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ORGANISED BY GEOTECHNICAL ENGINEERING TECHNICAL DIVISION (GETD)

ONE DAY COURSE ON "ADAPTATION OF INSAR FOR GEOTECHNICAL PRACTICE"

DATE: 27 JUNE 2024, THURSDAY
TIME: 8.00AM - 6.00PM
VENUE: MALAKOFF AUDITORIUM, GROUND FLOOR, WISMA IEM, PJ

BEM Approved CPD: 7
IEM24/HQ/114/C

SPEAKERS:


Prof. Tseng Kuo Hsin


Mr. Tai Yu Heng


Dr. Elizabeth Wing See Wong


Prof. Tsai Fuan


Mr. Wu Hsi Hsien


Mr. Wan Muhammad Hafiz Bin Zakaria


Mr. Abhinandan Arya


Ir. Asif Abdullah Shah Aimin

CLICK TO SAVE EVENT INTO YOUR CALENDAR

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Non-IEM Member	RM800	RM900

HRDCORP CLAIMABLE

APPROVED DURATION:
HRD CORP SERIAL NO:
10001415990

PROGRAM

Time	Description	Speaker
8.00am - 8.50am	Registration & Refreshment	
8.50am - 9.00am	Welcoming Address	
9.00am - 10.30am	Lecture 1: Application of PSInSAR to Improve Situational Awareness in Civil Engineering	Prof. Tseng Kuo Hsin
	Lecture 2: InSAR Data Processing	Mr. Tai Yu Heng
10.30am - 11.00am	Morning Tea Break	
11.00am - 12.00pm	Lecture 3: Adaptation and applications of SAR – Deep Dive Case Studies	Dr. Elizabeth Wing See Wong
12.00pm - 1.00 pm	Lunch	
1.00pm - 2.30pm	Lecture 4: Applications of InSAR—Examples in Taiwan	Prof. Tsai Fuan
	Lecture 5: GIS Platform for InSAR Monitoring	Mr. Wu Hsi Hsien
2.30pm - 3.30pm	Lecture 6: The Application of Interferometric Synthetic Apperture Radar (INSAR) in Identifying Landslide Susceptible Area: Case Study for Gunung Pass Slope, Seksyen 44, FT185, Daerah Kinta,Perak	Mr. Wan Muhammad Hafiz Bin Zakaria
3.30pm - 4.00pm	Afternoon Tea Break	
4.00pm - 5.00pm	Lecture 7: SAR Tech and its Usefulness for Engineering	Mr. Abhinandan Arya
5.00pm - 5.30pm	Lecture 8: Risk Assesment for Slope along Railway with Drone Survey	Ir. Asif Abdullah Shah Aimin
5.30pm - 6.00pm	Discussion and Q&A	

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REGISTRATION FORM

Kindly email the registration form to **amira@iem.org.my**

IMPORTANT:

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IEM reserves the right to postpone, reschedule, allocate or cancel the course. Full refund if cancellation is received in writing more than 7 days before start date of the event. No cancellation will be accepted prior to the date of the event. However, replacement or substitute may be made at any time with prior notification and substitute will be charged according to membership status.

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SPONSORSHIP BOOKING FORM

One Day Course on "Adaptation of INSAR for Geotechnical Practice" at Wisma IEM, Petaling Jaya, Selangor 27th June 2024, Thursday

Please tick (√) in the appropriate boxes below (ALL SUBJECT TO 8% SST):

EXHIBITION BOOTH PACKAGE		AMOUNT (RM)	ENTITLEMENT
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ADVERTISEMENT PACKAGE		**AMOUNT (RM)**	**ENTITLEMENT**
	Outside back cover (colour)	2000	> Additional 3 complimentary seminar participants
	Inside front cover (colour)	1500	> Additional 2 complimentary seminar participants
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SPEAKER'S PROFILE

Prof. Tseng Kuo Hsin

Professor,
Center for Space and Remote Sensing Research & Department of Civil Engineering, National Central University

APPLICATION OF PSINSAR TO IMPROVE SITUATIONAL AWARENESS IN CIVIL ENGINEERING

Man-made structures undergo periodic deformation throughout their lifecycle, influenced by material degradation and surrounding geological conditions. While some variations remain within acceptable limits, others may signal potential structural failure. Implementing a systematic monitoring approach with advanced remote sensing technology is crucial for effectively observing land target deformations. The Sentinel-1 satellite, a European Space Agency (ESA) mission, operates in C-band Synthetic Aperture Radar (SAR) data, offering extensive coverage and frequent revisit intervals. Leveraging this satellite's capabilities, we can efficiently generate Persistent Scatterer Interferometric SAR (PSInSAR) data, facilitating rapid and effective monitoring of ground target deformations. PSInSAR techniques involve analyzing coherent radar measurements over time to detect and monitor subtle ground movements. By utilizing Sentinel-1 data, we can produce high-resolution deformation maps with enhanced accuracy. These maps provide valuable insights into man-made structures' behavior, enabling proactive maintenance and mitigation strategies.

