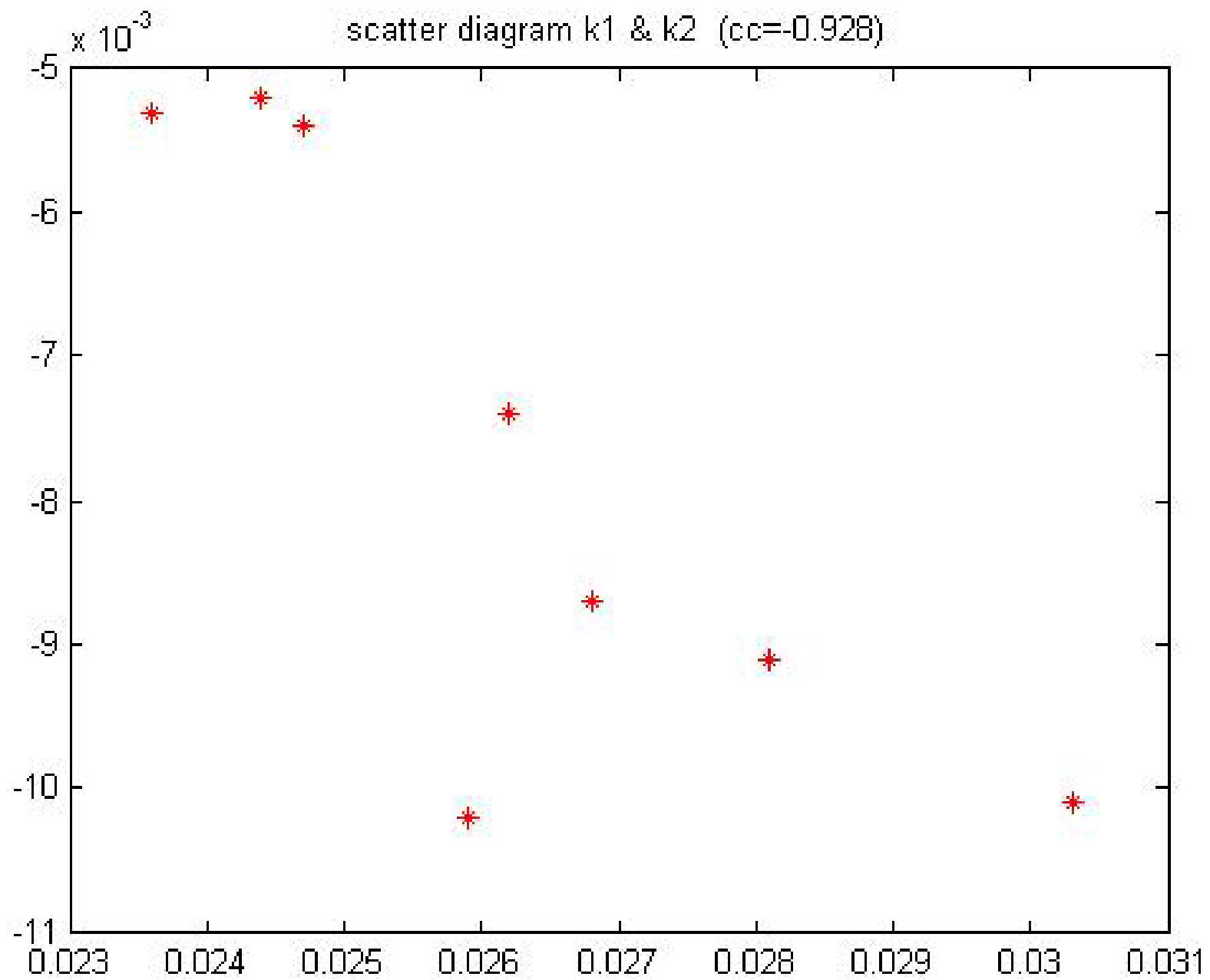
x0	y0	f	k1	k2	p1	p2
12.27	0.066025	-0.019048	0.12935	-0.16486	-0.96076	0.074702
0.066025	8.3128	0.372	0.13127	-0.17849	-0.087447	-0.80807
-0.019048	0.372	7.9612	0.29612	-0.40648	0.028696	-0.19418
0.12935	0.13127	0.29612	0.0022158	-0.92764	-0.12553	-0.1024
-0.16486	-0.17849	-0.40648	-0.92764	0.0024583	0.15455	0.072044
-0.96076	-0.087447	0.028696	-0.12553	0.15455	2.6527	-0.041622
0.074702	-0.80807	-0.19418	-0.1024	0.072044	-0.041622	1.7055

scatter diagram x0 & p1 (cc=-0.961)

