DAYANANDA SAGAR UNIVERSITY

Department of Computer Science Engineering

School of Engineering

Webinar Report on

"Earth Observation Satellite Images' Processing"

Date: 14 December, 2022
Time: 10:00 am – 1.00pm

Resource Person:

Dr. P S Diwaker
ISRO Chair, Professor, NIAS

Patrons:

Dr. Uday Kumar Reddy K R
Dean,SOE

Dr. M. K. Banga
Dean, R & D

Dr. Girisha G S
Professor & Chairman,CSE

ORGANISERS:

Dr. Rajesh TM, Associate Professor,CSE

Dr. Tina Babu, Assistant Professor,CSE

Prof. Nandini K, Assistant Professor,CSE

CO-ORDINATOR:

Dr. Gopal Joshi Sharma,Professor,CSE

Target Audience: Image processing inspired students

Number of Participants : 43

The Dept. of CSE has successfully organized a webinar on **"EARTH OBSERVATION SATELLITE IMAGE PROCESSING".** The targeted audience was 3rd year students of all the programs of the Department of CSE. The course was organized in offline mode. Around 30+ students attended the webinar. All students were trained on both theoretical and practical knowledge of the satellite image processing. At the end of the seminar a feedback was taken from the students and it is found to be satisfactory.

DAYANANDA SAGAR UNIVERSITY

DAYANANDA SAGAR UNIVERSITY
Innovation Campus, Campus 3, Near Kudlu Gate Hosur
Main Road, Bangalore - 68

School of Engineering
Department of Computer Science & Engineering

SEMINAR
ON
EARTH OBSERVATION
SATELLITE IMAGE
PROCESSING

14th December 2022
9:30 AM Onwards
Gallery Hall, A Block

Dayananda Sagar Institutions founded in the 60s by one such visionary, late Sri Dayananda Sagar committed to take knowledge to the people, transforms today's students into responsible citizens and professional leaders of tomorrow. Dayananda Sagar University created by an Act of the Karnataka State in 2014, built on this adorable legacy and inspired by its own milestones, meeting the needs of quality higher education in this part of the world. DSU is a proud member of the Dayananda Sagar Institutions family. Founded by Late Sri Dayananda Sagar in the early sixties (with just four students), DSI has morphed into global education power house, spread over five campuses, catering to the education needs of over 17,000 students. Operating under the aegis of the Mahatma Gandhi Vidya Peetha Trust in Bengaluru, DSI has enabled the transformation of tens of thousands of young Indian and international citizens into professionals in diverse specializations.

ABOUT THE DEPARTMENT

The Department of Computer Science & Engineering was started in the year 2015. It offers four Undergraduate Programmes, namely, B.Tech CS&E, B. Tech CS&E (AI & ML), B. Tech CS&E (Data Science) and B. Tech CS&E (Cybersecurity) which prepares students for the current and future demands of industry and the research world.The Department of Computer Science and Engineering provides a solid foundation and new age skills to our bachelor's level students, to build a career of the future to contribute effectively to the global opportunities. We use innovative curriculum, pedagogy and assessment methods in line with the National Education Policy and in partnership with industry to enable students get not only the breadth of CSE and depth of various specializations, but also to develop personal effectiveness and leadership skills for all rounded development.

SPEAKER

DR. P.G. DIWAKAR

Director,
Earth Observation & Disaster Management,
ISRO Chair Professor, NIAS
INDIA

PATRONS

Dr. Uday Kumar Reddy K R
Dean,SOE

Dr. M. K. Banga
Dean, R & D

Dr. Girisha G S
Professor & Chairman,CSE

ORGANISERS

Dr. Rajesh TM,
Associate Professor,CSE

Dr. Tina Babu,
Assistant Professor,CSE

Prof. Nandini K,
Assistant Professor,CSE

CO-ORDINATOR

Dr. Gopal Joshi Sharma,
Professor,CSE

Demonstration by the Speaker

The Seminar covered practical knowledge on different topics including types of satellite images which helps in better visualization,brief understanding of data fusion methods like multispectral,Hyperspectral etc ,and understanding how to predict glacier loss over the years.

Data fusion can be done in many ways such as simple multispectral methods, simple linear equations between images and also wavelet transforms.

