

Report on

Short Term Course on

Airborne Altimetric LiDAR Data Processing

Indian Institute of Technology Kanpur

17 to 20 October 2005



Course Coordinator:

Bharat Lohani, PhD

Assistant Professor

Department of Civil Engineering

IIT Kanpur, Kanpur 208016

Sponsored By: Department of Science and Technology, Govt. Of India

Prologue

This report briefly describes the activities conducted during the short term course on Airborne Altimetric LiDAR Data Processing. This course was sponsored by the Department of Science and Technology, Govt. Of India and was conducted at IIT Kanpur from 17 to 20 October 2005. Publicity for course was done through leaflets and internet and attracted a large number of applications. The participants were selected considering the diverse areas where this technology can be applied and also applicant's background. The participants came from various government organizations representing education, scientific, military, operation, and user segments (Appendix II). A total of 25 participants attended the course of which four came from private organizations. A large number of applicants could not be selected considering the limited places.

The main aim of this course was to provide strong theoretical knowledge of LiDAR technology, its applications and hands-on experience on LiDAR data processing. Considering this, half of the course was devoted to the discussion on LiDAR technology and its applications. The second half of the course mainly concentrated on laboratory exercises where LiDAR data were used. The flagship software of Terrasolid were used for this purpose.

The faculty members for the course were invited from organizations in India and abroad. A major part of the course was covered by the faculty from IIT Kanpur. The laboratory exercises were benefited by the presence of Terrascan software developer, who conducted exercises and interacted with the participants. Furthermore, lectures were also organized to learn about the status of this technology in India and the modalities to procure data from national agencies when they begin flying LiDAR in India (For the list of faculty members please see Appendix I. For the detailed schedule of course please see Appendix III).

The participants were provided the course material in CD and Xerox notes. At the end of the course feedbacks were invited from participants for further improvement in the course.

For more information about the course and future activities of IIT Kanpur in the area of Airborne Altimetric LiDAR please contact the undersigned.

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Introduction:

In last few years the Airborne Altimetric LiDAR (Light Detection and Ranging) has established as an industry standard tool for collecting accurate and dense topographic data at high speed. In view of their typical characteristics and several advantages, LiDAR data are being applied to several applications where topographic data are of fundamental significance. Furthermore, several new applications are being targeted which were not feasible with conventional techniques of topographic data collection. The technology has witnessed multi-fold growth world over. However, except a few developments, the technology has yet not gained full momentum in India. Moreover, considering the needs of India for infrastructure development, disaster management, urban management and several others, there is an urgent need to give special thrust to training, research and development in the area of LiDAR technology.

Objectives:

Considering above the objectives for this course were:

1. To impart knowledge about theoretical concepts of LiDAR technology.
2. To provide hands-on training on LiDAR data processing.

Report on course activities:

Day 1 : 17 October 2005

At the beginning of inaugural function, Dr. Bharat Lohani, course coordinator introduced the course. He begun with a brief introduction of the technology and emphasized the utility of technology for a developing country like India. In view of her special needs to manage disasters and leapfrog in the infrastructure development, India needs LiDAR technology along with other complimentary technologies. Dr. Lohani presented an outline of the course and the various lectures which were planned. He also gave details of the participants, their organizations and their major responsibilities. Further, he outlined that why this course had more emphasis on laboratory exercises. Dr. Lohani also introduced the faculty members for the course.

Prof. Bithin Datta, Head, Department of Civil Engineering, IIT Kanpur gave a brief introduction of the department and the Geoinformatics activities in the department. The course was inaugurated by Prof. Gautum Biswas, Dean Academic Affairs, IIT Kanpur. Prof. Biswas emphasized the utility of such courses being conducted at IIT Kanpur and appealed to participants to make full use of the course. The inaugural function ended with a vote of thanks by Professor Onkar Dikshit to all who contributed in conducting this course.

Dr. Bharat Lohani initiated discussions by delivering first lecture of course on introduction of LiDAR technology. The main aim was to provide necessary background to the participants to make them ready for the further lectures. He described the principle of technology and the different modes in which it works.

The Keynote address “*Airborne mapping in India with special emphasis on LiDAR mapping*” was delivered by Mr. K. Kalyanraman, GM, Airborne Remote Sensing Division, NRSA , Hyderabad. He briefly discussed the status of LiDAR technology in India and specially the activities of NRSA . He provided the vision of NRSA in this area and outlined the procedure to obtain data from NRSA. Mr. Kalyanram also presented the results obtained in some experimental projects carried out by NRSA.

