

Unit 12 - Week 10: RADAR (RADARgrammetry)

Course outline
How does an NPTEL online course work?
Week 0: Prerequisite
Week 1: Introduction to Higher Surveying and Coordinate System & Reference Frame
Week 2: Coordinate System and Reference Frame & Time and Astronomy
Week 3: Time and Astronomy & Error, Accuracy, and Adjustments Computations
Week 4: Error, Accuracy, and Adjustments Computations
Week 5: Error, Accuracy, and Adjustments Computations, GPS & Photogrammetry
Week 6: Photogrammetry
Week 7: Photogrammetry
Week 8: Photogrammetry & LIDAR (LIDARgrammetry)
Week 9: RADAR (RADARgrammetry)
Week 10: RADAR (RADARgrammetry)
<input checked="" type="radio"/> Lec 1: RADAR fundamentals- II <input type="radio"/> Lec 2: Radargrammetry <input checked="" type="radio"/> Lec 3: Imaging RADAR Interferometry <input type="radio"/> Quiz : Assignment 10 <input type="radio"/> Weekly feedback form for week 10
Week 11: RADAR (RADARgrammetry) & Hydrographic Survey
Week 12: Hydrographic Survey & Navigation
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Assignment 10

The due date for submitting this assignment has passed. **Due on 2020-04-08, 23:59 IST.**
 As per our records you have not submitted this assignment.

- Why in multi look filtering of a speckle, we use equivalent number of looks to reduce the unwanted noise? **1 point**
 - a. It reduces the texture of the image
 - b. It reduces the mean of the image speckle
 - c. It reduces image speckle variance
 - d. It reduces the reflectivity in the image (brightness of resolution cell)

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. It reduces image speckle variance
- If θ is incident angle of a RADAR, β =depression angle, α =terrain slope, which of the following is true in the case of Foreshortening? **1 point**
 - a. $\alpha + \beta < 90^\circ$
 - b. $\alpha + \beta = 90^\circ$
 - c. $\alpha + \beta > 90^\circ$
 - d. No relationship exists between them.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. $\alpha + \beta < 90^\circ$
- Find the azimuth resolution of a Real Aperture Radar flying at a height of 5.2 km above the terrain with a depression angle of 60° and beam width of 1.8 milliradians? **1 point**
 - a. 10.81 m
 - b. 10.86 m
 - c. 10.83 m
 - d. 10.85 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 10.81 m
- Find the length of the Radar shadow formed due to object of height 1 m on the ground, and its percentage with respect to the slant range if it is mapped using a SAR aircraft at a height of 5 km and found that the object has a ground resolution of 12 km? **1 point**
 - a. 2.6 m, 0.02 %
 - b. 2.5 m, 0.03%
 - c. 2.4 m, 0.04%
 - d. 2.3 m, 0.025%

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 2.6 m, 0.02 %
- Find the incident angle and range spacing of objects on the terrain which are spaced vertically 20 cm if it is found that it is undergoing bragg scattering when it is mapped using a radar of wavelength 10 cm? **1 point**
 - a. 48.6° , 15 cm
 - b. 48.9° , 15.1 cm
 - c. 49.6° , 15.3 cm
 - d. 48.1° , 15.2 cm