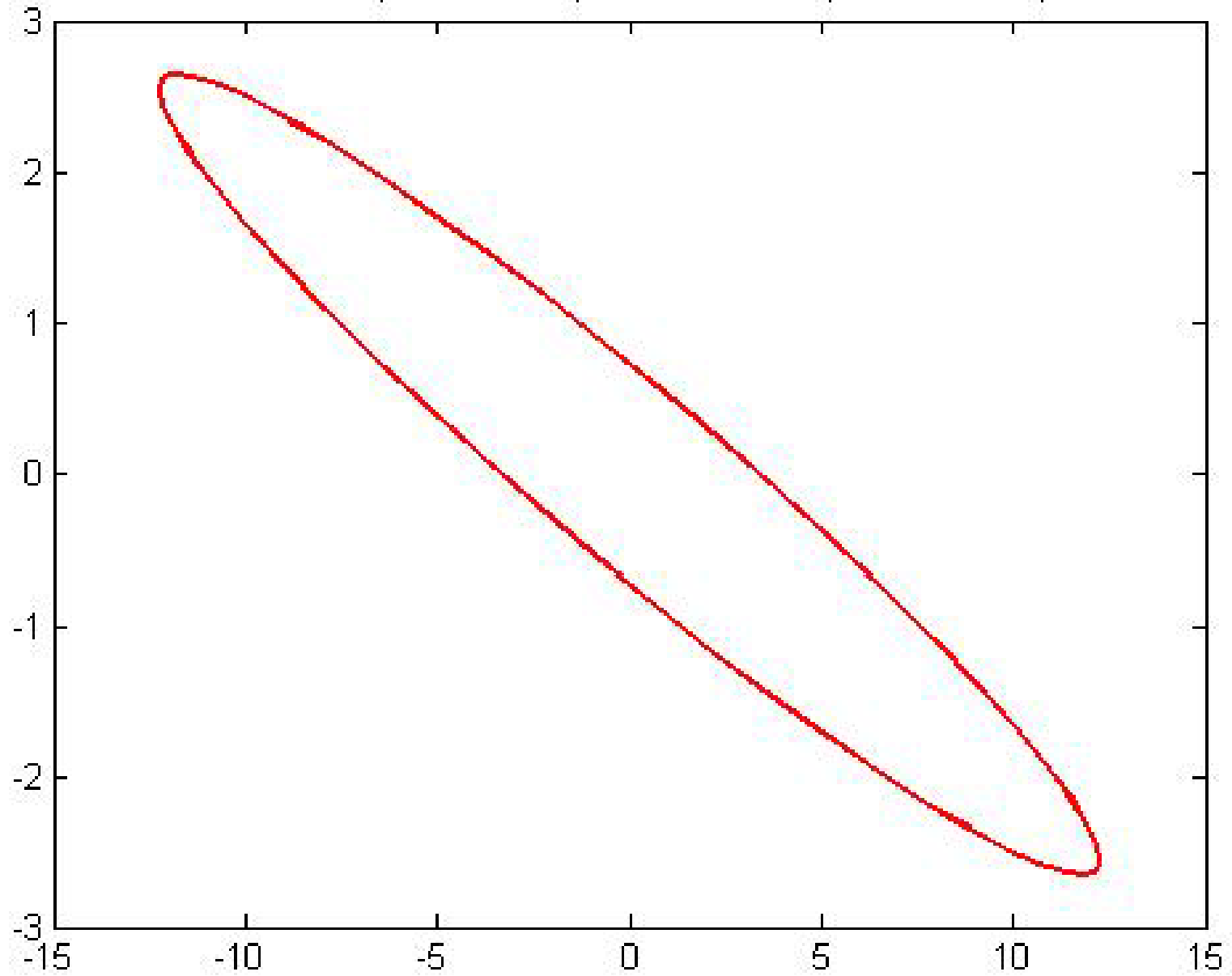


scatter diagram y0 & p2 (cc=-0.808)





