Learning Articulation

Learning Model Parameters

Prismatic

Let $x_{ij}^{(t)}$ denote the position vector of p_j in p_i's local coordinate frame. Then,

$$a_{ij} = \frac{1}{T}\sum_{i=1}^{T} x_{ij}^{(t)}$$
$$c_{ij}^{prismatic} = \frac{a_{ij}}{\|a_{ij}\|}$$
$$r_{ij} = \frac{1}{T}\sum_{i=1}^{T} \|x_{ij}^{(t)}\|$$

TODO: Transform δ to reflect noise in the angle. Let δ be the observation noise variance. Then the likelihood

$$P(x_{ij}^{(t)}|\text{prismatic}) = \mathcal{N}(x_{ij}^{(t)} \cdot c_{ij}^{prismatic}; 0, \delta)$$
$$P(x_{ij}^{(t)}|\text{revolute}) = \mathcal{N}(\|x_{ij}^{(t)}\|; r_{ij}, \delta)$$

Assuming the observation probabilities of the edges at each timestep are independent given the joint types, we have:

$$P(x_{ij}|\text{prismatic}) = \prod_{t=1}^{T} P(x_{ij}^{(t)}|\text{prismatic})$$
$$P(x_{ij}|\text{revolute}) = \prod_{t=1}^{T} P(x_{ij}^{(t)}|\text{revolute})$$