Our primary objective is to improve ground target deformation estimation accuracy through PSInSAR techniques. Comparing these estimations with ground-truth measurements obtained from on-site surveys validates the reliability and effectiveness of our remote sensing approach. Sentinel-1's advantages for deformation monitoring are manifold. Its broad coverage enables comprehensive monitoring of large geographical areas, which is beneficial for assessing extensive infrastructure networks. Additionally, Sentinel-1's short revisit time allows frequent updates of deformation data, facilitating timely change detection and intervention. Moreover, historical Sentinel-1 data availability supports long-term trend analysis, aiding in identifying persistent deformation patterns and potential risk areas. This analysis enhances understanding of structural behavior over time, assisting in developing predictive models for future deformation scenarios.

In summary, utilizing Sentinel-1 satellite data and PSInSAR techniques offers a powerful means of monitoring ground deformation of structures in civil engineering. Combining remote sensing technology with on-site monitoring data improves deformation estimation accuracy, enhancing infrastructure system resilience and safety.

Prof. Tseng Kuo Hsin is an excellent faculty member at the Center for Space and Remote Sensing Research and the Department of Civil Engineering at National Central University. Concurrently, he serves as an Adjunct Professor in the Department of Civil Engineering and the Graduate Institute of Hydrological and Oceanic Sciences at NCU, a position he has held since 2014.

With a Ph.D. in Earth Sciences from The Ohio State University, Prof. Tseng brings a wealth of expertise to his field. His research focus includes InSAR, Environmental Remote Sensing, Satellite Altimetry, Geodetic Surveying, and Multispectral Image Analysis. As an accomplished academic, he contributes significantly to the advancement of knowledge in these areas, reflecting his commitment to excellence in research and education.

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SPEAKER'S PROFILE

Mr. Tai Yu Heng

Associate Engineer,
Center for Space and Remote Sensing Research,
National Central University

INSAR DATA PROCESSING

The Interferometric Synthetic Aperture Radar (InSAR) technology is an effective tool for large-scale surface deformation detection. serval applications such as earthquake monitoring and digital elevation model generation have been done in previous studies. However, the decorrelation problem, usually caused by vegetation cover, has a huge impact on InSAR results. To overcome this, Persistent Scatterer Interferometric Synthetic Aperture Radar (PSInSAR), which has several advantages in multi-temporal deformation estimation and noise resistance, is developed to acquire more accurate and reliable results. It has been widely utilized in long-term land subsidence monitoring, detecting slow creeping of slop, and risk management of infrastructure.

Thanks to the Scientific Exploitation of Operational Missions program support by the European Space Agency, SAR data, also data processing software are open and free to access, making InSAR analysis easier than before. Combining the Sentinel Application Platform (SNAP) and Stanford Method for Persistent Scatterers (StaMPS) software, the PSInSAR analysis could be done on a typical PC. This has enabled a new solution for high-efficiency, large-volume ground deformation data analysis and database construction.

Mr. Tai Yu Heng has worked for the Center for Space and Remote Sensing Research at National Central University for five years. He graduated from the Department of Earth Science at National Central University, Taiwan, and obtained a master's degree. As a full-time associate engineer, specializing in the processing and application analysis of space-borne radar satellite remote sensing data, he is skilled in SAR data processing and analysis result description. He has developed a semi-automatic SAR data processing system, which is optimized for recent satellite data, making the workflow more efficient than before. His current research is focused on the potential and application of artificial intelligence and deep learning in SAR data processing and result analysis.

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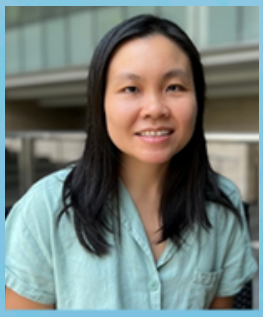
SPEAKER'S PROFILE



Dr. Elizabeth Wing See Wong

Sales Engineering Manager.
Synspective Inc., Singapore

ADAPTATION AND APPLICATIONS OF SAR – DEEP DIVE CASE STUDIES

Synthetic aperture radar (SAR) satellites utilises radar systems on spacecrafts to create high-resolution images of the Earth's surface and has garnered widespread interest for its adaptation and diverse applications. As SAR data becomes more readily available with the launch of SAR satellite constellations, its unique applications play a pivotal role in various fields including environmental monitoring, disaster response and urban infrastructure monitoring.

