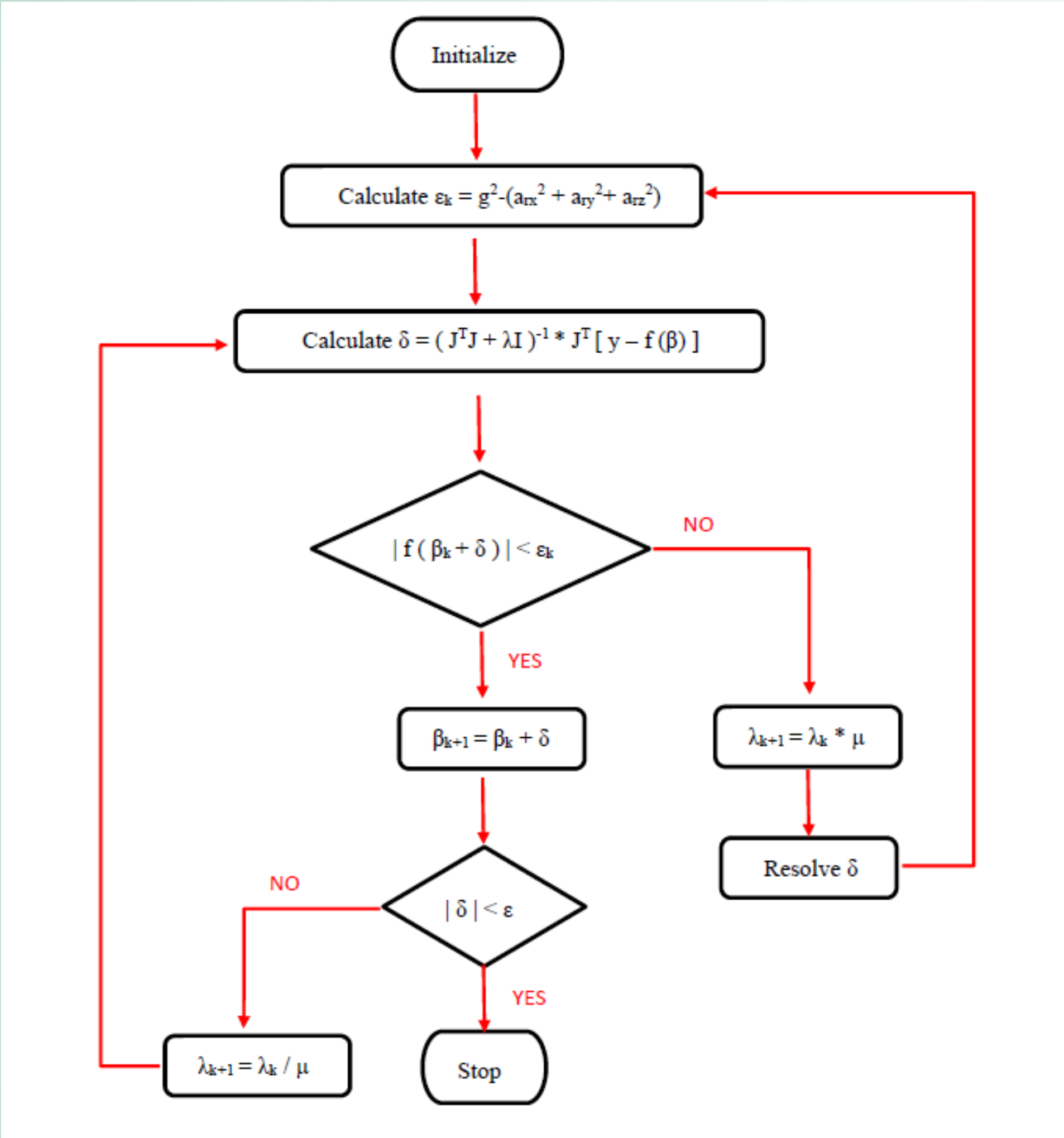


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