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Warming up


1.1 What is the Problem?

1.2 Quality and Types of Errors - part 1

1.2 Quality and Types of Errors - part 2

1.3 Elements of the Estimation Problem

Assessment

Graded Assignment due Feb 8, 2017 17:30 IST 

Q&A Forum

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- ▶ 2. Mathematical model

1. Introduction to Observation Theory > 1.3 Elements of the Estimation Problem > Exercises: Elements of the estimation problem

Exercises: Elements of the estimation problem

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Driving car (1)

1/1 point (ungraded)

PROBLEM

A car drives with a velocity of 100 km/h for 15 minutes. We are interested in the corresponding distance. Identify the observations/knowns/unknowns:

Time interval velocity

Distance

- ▶ 3. Least Squares Estimation (LSE)
- ▶ 4. Best Linear Unbiased Estimation (BLUE)
- ▶ Pre-knowledge Mathematics
- ▶ MATLAB Learning Content

Observations	Knowns	Unknowns

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i In this exercise there are no observations defined. Hence, it is not an estimation problem, but rather a direct calculus problem.

Driving car (2)

1/1 point (ungraded)

PROBLEM

We measure the velocity of a car, which is driving with constant velocity for 15 minutes and are interested in the distance travelled. Identify the observations/knowns/unknowns:

Observations	Knowns	Unknowns
velocity	Time interval	Distance

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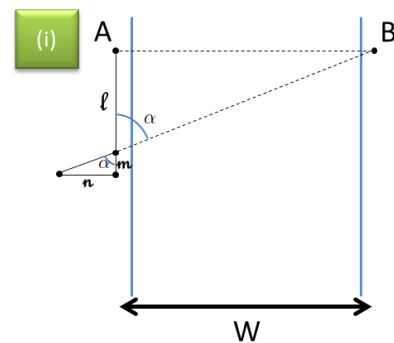
i This is an estimation problem. Once the observation is done, it is very straightforward and similar to the previous question, but it is of a fundamentally different nature.

Nerd team

1/1 point (ungraded)

PROBLEM

In the canal width problem, for the nerd team, identify the observations/knowns/unknowns:



Observations	Knowns	Unknowns
Distance 'l'	distance 'm'	distance 'W'
	distance 'n'	

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i This is an estimation problem. The side lengths 'm' and 'n' on the board are assumed known, 'l' is measured.

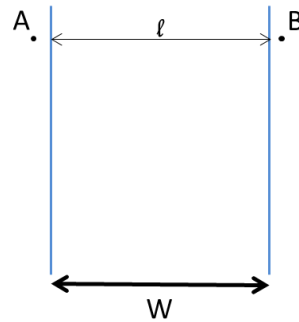
Sports team

1/1 point (ungraded)

PROBLEM

In the canal width problem, for the sporty team, identify the observations/knowns/unknowns:

(ii)



Observations	Knowns	Unknowns
distance 'l'		distance 'W'

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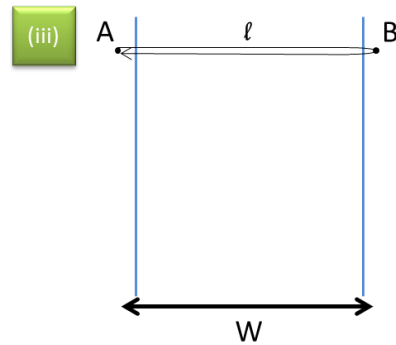
i This is an estimation problem. The sports team measured the length of the rope that they spanned over the canal.

Lazy team

1/1 point (ungraded)

PROBLEM

In the canal width problem, for the lazy team, identify the observations/knowns/unknowns:



Observations	Knowns	Unknowns

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i This is an estimation problem. The lazy guy use the laser device the measure the two-way travel-time, which is already converted to the two-way distance 'l' in this problem.

Cool team

1/1 point (ungraded)

PROBLEM

In the canal width problem, for the cool team, identify the observations/knowns/unknowns:

(iv)

Observations	Knowns	Unknowns
distance 'l'		distance 'W'
Angle 'alpha'		
Angle 'beta'		
Angle 'gamma'		
Angle 'delta'		

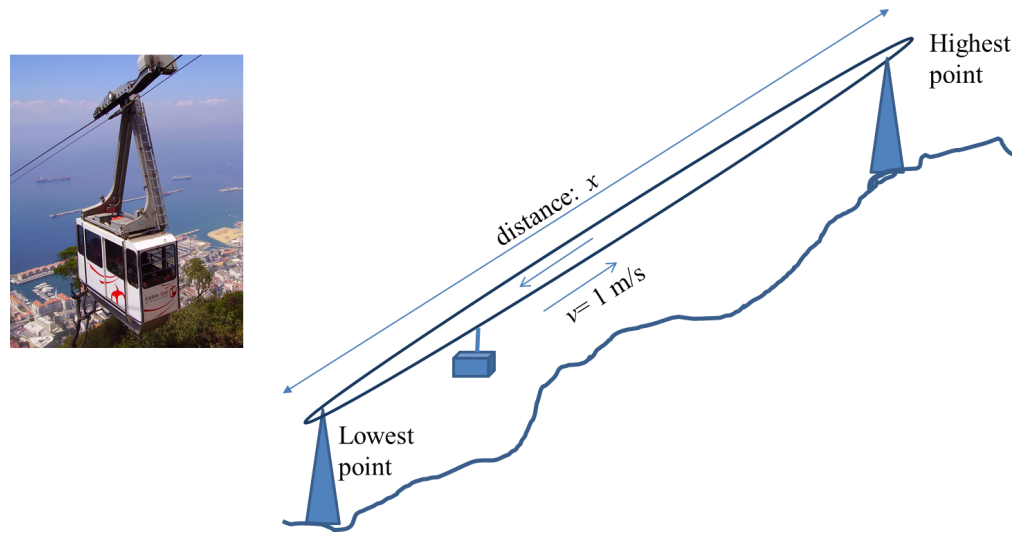
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i This is an estimation problem. The cool team measured the length between points p and q, as well as the directions to all other points from p and q, respectively. Note that the 'directions' are converted to 'angles' in this problem.