Wavelet transform is similar to Fourier transform where we can detect and eradicate the noise and gives the final image.
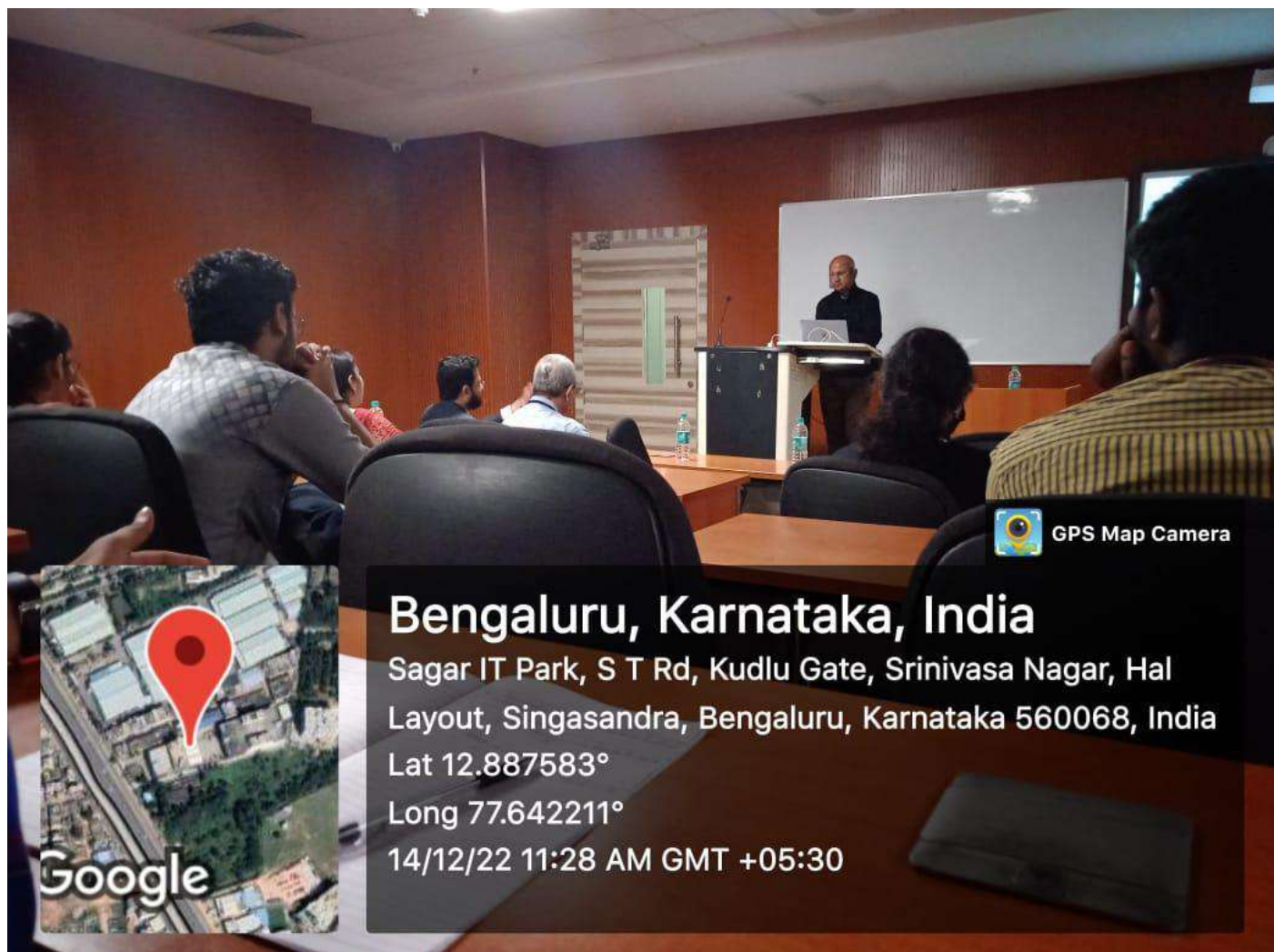
Digital elevation model:
A 2-dimensional image is dripped into digital image and can be viewed as a 3D image.