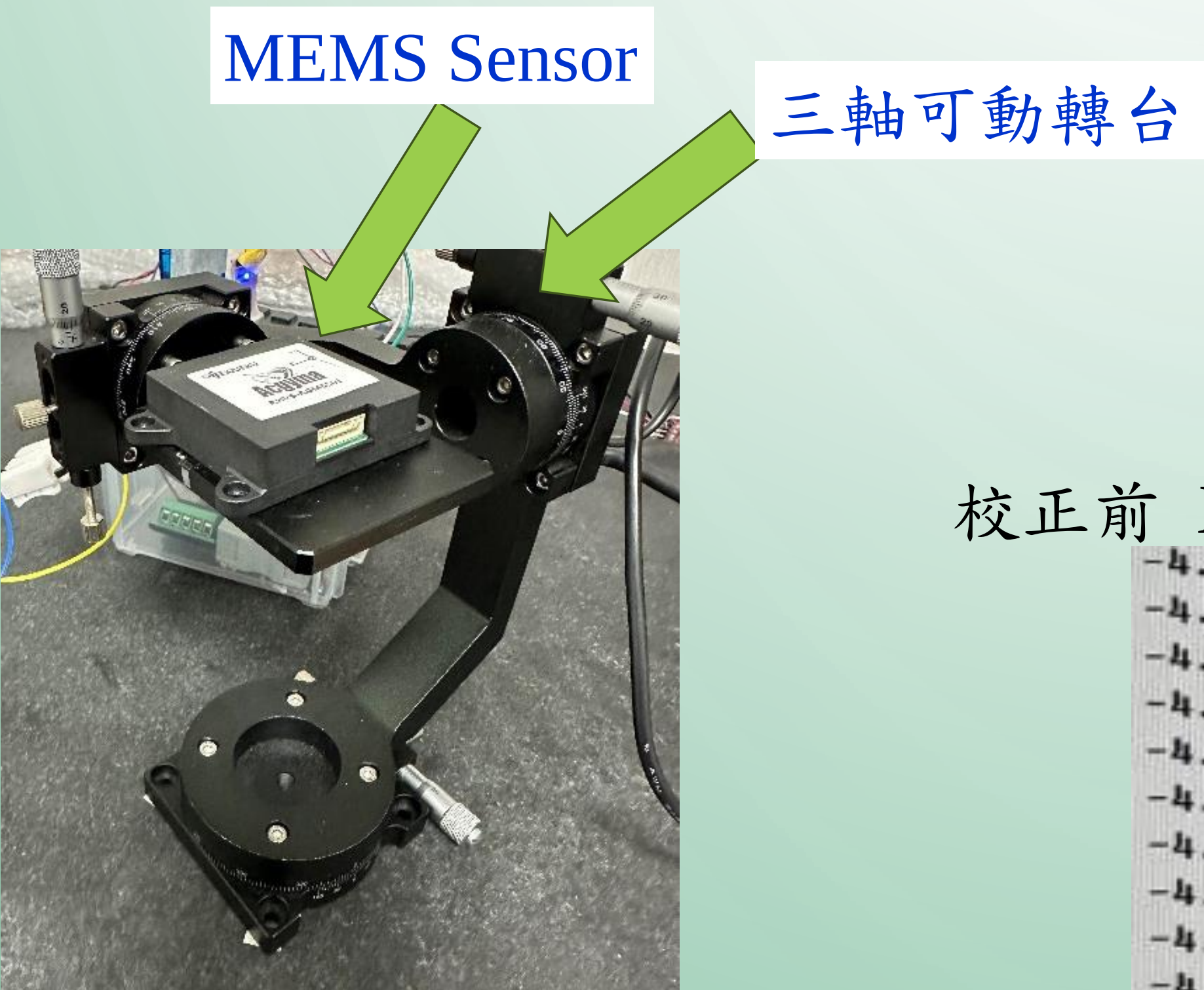
工業級航姿慣性感測模組

