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	Exercise 9: Adjust	tment Calculation - p	art IV
	- Non-linea	r adjustment problem -	
Group:	Surname, First name:	Matriculation number:	Signature*:
	* With my signature I declare that	I was involved in the elaboration of th	is homework.
	Submi	ission until: <b>20.01.2022</b>	
est Certifica	to.		
Received o	n: Date	Grade	Signature

## Objective

This exercise deals with the adjustment of the parameters of an appropriate functional model which is represented by a time series as depicted in Figure 1.

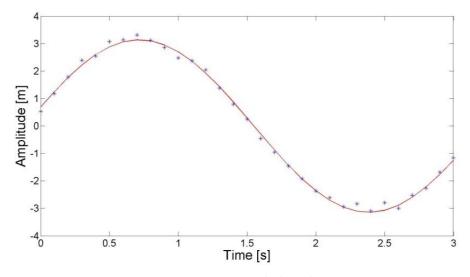


Figure 1: Given time series and adjusted sin curve

Adjustment Theory I
Winter Term 2021/22

Chair of Geodesy and Adjustment Theory

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## Task 1:

The time series depicted in Figure 1 is given in the file "Exercise9Task1.txt". The y(t) values are measurements and the time t is regarded as error free. The objective of this task is the determination of the unknown parameters of the chosen functional model via least-squares adjustment applying matrix notation. The measurements are uncorrelated and were obtained with a standard deviation of  $\sigma_{y_i} = 0.15 \text{ m}$ .

- Set up an appropriate functional model as well as the observation equations.
- Set up the stochastic model.
- Choose appropriate values for the break-off conditions  $\epsilon$  and  $\delta$  and justify your decision.
- Solve the normal equation system and determine the adjusted parameters as well as their standard deviations.
  - o Plot the time series and the resulting adjusted function.
- Calculate the residuals as well as their standard deviations.
  - o Plot the residuals in an appropriate way and decide if the measurements contain blunders.
  - Justify your decision.
- Calculate the adjusted observations as well as their standard deviations.

## Task 2 (Homework):

In the file "Exercise9Task2.txt" is given a series of measurements, where the first column represents the x values and the second column the y(x) values. The y(x) values were observed with the same standard deviation and are uncorrelated. The x values are regarded as error free.

- Plot the x and y(x) values.
- Setup a functional model that describes the behavior of the measurements.
- Which parameters are observations, error-free or unknown parameters?
- Why it is a non-linear adjustment problem? Please give a short explanation.
- Determine the unknown parameters via least-squares adjustment.
- Plot the residuals and evaluate the adjustment results.