The interpretation of SAR imagery and how this data can be exploited will be discussed in this talk. Crucial insights through the analysis of different types of radar data, such as the use of X-band, C-band and L-band sensors and its relevant application will be addressed. We will also explore on the various usages of SAR through use case discussions where SAR is capitalised on, to address real-world issues and how this technology can be used to complement existing geotechnical engineering work.

Dr. Elizabeth Wing See Wong is currently the Sales Engineering Manager at Synspective Singapore. She has a BEng in electrical engineering from the National University of Singapore and received her PhD in Physical Oceanography and Meteorology from the University of Miami. She has had over 10 years of experience in research, working with satellite remote sensing data in sectors ranging from maritime, environmental science to disaster relief. Having worked on several novel commercial use. Elizabeth is always looking to further expand remote sensing applications in new areas. She believes that the exploitation of Synthetic Aperture Radar (SAR) imagery from new-generation satellite constellations is the next key to revolutionising our ability to observe and understand our planet.

SPEAKER'S PROFILE

Prof. Tsai Fuan

Professor,
Center for Space and Remote Sensing Research & Department of Civil Engineering, National Central University

APPLICATIONS OF INSAR—EXAMPLES IN TAIWAN

Persistent Scatterer Interferometric Synthetic Aperture Radar (PSInSAR) technology can be utilized in a variety of environmental and engineering applications with different scales, including large-scale deformation previews, medium-scale surface deformation monitoring, and engineering-scale area or infrastructure monitoring programs. Large-scale PSInSAR analysis results in Taiwan are primarily utilized as a quick preview for the determination of extensive and serious deformation states. Integrating with the Homeland Security Monitoring Platform, these results can rapidly provide preliminary information, assisting in the design of regional or engineering monitoring projects and decision-making processes. The medium-scale applications allow for a further understanding of regional surface deformation patterns, which are usually related to local geological structures, hydrological environments, and other factors. This level of analysis not only could be used for disaster events investigation, but also provides valuable references for land use planning and other policy making tasks. At the engineering scale, the focus shifts to important infrastructures or specific targets such as slopes, bridges, roads, or buildings. Long-term multi-temporal monitoring of these objects helps understand their deformation patterns, provide early-warning or alerts for unexpected ruptures or collapses if possible, and facilitate the planning or implementation of ground monitoring and maintenance. This presentation provides an overview of the current state of PSInSAR technology applications in Taiwan, emphasizing its role in deformation monitoring at different scales and its contribution to decision support in disaster-related investigation, prevention and mitigation scenarios.

Prof. Tsai a highly experienced Professor at the Center for Space and Remote Sensing Research and the Department of Civil Engineering at National Central University. Currently serving as the Director of the Resource Satellite Ground Receiving Station at NCU since 2017, he has also served as the Director of the Center for Space and Remote Sensing Research from 2018 to 2021.

In addition to his roles at the university, Prof. Tsai is actively involved in the field, holding the position of Deputy Secretary General at the Asian Association on Remote Sensing (AARS) since 2018. Previously, he chaired the International Society for Photogrammetry and Remote Sensing Working Group VI/5 from 2012 to 2016.

With a Ph.D. in Civil and Environmental Engineering from Cornell University, Professor Tsai is an expert in various aspects of remote sensing, including Remote Sensing Image Analysis, Satellite Imagery Processing System, Multi-dimensional Spatial Analysis, Digital City Modeling, and Computer Vision. His extensive contributions reflect a dedication to advancing knowledge and expertise in the field of remote sensing.

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SPEAKER'S PROFILE

Mr. Wu Hsi Hsien

Manager, CECI Engineering Consultants, Inc., Taiwan

GIS PLATFORM FOR INSAR MONITORING

In response to the need for seeking ways to assist mitigate damage resulting from the occurrence of natural disasters, CECI Engineering Consultants, Inc., Taiwan (CECI), by applying GIS technology, has developed the "Homeland Safety Monitoring Platform" which consists three major modules; such as (1) Bridge Maintenance Management Module, (2) Infrastructure Disaster Management Module, and (3) InSAR Safety Monitoring Management Module. This integrated platform can be an invaluable reference and tool to assist in the decision-making process for handling disaster reduction related matters. A quick-screening function built in the platform can screen out dangerous and old infrastructures and a grade management function helps management authorities focus on management related matters by prioritizing infrastructure assessments and retrofits. When dangerous infrastructures have subsequently been strengthened and retrofitted, the resilience of homeland is greatly enhanced which thereby ensures the safety of travelers and creates a sustainable living environment. The InSAR Safety Monitoring Management Module primarily utilizes ESA Sentinel-1 radar satellite imagery to compute Persistent Scatterer Interferometric Synthetic Aperture Radar (PSInSAR) data for Taiwan over the past five years. This enables the monitoring of ground subsidence or uplift movements. Simultaneously, it integrates and correlates data from GPS tracking stations and seismic events across Taiwan. This GIS information service platform has also been granted a national patent.