組別: 通訊組-16 組員:孫煒勛、彭丞楷、鄭俊生

自動駕駛中，對於車輛位置、速度及航向的掌握也是很重要的一環，除了衛星定位，也能從加速度計與陀螺儀的數據計算後得知。那麼所使用的MEMS感測器所收集到的數據精度就很重要。此專題在找尋可用的數據校正算法，來校正加速度計的讀值，並收集算法中所需要的數據，製作出可以校正的程式，讓讀值更接近物體實際的狀態。所使用的感測器為連騰AHRS-5501、手動三軸轉台、Matlab。利用迭代校正參數的方式來找到最佳的三軸的零偏誤差、比例因子誤差及安裝誤差。



圖(1) LM校正法的迭代流程圖



圖(2) 手動三軸轉台

```
1 = close all;
2 = clear all;
3
4 = refA = 1; % 1000 mg
5
6 % parameters
7 = k11,k12,k13,k22,k23,k33, bx,by,bz
8 = rX = [ 1; 0; 0; 0; 1; 0; 0; 0; 1; 0; 0; 0; 1; 0; 0; 0; 1;
9
10 = K = [ rX(1), rX(2), rX(3); ...
11 = rX(4), rX(5), rX(6); ...
12 = rX(7), rX(8), rX(9); ...
13 = B = [ rX(10); ...
14 = rX(11); ...
15 = rX(12); ...
16
17
18 % measure data
19
20
21
22
23
24
25
26
27
28
29
30
31
```

A矩陣:量測值平均

圖(2)LM校正法Matlab程式-定義

```
60 = I = eye(12);
61
62 = N = size(A, 2);
63
64
65
66 %alpha = 0.32;
67 saveLens = 0;
68 e = 10^-6;
69 lambda = 0.1;
70
71 u = 10;
72 for i = 1 : N
73 % noiseA(:, i) = inv(K) * refA * A(:, i) + B;
74 E = abs(eq.e(rX, A(:, i), refA));
75 end
```

圖(3)LM校正法Matlab程式-2

```
76
77 for k = 0 : 300
78 % error2 = 0;
79 gradientE = zeros(12, 1);
80 gradient2E = zeros(12, 12);
81 for i = 1 : N
82 % error2 = error2 + eq.e(X, noiseA(:, i), refA)^2;
83 gradientE = gradientE + 2 * (-eq.e(rX, A(:, i), refA)) * eq.Ge(rX, A(:, i));
84 gradient2E = gradient2E + (2 * eq.Ge(rX, A(:, i))' * eq.Ge(rX, A(:, i)))+(1*lambda));
85 end
86
87 Delta = invx(gradient2E) * gradientE;
88 %X = X - alpha * corr;
89
90
91 for i = 1 : N
92 % noiseA(:, i) = inv(K) * refA * A(:, i) + B;
93 F = eq.e((rX+Delta), A(:, i), refA);
94 end
95
96 if abs(F) < E
97 rX=rX+Delta;
98 if abs(Delta) < e
99 break;
100 else
101 lambda=lamda/u;
102 end
```

圖(4)LM校正法Matlab程式-迭代

校正前 X Y Z 校正後 X Y Z

-4.815,	0.258,	-8.392,	-4.815,	0.258,	-8.392
-4.814,	0.258,	-8.387,	-4.814,	0.258,	-8.387
-4.810,	0.256,	-8.386,	-4.810,	0.256,	-8.386
-4.809,	0.255,	-8.386,	-4.809,	0.255,	-8.386
-4.811,	0.254,	-8.391,	-4.811,	0.254,	-8.391
-4.814,	0.259,	-8.393,	-4.814,	0.259,	-8.393
-4.810,	0.256,	-8.396,	-4.810,	0.256,	-8.396
-4.814,	0.258,	-8.402,	-4.814,	0.258,	-8.402
-4.811,	0.255,	-8.401,	-4.811,	0.255,	-8.401
-4.813,	0.257,	-8.399,	-4.813,	0.257,	-8.399
-4.810,	0.254,	-8.397,	-4.810,	0.254,	-8.397
-4.811,	0.254,	-8.397,	-4.811,	0.254,	-8.397
-4.810,	0.251,	-8.394,	-4.810,	0.251,	-8.394

圖(5)原始數據與LM法結果比較

