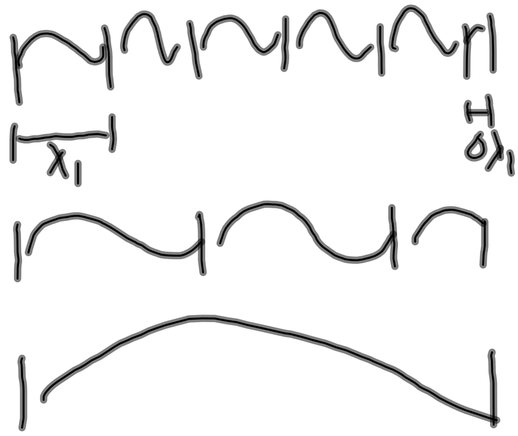
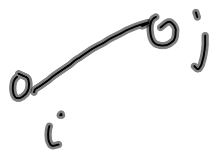


$D = m_1 \lambda_1 + \delta\lambda_1$ 18-1

$D = m_2 \lambda_2 + \delta\lambda_2$

$D = 0 \cdot \lambda_n + \delta\lambda_n$

$$d_{ij} = \left[ (x_j - x_i)^2 + (y_j - y_i)^2 \right]^{1/2}$$



$$F_d = d_{ij} - D_{ij} = 0$$

$$\frac{\partial F_d}{\partial x_i} = \frac{x_j - x_i}{D_{ij}}, \quad \frac{\partial F_d}{\partial x_j} = \frac{-\Delta x}{D_{ij}}, \quad \frac{\partial F_d}{\partial y_i} = \frac{\Delta y}{D_{ij}}, \quad \frac{\partial F_d}{\partial y_j} = \frac{-\Delta y}{D_{ij}}$$

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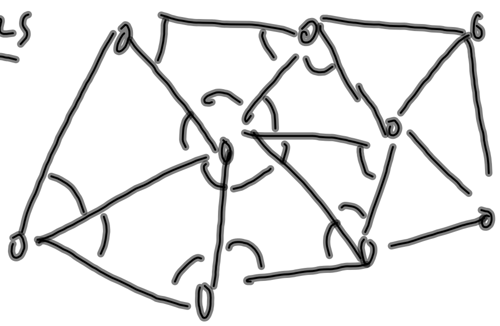
2D networks 18-2



3D networks

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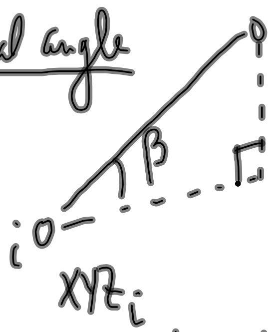
## Vertical angle

18-3




$xyz_j$

$$\beta_{ij} = \tan^{-1} \frac{z_j - z_i}{(\Delta x^2 + \Delta y^2)^{1/2}}$$

$$F_\beta : \beta_{ij} - \tan^{-1} \frac{\Delta z}{(\Delta x^2 + \Delta y^2)^{1/2}} = 0$$

$$\frac{\partial F_\beta}{\partial x_i} = \frac{-\Delta z \cdot \Delta x}{D^3 + D\,\Delta z^2}$$

$$\frac{\partial F_\beta}{\partial x_j} = \frac{\Delta z \cdot \Delta x}{D^3 + D\,\Delta z^2}$$

$$\frac{\partial F_\beta}{\partial y_i} = \frac{-\Delta z \cdot \Delta y}{\cdot}$$

$$\frac{\partial F_\beta}{\partial y_j} = \frac{+\Delta z \cdot \Delta y}{\cdot}$$

$$\frac{\partial F_\beta}{\partial z_i} = \frac{D}{D^2 + \Delta z^2}$$

$$\frac{\partial F_\beta}{\partial j} = \frac{-D}{D^2 + \Delta z^2}$$

should be dzj

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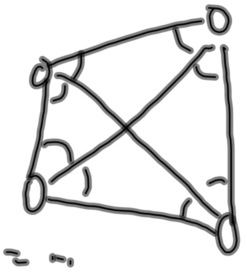
## Datum Definition = minimal constraints

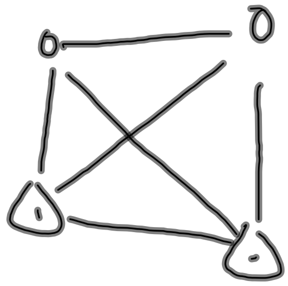
18-4

angle only
2D netw

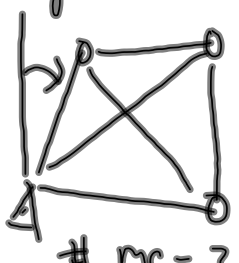
# m.c. = 4

$x_1 = ..$ $x_2 = ..$
$y_1 = ..$ $y_2 = ..$

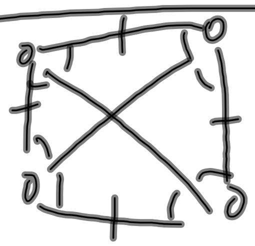




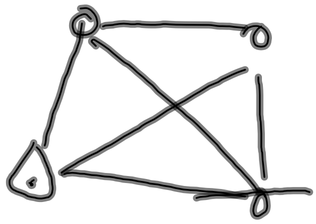
angles + dist



# mc = 3



# mc = 3



$x_1 =$
$y_1 =$
$y_2 = ..$

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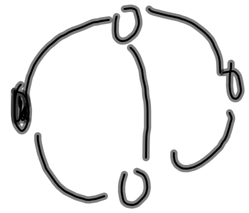
1D netw



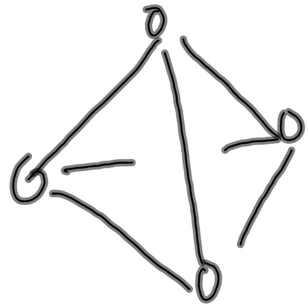
#m.c. = 1

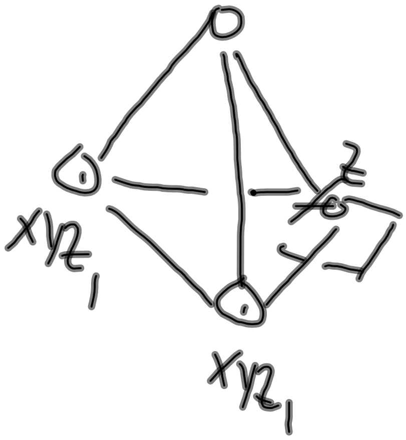
18-5

3D netw

angle only

#mc = 7



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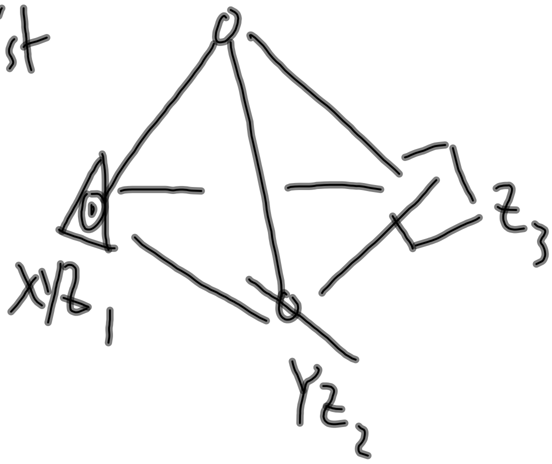
angle & dist

#mc = 6




18-6

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Error Propagation + Hypothesis testing 18-7

↳ confidence interval

↳ confidence region

distribution

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