confidence ellipse for x_0 & p_1 == same shape as scatter plot

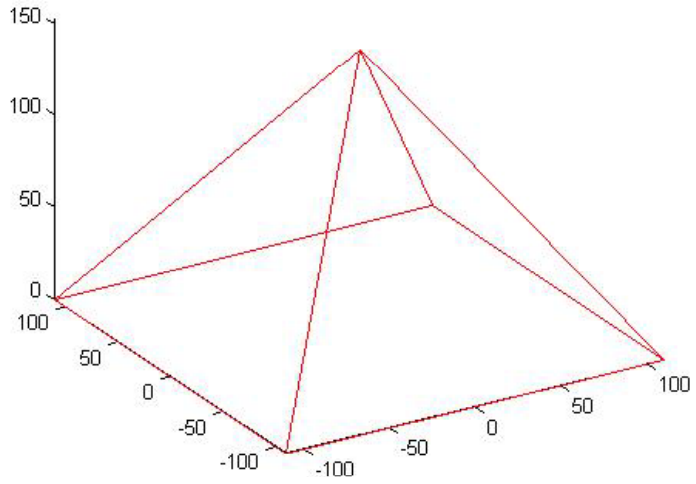


$$\kappa(N) = \frac{\lambda_{\max}(N)}{\lambda_{\min}(N)}$$

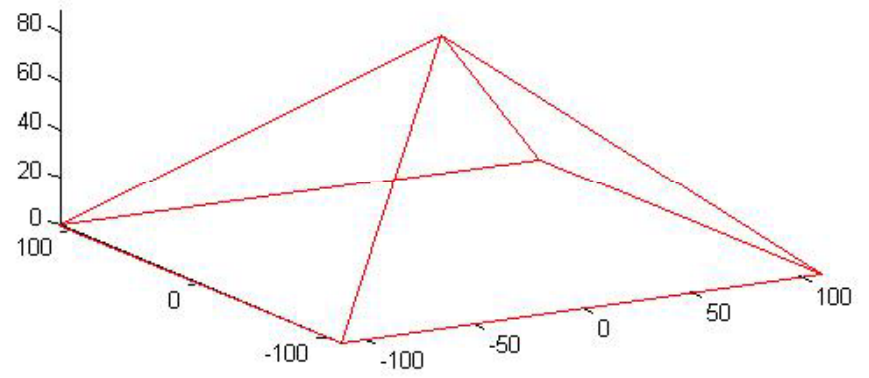
11.519	0.77048	0.74745	-9.663e-005
0.77048	22.349	12.157	-0.0010709
0.74745	12.157	51.073	-0.0015528
-9.663e-005	-0.0010709	-0.0015528	6.7353e-007

x0	y0	f	k1
3.3939	0.04802	0.030817	-0.034692
0.04802	4.7275	0.35985	-0.27603
0.030817	0.35985	7.1465	-0.26475
-0.034692	-0.27603	-0.26475	0.00082069

