# *Programming Assignment - 1*

# *Assignment 1*

## Data processing – Part A (basis data programming)

- **Suppose we have a straight line in 2-dimensional Cartesian coordinate system (x, y): y = 3*x + 2**

- **Let x = 10:2:1000, calculate all y(x) and save the data.**

- **Now add noise to the observation data y:  yn(x) = y(x) + n;**

- **n is a random number generated by a random number generator**

- **Try to test at least two different distributions of random number generator**

- **Plot the straight line and the observation data yn(x) in a coordinate system**

- **Find the statistics of the observed data yn(x): mean, variance**

- **Plot the distribution of yn(x) by repeating 500 times the sampling of yn(x) for x = 10:2:1000.**

# *Tips*

- **You might want to search the Web to find the following**
  - **How to generate random numbers by C/C++**
  - **How to plot points and lines using Qt Graphics**
  - **How to manipulate data vectors in C++**
  - **Study a little on statistical data analysis**

# *Assignment 1 (cont'd)*

- **Data processing – Part B (optimization & graphical rendering)**
    - **Least squares data fitting**
    - **Find the best line that fits the observational data (x, yn) with noise**
    - **Repeat the identification for at least 10 times using different noisy samples of yn**
    - **Compare the fitting result by plotting the LS-fitted lines.**
    - **Calculate the point wise errors**
    - **Find the distribution of the errors using a statistical method you think proper**
    - **Use the plotting power of Qt.**