Cable car problem

3/3 points (ungraded)



A cable car moves with a constant speed (v) of 1 m/s up and down a hill (as illustrated in the figure). You enter the cable car at the lowest point and start recording time with a stop watch. When you are at the highest point of the cable car, you record the elapsed time (t_1), but you stay in the cabine and continue down again. At the lowest point you record the elapsed time again (t_2) (that is, the total time from the moment you entered the cabine). Again, you stay in the cabine and continue up again. At the highest point you record the elapsed time for the third time (t_3) (that is, the total time from the moment you entered the cabine). You want to know the distance x between the lowest and the highest point of the cable car.

In this problem, what are the "observations", "parameters/unknowns" and "knowns"?

The "parameters/unknowns" are:

distance x

✓ Answer: distance x

The "knowns" are:

✓ Answer: speed v

The "observations" are:

✓ Answer: t1, t2 and t3

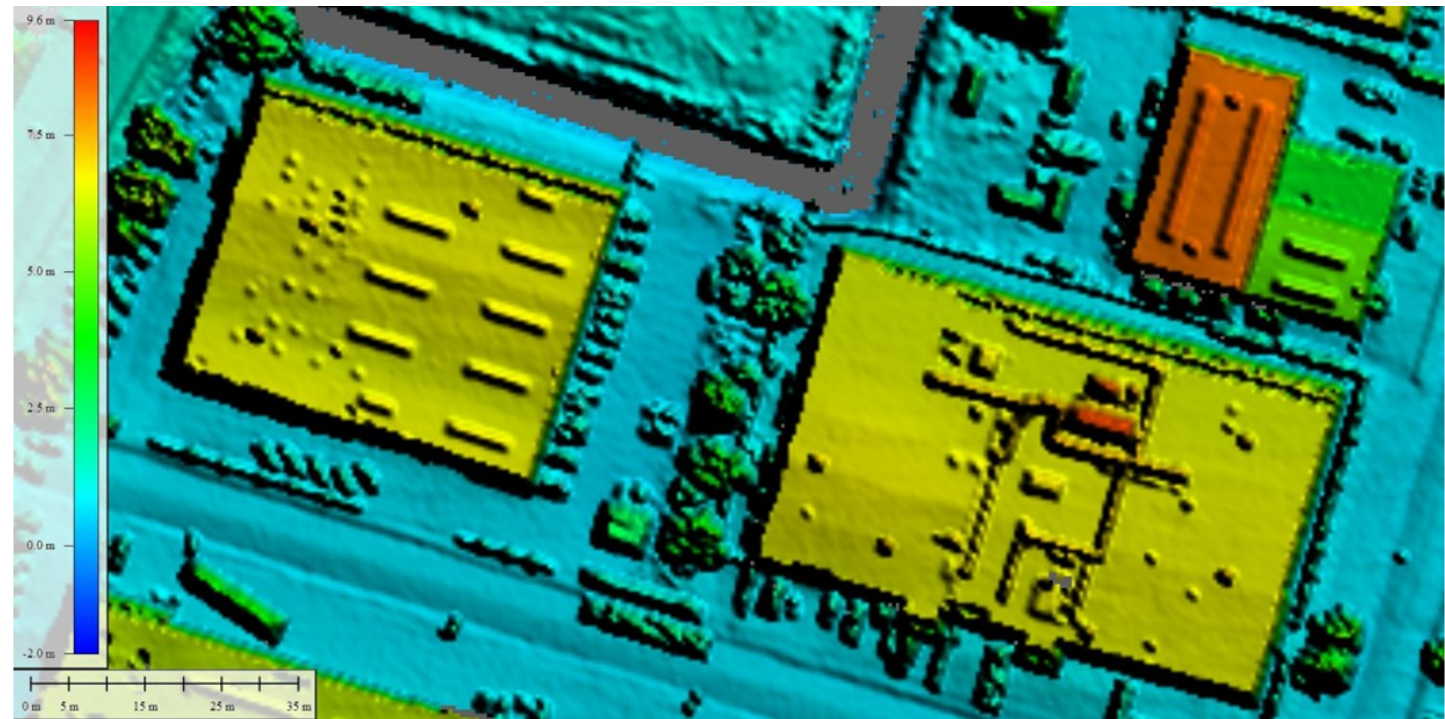
✓ Correct (3/3 points)

Laser altimetry

1/1 point (ungraded)

PROBLEM

This elevation data set is obtained by airborne laser altimetry. The laser is transmitted by the airplane, reflected on the Earth surface and received at the airplane again. The two-way travel time of the laser can be used to determine the distance from airplane to surface (questions: How to calculate the distance from the two-way travel time? What do we need to know in order to convert the distances to surface elevations?). Identify the observations, the unknowns and what is assumed to be known.



Observations	Knowns	Unknowns
Travel time	Position airplane Reference height level Propagation velocity of light Position GPS satellites	Elevation of points



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i Good work! You have completed this drag and drop problem.

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