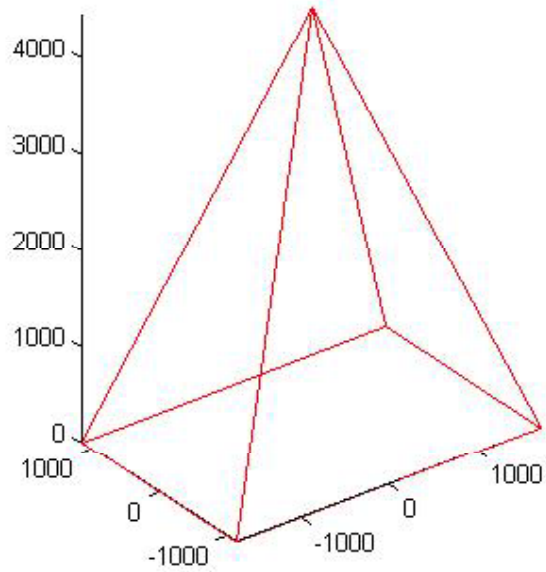
wide angle mapping camera



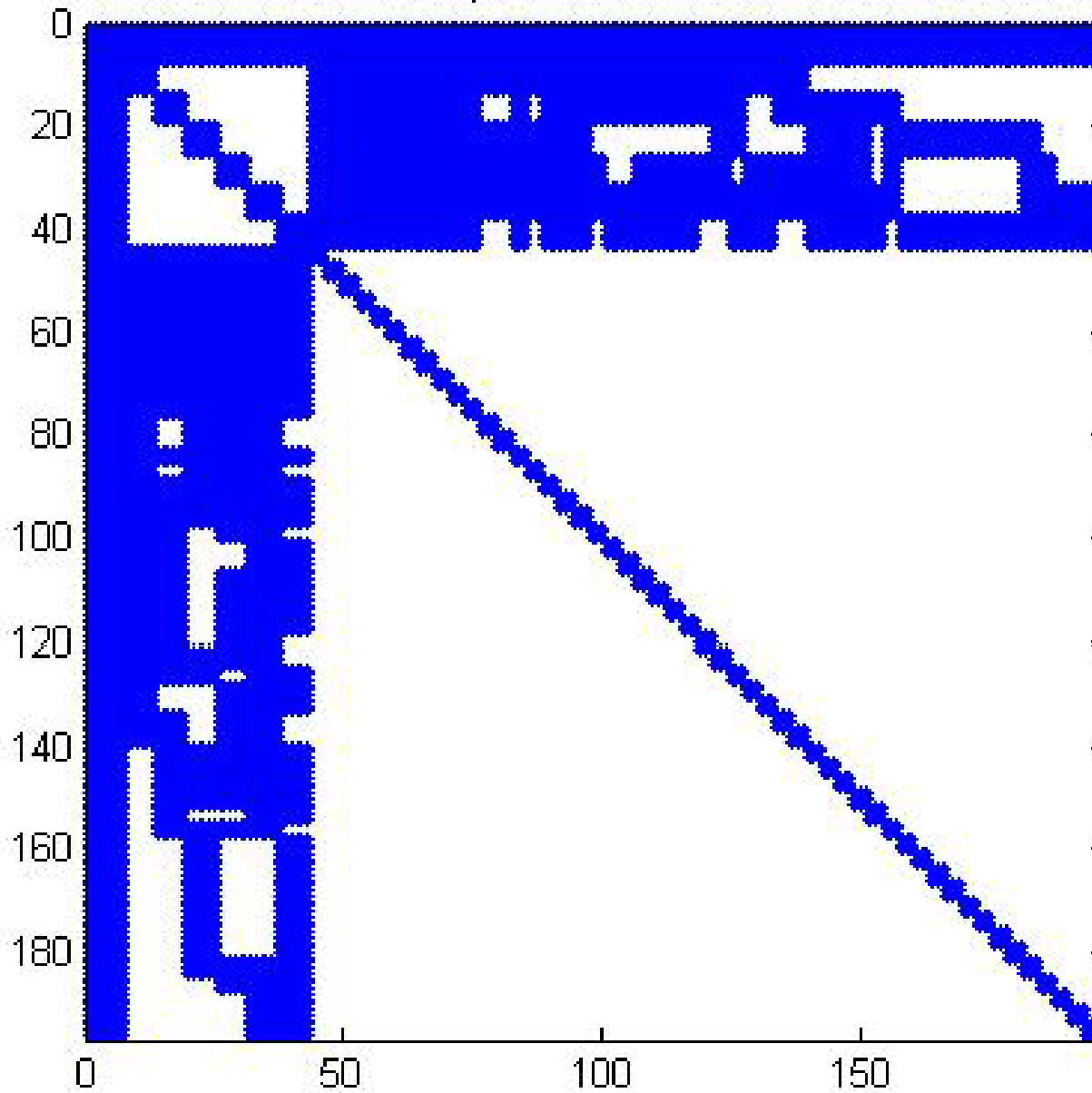
super wide angle mapping camera



canon xt with 28mm lens



structure of normal equation coefficient matrix N for HW5



Needed Improvement to BBA

- Generate good initial approximations to position & orientation (probably by R/O using 8-point algorithm)
- Better options for self-calibration (detect singularity & modify parameter selection)
- Free net (inner constraints) in case no control
- Blunder detection (L1 estimation)
- Properly exploit sparseness of equations (band & band/border)