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 48.6° , 15 cm
- Consider the following and choose the correct option: Statement 1: In SAR, the azimuth resolution is a function of beam width and height of spacecraft above Earth. Statement 2: The length of synthetic antenna is a function of overlap in footprint of two adjacent ocations of satellite.. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. Statement 1 is true and statement 2 is false
- Consider the following regarding Side Looking Airborne RADAR and choose the correct option: Statement 1: Time band width product (TBP) is equal to product of time taken by aircraft to travel azimuth resolution and Doppler band width. Statement 2: Doppler band width can be interpreted as number of beamwidth multiplied by N, where N is equal to number of half wavelength that can be counted in a distance covered by aircraft in one second. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Both statement 1 and statement 2 are true
- Consider the following and choose the correct option: Statement 1: Due to noise, in coherent signals, the algebraic sum of signals lead to a resultant value which is much higher than actual value. Statement 2: Noise of scatters in a resolution cell of SAR does not compensate each other while performing the algebraic sum of coherent signals. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Both statement 1 and statement 2 are true
- Consider the following and choose the correct option: Statement 1: Local incident angle is defined as angle between line of sight and terrain surface. Statement 2: Incident angle reduces if terrain slope increases. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. Both statement 1 and statement 2 are false
- Consider the following and choose the correct option: Statement 1: Receiver and transmitter are designed in such a way that area of target, area of receiver are made equal and each of these are proportionate to square of wavelength. Statement 2: Higher value of wavelength of RADAR demands higher value of transmitter's and receiver's area. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Both statement 1 and statement 2 are true
- Consider the following and choose the correct option: Statement 1: RADAR acquires the topographic data in the form of range and incident angle though; it provides the data in perspective projection. Statement 2: In RADAR image the projection center (perspective center in point through which all RADAR pulses are fired. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. Both statement 1 and statement 2 are false
- Show the following and choose the correct option: Statement 1: If a RADAR data of a point structure is not available because of occlusion, it is called NO-SHOW problem. Statement 2: Because, water behaves like a smooth surface, so RADAR cannot record any signal for water surface and it is case of NO-SHOW problem. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Statement 1 is false and statement 2 is true
- Consider the following and choose the correct option: Statement 1: If squint angle is zero, off nadir angle is equal to depression angle. Statement 2: If azimuth angle is not equal to 90° , the RADAR swath is not perpendicular to platform movement direction. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Statement 1 is false and statement 2 is true
- Consider the following and choose the correct option: Statement 1: For coordinate calculations of a RADAR range (R) is first converted to Sensor Reference Frame(u, v, w), which is then rotated to Global Reference Frame(X, Y, Z). Statement 2: In the process of calculating the coordinates of a RADAR pulse, position vector of vehicle orbit, vector of RADAR pulse position of a point on Earth's surface should be in Sensor Reference Frame. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. Statement 1 is true and statement 2 is false
- Find the height of the terrain having a stereo radar parallax (same look configuration) of 0.005 m, mapped with two aircrafts of heights 15 km and 11 km, having a ground resolution of 15 km. **1 point**
 - a. 0.0187 m
 - b. 0.0187 cm
 - c. 0.0197 m
 - d. 1.805 cm

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 0.0187 m
- For reducing the no blank area (area of no return) in the radar imagery, what should be the time delay applied to sweep on the digital data if the nearest ground distance (slant) is 9 km? **1 point**
 - a. 6 micro seconds
 - b. 0.6 micro seconds
 - c. $6 \times [10]^{-4}$ seconds
 - d. $0.06 \times [10]^{-4}$ seconds

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 6 micro seconds
- Find the ground range distance between two points having slant range of 18 km and 23 km respectively, if they are imaged with a SAR air craft flying at an altitude of 15 km? **1 point**
 - a. 7.486 m
 - b. 7.486 km
 - c. 7.496 m
 - d. 7.496 km

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. 7.486 km
- Which of the following is true, when we map a terrain using a SAR satellite with steep angles of incidence? **1 point**
 - a. Large shadow, brightness enhancement and small geometric distortions (elevation displacement and distortion)
 - b. Absence of shadow, severe brightness distortion and geometric distortions (elevation displacement and distortion)
 - c. Large shadow, severe brightness enhancement and geometric distortions (elevation displacement and distortion)
 - d. Absence of shadow, brightness enhancement and small geometric distortions (elevation displacement and distortion)