Mr. Wu Hsi Hsien is the Manager at CECI Engineering Consultants, Inc., Taiwan. He is a certified APEC Engineer/IntPE and earned his Master's degree in Surveying Engineering from National Cheng Kung University. With expertise in Photogrammetry, GNSS Surveying, Drone Mapping, Mobile Mapping, HD Map, and 3D GIS for Smart City applications, he brings a wealth of knowledge to his role. Mr. Wu was awarded his honor of Outstanding Young Engineer granted by CIE in 2010. Additionally, Mr. Wu serves as the Deputy CEO of the Chinese Taipei APEC/IPEA Monitoring Committee, showcasing his commitment to professional development and leadership in the field.

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SPEAKER'S PROFILE

Mr. Wan Muhammad Hafiz Bin Zakaria

Civil Engineer,
Early Warning System Unit, Slope Engineering Branch,
Public Work Department Head Quarters

THE APPLICATION OF INTERFEROMETRIC SYNTHETIC APPERTURE RADAR (INSAR) IN IDENTIFYING LANDSLIDE SUSCEPTIBLE AREA: CASE STUDY FOR GUNUNG PASS SLOPE, SEKSYEN 44, FT185, DAERAH KINTA,PERAK

In monitoring a large area of hilly terrain, the cost of in-situ instrumentation is too expansive. The monitoring of land displacement using an Interferometric Synthetic Aperture Radar (INSAR) is an ideal way to identify the susceptible area prior deciding type of instrumentation to be used for slope closed monitoring, Hafiz will delve into study of application of Interferometric Synthetic Aperture Radar (InSAR) in identifying landslide susceptible area. Attendees can expect to gain valuable insights on application of GIS in disaster risk reduction (DRR). Whether you're a civil engineer, geologist, researcher, or student, this session promises to be informative and thought-provoking.
Don't miss the opportunity to hear from Wan Muhammad Hafiz as he shares his knowledge and experience in Slope Monitoring and Early Warning System. This is a must-attend session for anyone learning about Landslide and Disaster Risk Reduction.

Mr. Wan Muhammad Hafiz Bin Zakaria received an early education at SMK Methodist ACS Sitiawan, Perak, UiTM Shah Alam in Bachelor of Science in Civil Engineering and Master of Science in Civil Engineering (Geotechnical) from Cardiff University, Wales. Registered as a member of Board of Engineers Malaysia (BEM) since 2015 and Institutions of Engineer Malaysia (IEM) since 2017. He started career as a Civil Engineer with an experience of infrastructure development locally and overseas involving airport (KLIA2 & Timor Leste), train viaduct (LRT) and elevated highway constructions (DASH). Currently serving as a Civil Engineer at Early Warning System Unit, Slope Engineering Branch, Public Work Department Head Quarters.
As an engineer who's in-charge of PWD Real-Time Slope Monitoring and Landslide Early Warning System, Hafiz not only monitors early warning system alone but also involved in advising the Local Authority and State Government in determining what instrumentations required and where it shall be install at the site. He was involved in installing and monitoring slope real-time instrumentation at Bukit Permai Ampang Landslide (under MPAJ), Batang Kali-Genting Highlands Massive Landslide (under JKR Selangor), MACA landslide (MACC) and a Landslide Early Warning System installation for Bentong, Raub and Cameron Highlands District (under State Government). Hafiz has an experience as a speaker for 'Introduction to Instrumentation and Slope Monitoring' at Jabatan Kerajaan Tempatan, KPKT.

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SPEAKER'S PROFILE

Mr. Abhinandan Arya

Technology Strategy Officer,
Synspective Inc., Japan

SAR TECH AND ITS USEFULNESS FOR ENGINEERING

Synthetic Aperture Radar (SAR) is a technology that employs electromagnetic waves to generate images of the Earth's surface from spaceborne or airborne platforms. Facilitating weather-agnostic monitoring, SAR can function in any weather condition, and at any time of the day, unlike optical sensors that depend on sunlight. SAR images exhibit distinctive features that are influenced by the waves' wavelength, polarization, and incidence angle, as well as the targets' dielectric and structural properties.