Different problem statements were given by Dr. Diwakar Sir on to work with-
Research is on the board where we get to know what is deep down the ocean as humans cannot sustain in deep ocean.
The amount of ice and glaciers being melted and lost due to various factors near the Arctic and Antarctica and the reason for ocean level to increase.
We can predict it by doing a comparative analysis of the amount of data collected among the various years. For e.g., we can measure the length and breadth of the glacier 50 years ago and the present day and tell how much of the glacier is lost.

Hyperspectral images have 500 bands and the multispectral images can be further broken down into smaller pieces and can be used to detect the problems related to agricultural land such as type of crops grown, health of leaves, water quality, etc.

Ocean color monitor data and the scatterometer data are used to understand the direction and the magnitude of the waves and the speed at which they move. However, we use the surface of the ocean and predict a lot of things using the satellite. India has a unique satellite named OCEANSAT dedicated to oceanography and atmospheric studies.

OCEANSAT-3 was recently launched on 26th November 2022 which will provide continuity to the operators of OCM and enhance other applications. OCEANSAT-3 is the 3rd generation satellite of its family.

RESOURCESAT is again a unique satellite launched back in 90's by ISRO and the series of these satellites have been providing us with the useful information till date.
Configuration of RESOURCESAT-3:
It is a 3-tier imaging where each camera is independently working of other.
Camera1:
AWiFS- Advanced Wide Field Sensor which sweeps the Indian terrain and covers 740km area of space and given the image of country in 4 to 5 days. The pixel size is 55mx55m and 12km coverage of overlap.
Camera 2:
LISS-III- It is a subset of the AWiFS and sweeps up to 141km with pixel size 23.5mx23.5m
Camera 3:
LISS-IV- - It is a subset of the LISS-III and sweeps up to 70km generating pixel size of 5mx5m.

GPS Map Camera

Bengaluru, Karnataka, India
1st Floor, Hosur Rd, Kudlu Gate, Srinivasa Nagar, Hal
Layout, Singasandra, Bengaluru, Karnataka 560068, India
Lat 12.887606°
Long 77.642638°
14/12/22 10:19 AM GMT +05:30

GPS Map Camera

Bengaluru, Karnataka, India
Sagar IT Park, S T Rd, Kudlu Gate, Srinivasa Nagar, Hal
Layout, Singasandra, Bengaluru, Karnataka 560068, India
Lat 12.887628°
Long 77.642205°
14/12/22 10:22 AM GMT +05:30

CARTOSAT-1 has stereo imaging capability that has 2 cameras which are placed on both the sides with back and front continuously providing us wide range of images. It gives us the different perspectives of the images and when we fuse them, we get a high-end resolution image(3D) which can be studied and analyzed. It served us for 13 years (2005 - 2018) giving us accuracy of 7m vertical height and pixel size of 2.5mx2.5m.

Generally, the images captured by the satellite are after 9:30 am as it provides a clear view and avoids the sun glint. The land, water, soil and many other features reflects different amounts of energy and the generated images can be used to create an excellent heatmap. During the rainfall, where the sky is covered with clouds and other circumstances where optical data can't be used to process, we use microwaves. Microwaves penetrate through the cloud or any other object and obtain the view of the land.

Sun-synchronous satellites are those satellites which are available at 10:30 am for imaging over a particular region. The velocity of the satellite is set in such a way that every morning it arrives at 10: 30 am and does imaging.

All the satellites discussed above are polar satellite images which are in the range of 600-900km.
These satellites move from one pole to other pole and earth moves from west to east. As earth and satellites move always, the shape of the image obtained is always a quadrilateral and not a square.

North orientation:
When a satellite sweeps from one region to other, the time taken to sweep and the degree of rotation of earth is also noted with respect to the revolution rate of earth to geometrically correct the image and obtain a quadrilateral.

India has a unique feature of taking a 1 minute of video from the satellite if needed. Microwave imaging sends a signal to the earth for image capturing. But after sending, the bounced back signal is not known, from where it is bounced back. Hence, construction of image is difficult.

Microwave imaging can be used in traffic less areas like, hill ranges, where there are less objects

MEETING TAKEAWAYS:
- In the next session, a brief on image processing tools will be taught to students.
- Requirements for setting up of an image processing lab discussed.
- Visit the Bhuvan Portal website and study the various kinds of images generated.
- Getting the basic fundamentals on image processing in order to work on a bigger project.

Thank You.