Exercise for the lecture

Wireless Sensor Networks

Summer 2016

Sheet 6

EXERCISE 7:
Consider aggregation in wireless sensor network with a routing tree. The sensor information of sensor \(i\) is called \(x_i \in \mathbb{R}\) and \(z_i \in \mathbb{Z}\) for the sensor set \(\{1, \ldots, n\}\).

1. Which of the following functions can be easily aggregated?
2. What calculation has to be done at a router?
3. What information is passed from nodes to nodes?
4. How to collect the data if aggregation is not possible?

Answer these questions for the following outputs.

a) \(y_1 = \frac{1}{n} \sum_{i=1}^{n} (x_i - \frac{1}{n} \sum_{j=1}^{n} x_j)^2\)

b) \(y_2 = \sum_{i=1}^{n} z_i \mod 3\)

c) \(y_3 = \sum_{i=1}^{n} (x_i - x_{n+1-i})^2\)

d) \(y_4\) is the number of sensor nodes where \(z_i\) is larger than 10.

e) \(y_5\) is the third largest value \(x_i\)

f) \(y_6 = \begin{cases} x_{\min \{z_1, \ldots, z_n\}}, & \min \{z_1, \ldots, z_n\} \in \{1, \ldots, n\} \\ x_n, & \text{else} \end{cases}\)

g) \(y_7\) is a random value \(x_i\) chosen uniformly at random from values \((x_1, \ldots, x_n)\).

h) \(y_8 = \prod_{i=1}^{n} z_i\)

i) \(y_9\) = sorted list of all elements \((z_1, \ldots, z_n)\)

j) \(y_{10}\) = longest distance of a node to the base station.