Insight, precursor, and response are key engineering paradigms and thus requirements for organizations and authorities to enhance decision-making, strengthen the world economy, and improve the quality of life for all.

Satellite constellations, notably SAR sensors, are becoming indispensable in enabling decision-making and response for companies and governments focusing on infrastructure, mining, forest and environment, national security, and maritime. From alerting authorities of slope and ground instability to saving lives, estimating carbon credits to boost sustainable farming, monitoring floods to assist people in disaster-hit areas, to estimating wind to better plan wind farms to support renewable energy and the economy, SAR satellite constellations with its distinctive features and through persistent monitoring and intelligent analytics are becoming the go-to tool. This talk introduces two diverse SAR engineering application use cases from infrastructure monitoring and forest biodiversity.

Geotechnical land-deformation events such as slope failures associated with landslides often occur without much apparent warning, thus causing loss of lives and property. A methodology for detecting salient precursors of ground instability through SAR satellite persistent scatterer point, robust to spatio-temporal noise is developed to improve the applicability of ToF (time of failure) in the operational monitoring of infrastructure, land subsidence, and mine slopes.

Furthermore, with the growing importance of decarbonization, forest preservation, and management face critical challenges. With their persistent monitoring capabilities, SAR satellite constellations offer a comprehensive solution for forest owners and governments, enabling them to monitor biodiversity, carbon estimation, forest degradation, and logging monitoring. The talk encourages the audience to explore the engineering applications with SAR constellations and analytics.

Mr. Abhinandan Arya is a Technology executive with expertise in remote sensing and computational intelligence and also an AI professional with industry experience in satellite remote sensing, telecommunication, and product design & development. Graduated from India's Ivy League, Indian Institute of Technology (IIT), Guwahati in Electronics and Electrical with Computer Science and Engineering, He has worked in Research and Development with leading universities and MNCs in India, South Korea, and Japan.

Mr. Abhinandan has demonstrated research, and professional excellence throughout his career working with large corporations, like Vodafone Group, and Tech Mahindra as an Engineering Leader, and Technology Specialist. He also holds a PGP degree in Artificial Intelligence and Machine Learning from the University of Texas at Austin and is a Ph.D. Scholar in the field of computational intelligence in remote sensing.

At present, Mr. Abhinandan is responsible for the technology strategy at Synspective and is leading the core solution strategy using Synspective SAR satellite constellations.

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SPEAKER'S PROFILE

Ir. Asif Abdullah Shah Aimin

Geotechnical Manager
Aurecon Perunding Sdn. Bhd

RISK ASSESMENT FOR SLOPE ALONG RAILWAY WITH DRONE SURVEY

Risk assessment has been carried out on over 3000 slope assets along railway in Australia. A team of geotechnical engineer and geologist from Malaysia, Philippines, Thailand, and Vietnam were mobilized to assist the assessment. The slope assets basically categorized as soil or rock cut slope and embankment. The assessment mainly carried out on data collected from drone survey. In addition to point cloud, the data were also processed into 2D, 3D and terrain model. Each type of model enable assessor to conveniently navigate, view and measure relevant information related to the slope being assessed such as vegetation cover, rock slope discontinuity, slope reinforcement, retaining wall and drainage. Sign of distress such as ground movement, erosion, historical rock fall were also able to be identified. Conventional physical inspection method tends to overlook certain signs of distress due to its remote and inaccessible location. In addition, assessor can also measure the slope geometries, catchment area, etc. Collected data were then logged into ArcGIS application, developed in-house, where each feature was assigned with suitable risk rating. The risk assessment rating was referred to Geotechnical Risk Assessment and Hazard Management guideline by the local transport authority.

Ir. Asif Abdullah Shah Aimin is currently a Geotechnical Manager at Aurecon Perunding Sdn. Bhd (formerly known as GCU Consultants Sdn. Bhd.). He received his BEng. in Civil Engineering from Universiti Teknologi Malaysia, Skudai and MSc. in Geotechnical Engineering from University Teknologi MARA, Shah Alam. Having over 15 years of experience in consultancy firm, exposed him in various nature of geotechnical engineering works such as ground treatment, deep excavation, and slope engineering. Serving in multinational firm had opened the opportunity for him to involve with abroad projects. Recently, he has led a team of local geotechnical engineer and geologist in supporting the Australia's team with slope risk assessment for railway operator in Australia. He is looking forward in sharing the team experience, hoping it will contribute to the current local practice.