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Absence of shadow, severe brightness distortion and geometric distortions (elevation displacement and distortion)
- Consider the following and choose the correct option: Statement 1: Two-pass interferometry only derives the change in point on terrain whereas three-pass interferometry derives the change in variation of a point. Statement 2: Base line for a single pass and two-pass interferometry are different in a sense for former one (single pass) we know the base line length beforehand, whereas for latter one we need to calculate it from data. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Statement 1 is false and statement 2 is true
- Consider the following and choose the correct option: Statement 1: If a point is not shifted over two observations of a point by a RADAR sensor, it means that temporal baseline is zero. Statement 2: If a point is acquired by two RADAR sensors on two tracks, which are moving parallel to each other, which means that temporal baseline is zero whereas spatial baseline is non-zero. **1 point**
 - a. Statement 1 is true and statement 2 are false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Statement 1 is false and statement 2 is true
- Consider the following and choose the correct option: Statement 1: Modulus of phase difference provides the phase difference between 0 to 2π , which is maximum phase difference possible. Statement 2: Selecting higher wavelength of a RADAR sensor is better because it gives larger length of wavelength, which is equivalent to maximum phase difference (2π) to provide more details. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. Statement 1 is true and statement 2 is false
- Consider the following and choose the correct option: Statement 1: Range of a point is proportional to the phase difference shown by the interferogram. Statement 2: Range can be used to find out the height and across position of a point because incident angle for two observations of a point are known through interferometry. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Statement 1 is false and statement 2 is true
- Consider the following and choose the correct option: Statement 1: Higher the error in signal, one should expect higher error in estimate of incident angle ($\Delta\theta$). Statement 2: Incident angle error for a given value of α , which is elevation angle of baseline above horizontal line, in single pass interferometry, is equal to error in angle α . **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Both statement 1 and statement 2 are true
- Consider the following and choose the correct option: Statement 1: In differential interferometry, one has to work with difference of two interferograms where, one interferogram is itself prepared by difference of two phase images. Statement 2: In differential interferometry, it is assumed that change of point on terrain is occurring between first and last observation **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. Statement 1 is true and statement 2 is false
- Find the coordinates of the object in the coordinate system which is imaged using a SAR satellite with azimuth angle 80° having a slant range of 12 km and an incident angle of 40° ? **1 point**
 - a. (2.084,4.596,-9.192)
 - b. (-2.084,4.596,-9.192)
 - c. (2.084,-4.596,-9.192)
 - d. (-2.084,-4.596,-9.192)

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. (2.084,4.596,-9.192)
- Consider the following and choose the correct option: Statement 1: For a side looking stereo configuration, stereo parallax increases as the look angle reduces Statement 2: In case of stereo images in the photogrammetry for the same side looking cameras, we add the parallax in the two images of a point to find the parallax of that point. But in case of RADAR, we will make difference of the two parallax to find the parallax of that point. **1 point**
 - a. Statement 1 is true and statement 2 is false
 - b. Both statement 1 and statement 2 are true
 - c. Statement 1 is false and statement 2 is true
 - d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Both statement 1 and statement 2 are true
- Which of the following do you think it might be a reason for buildings to appear in L shape in the RADAR images? **1 point**
 - a. The walls of the building are acting as dihedral reflectors
 - b. The walls of the building are acting as trihedral reflectors
 - c. The walls of the building are acting as mirror reflectors
 - d. The walls of the building are acting as diffuse reflectors

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. The walls of the building are acting as dihedral reflectors
- Find the corrections in the image coordinates of a point on the terrain if it is mapped using a SAR satellite of look angle 40° having a range of 12 km? (assume no change in the satellite position vector and roll, pitch, yaw bias of 1 rad, 0.5 rad, 0.8 rad respectively)? **1 point**
 - a. (-10.76,0)
 - b. (-10.27,5.335)
 - c. (-10.17,5.035)
 - d. (-10.71,5.635)

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. (-10.76,0)
- Why projection lines are circular in case of RADAR **1 point**
 - a. Due to the type of image acquisition
 - b. Due assumption of wave fronts as spherical
 - c. Due to terrain of the ground
 - d. Due to atmospheric attenuation

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Due assumption of wave fronts as spherical