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Freiburg, 18 May 2007
Due until 25 May 2007

Exercises of lecture

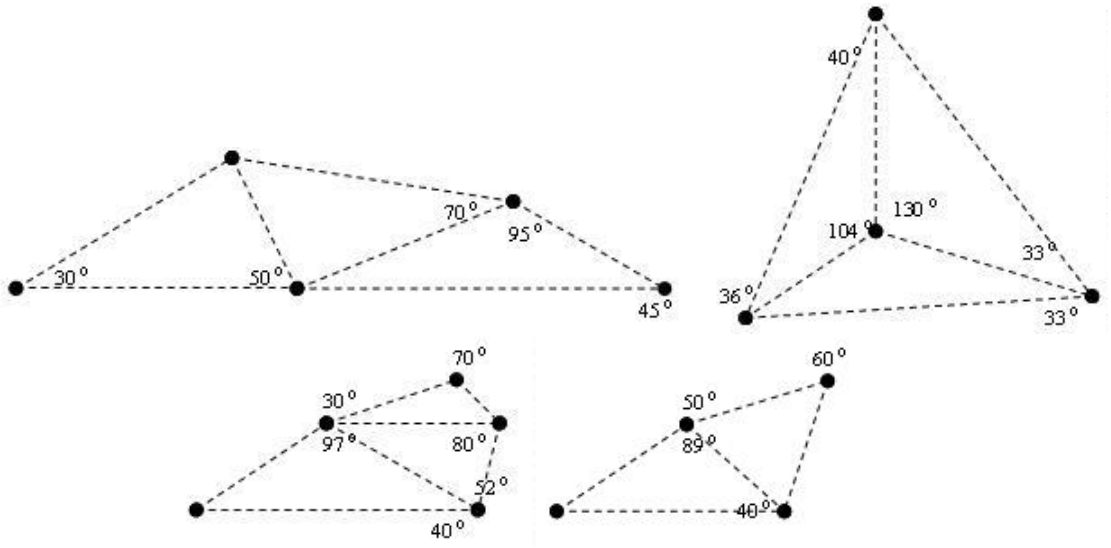
Mobile Ad Hoc Networks

Summer 2007

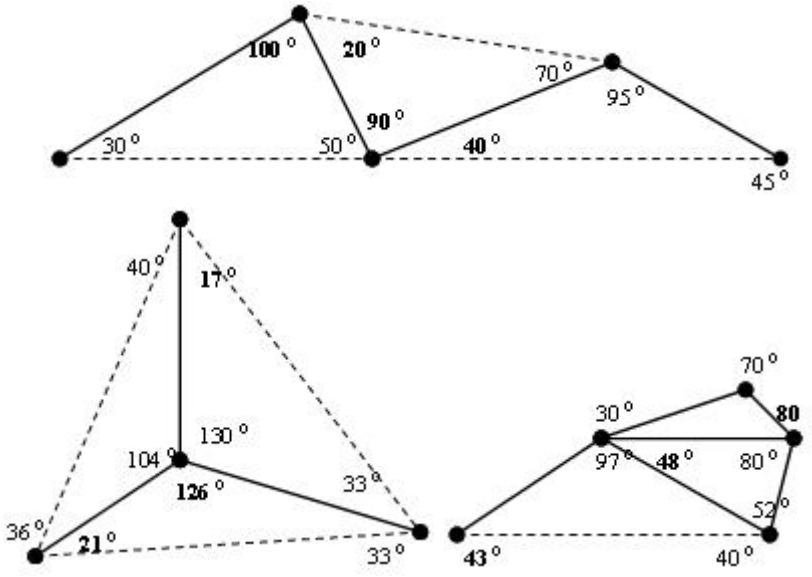
Sheet 5

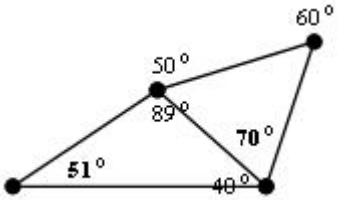
SECTION 1:
Optimal Energy Path

1. Given the following four set of points, draw the corresponding *Gabriel Graphs*.

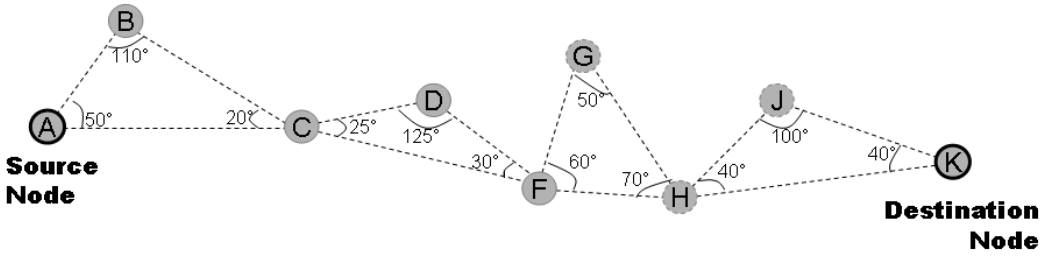


Solution:





2. Given the unit disk graph shown in the figure below, construct the optimal energy path between the source and destination node based on *Gabriel Graph*. Once the path is constructed, compute the total energy consumption to transmit p bits of data from node A to K.



Solution:
Based on Gabriel Graph, two paths exist. They are A-B-C-D-F-G-H-J-K and A-B-C-D-F-H-J-K. The optimal energy path for the source node A and destination node K is A-B-C-D-F-H-J-K.
Total energy consumption, $E_{total} = e_{tx} \cdot p \cdot \sum_{i=1}^{m} d_i^{\alpha}$ where m is the total number of links in the path, i is the link number, e_{tx} is the energy required to transmit one bit data over the distance of one meter in the power amplifier of transceiver. Depending on the transceiver sensitivity, the value of e_{tx} ranges from some pico- to nano-Joule per bit per meter$^{\alpha}$.

α is called the path loss exponent of the transmission medium that ranges from 2 to 6, while i represent the link that forms the shortest path up to link m.