Samples of a Population

Group Assignment 9

Test Data

Before software is tested on real data, it is tested with well-controlled test data. Test data is generated after a discrete stochastic process that has the following signal model:

$$X(n) = w(n)$$

where $w(n)$ is i.i.d and $w(n) \sim \mathcal{N}(7, 2)$

Questions

1. Are the samples of $X(n)$ statistically independent?
2. Is the process ergodic?
3. Plot the data from one realisation of the process.
4. What is the population in this case?
5. Use the formula to calculate the sample mean.
6. Verify with the matlab function mean.
7. Use the formula to calculate the sample variance.
8. Verify with the matlab function var.
9. Find the z-score for the data. What does the z-score tell you?
10. Find the confidence interval for the mean (lower and upper endpoint).
11. Draw the confidence interval on the plot together with the data. What does the confidence interval tell you?
12. How large a sample size do you actually need?
13. Repeat questions 3 and 6, 30 times and make a histograms of the found sample means. What distribution do the samples have?
14. What would happen in question 13, if the signal model was given as:

$$X(n) = w(n)$$

where $w(n)$ is i.i.d and $w(n) \sim \mathcal{U}(5, 9)$