em simple

below is E step.

h_exp_first

inside

- try every permutations between the prior axis and the sfmo quadric axis.

log_hammer_obs2

inside

first term:

((obs_gen - mu_data)' * prec_data *(obs_gen - mu_data)) / length(mu_data);

$\log(P(s_i, z_i | C_i^r)) \propto (x_i - C_i^r) \frac{1}{6} I_3 (x_i - C_i^r) + s_i^T \frac{1}{6} I_3 s_i \quad (14)$

second term:

min(10^15, -log(gmm.pdf(M(2,3)')));

$s_i^T \frac{1}{6} I_3 s_i \quad (14)$

```
axes = m(1) * sqrt(abs(P * M(2:3) + mu));
axes = axes.^2;
obs_gen = C * R * axes;
```

$x_i = G^r R_i z_i (V s_i + \mu c_i)$

back to h_exp_first:

```
[modi, lgP] = gwmcmc(minit, logPfuns, 1000, 'ThinChain', 1);
```

this runs the MCMC inference to find the expectation of latent variables $\{\hat{z}, \hat{s}_i\}$ under the posterior.

Optimize the orientation:

```
obs = C * Rm * l;

x = lsqnonlin(@(x) cost(x, C, obs, l), init_angle);

function c = cost(angles, G, C, l)
  R = rot_euler2rot(angles)';
  Rm = [R(1,:).^2; ...];
  c = norm(G*Rm*l - c);
end.
```

In paper (15): $\hat{\theta} = \arg\min_{\theta} \| \hat{x}_i - c_i^r \|^2$

$\hat{x}_i = G^r R_i \hat{z}_i (V\hat{s}_i + \mu)$.

back to em_simple, M step

In M step, use estimate of $\hat{w}_i$ to estimate noise cov. σ:

$$\hat{\sigma} = \frac{1}{3}\sum_{i=1}^{D}\{\|c_i^r\|^2 - 2 w_i^T G^r c_i^r + \mathrm{trace}(w_i^T \hat{w}_i G^{rT} G^r)\} \quad (17)$$

where is the trace term?

in code:

```
diagnoise(i) = measure(i,:) * measure(i,:)' - C(i,:) * Eh * measure(i,:)';
diagnoise(i) = diagnoise(i) / n_images3;
```