The afternoon session begun with a lecture on “LiDAR: Comparison with other technologies and advantages and disadvantages” by Dr. Bharat Lohani. This lecture was aimed at understanding the strengths and limitations of LiDAR technology *vis-à-vis* the other technologies for topographic data collection. Participants, who had come from diverse background, could relate the LiDAR technology with their area and also understand its utility. Following this, Dr. Onkar Dikshit talked about the interaction of laser with earth surface features, which forms the basis of remote sensing. He described how under different conditions the laser will reflect or would not reflect. This is important as the accuracy of LiDAR depends to some extent on the reflected intensity. This information is also useful while interpreting LiDAR reflectance image. The last lecture of the day was delivered by Dr. Bharat Lohani where he listed the various applications which are employing LiDAR data. Several new applications are also possible with LiDAR data which were not feasible earlier with low resolution topographic data. Dr. Lohani outlined several such possibilities and prompted the participants to think of further innovative applications.

The special presentation of the day was delivered from 6:00 PM to 7:00 PM by Dr. D. C. Mason of University of Reading, UK. It was a detailed study on using LiDAR data for urban flood modeling and the consequent improvement in model efficiency.

Day 2 : 18 October 2006

In the first two lectures of the day Dr. Bharat Lohani begin with the basic concepts of LiDAR, which included the physics of laser pulse travel through atmosphere and its interaction with the terrain and the final signal captured by receiver. The basic formulae were derived. More formulae were derived and discussed which explain the interdependence of flight parameters like swath, height, speed, return energy, required peak power, effect of divergence, footprint size and within footprint variability etc. The various methods of time of travel measurement and their effect on measured range were also covered.

Dr. Onkar Dikshit very succinctly explained the concepts of Geodesy and in particular various coordinate systems and their intra-transformations. This is important as one can

transform the WGS84 derived coordinates in their local system to relate LiDAR survey to the other techniques of survey yielding local coordinates.

The laboratory exercises were planned on Terrascan which runs on Microstation. It was required to educate the participants on Microstation prior to working with Terrascan. Mr. Subro Basu from Bentley Systems India Pvt. Ltd. delivered an over-a-hour long presentation on Microstation and its various functions.

The afternoon session begun by a lecture by Dr. Bharat Lohani which covered the concept of geolocation of LiDAR footprint. It was explained that how the basic measurements of range, scan angle, attitude parameters, GPS positions, and calibration measurements can be combined through a series of coordinate transformations (rotation and translation) to yield the final LiDAR coordinate in WGS84 of the point hit by laser pulse. This lecture also provided an idea of various sources of errors in LiDAR data which are due to the limitations of sensors and their integration at instrument level.

In next two lectures of the day Dr. Bharat Lohani discussed in detail the sources and types of errors in LiDAR data. The moot points of discussion were that how the accuracy should be reported, what are the acceptable standards and what are the methods of determining vertical and horizontal accuracies of LiDAR data. The lecture further dealt with a case study where in detail a procedure was explained to identify and minimize systematic and random errors from LiDAR data.

Day3 : 19 October 2005

The first half of the day was totally dedicated for laboratory exercises. A laboratory having 35 PCs (1 GB RAM and 100 GB HDD specification) in the computer center of IIT Kanpur was especially reserved for this purpose. Dr. Bharat Lohani has developed a facility in IIT Kanpur where unlimited licenses of Terrascan/ Terramodeller/ Terraphoto and Microstation are available for any student across the institute. The funds for this facility were arranged from MHRD. These licenses are installed in the computer center and can be accessed by individuals across the institute. Mr. Arttu Soinen of Terrasolid, who is the main developer of Terra software, conducted laboratory exercises for participants. Mr. Soinen used LiDAR data collected from a helicopter using TopEye

instrument for an area in Finland. The data consisted of multiple return LiDAR, orthophotographs and trajectory information.

Various aspects of data processing were covered, viz. coordinate system specification, creating transformations, reading LiDAR point data, creating point classes, selecting area of interests, defining a project, data visualization in different modes including by class, by elevation, by flight line, as isometric view and in dynamic mode. Further visualizations covered were profile, moving profile, active line profile. The participants understood how visualization of data in different modes can help in understanding of data.

In the first lecture of afternoon Dr. Bharat Lohani explained the general concepts behind data processing. In the second presentation, Mr. Arttu Soininen continued the discussion and explained the algorithms which were inbuilt in the Terra software.

Dr. D. C. Mason presented an innovative application of LiDAR data. He explained that how the terrain and objects on terrain can be modeled at micro level using LiDAR data. He used this micro-model of environment to understand the behavior of skylark bird, i.e., how these birds are responding to changes in landscape at micro-scale. The LiDAR data are very suitable for this purpose. In addition, Dr. Mason also detailed how LiDAR data along with aerial photographs are being employed in automatic mapping of tidal environments, specially the tidal channels.

Day 4 : 20 October 2005

Dr. Bharat Lohani begun the day with discussion on algorithms that are used for generating bare earth model from LiDAR data. The concepts like canopy penetration, multiple return etc. were revisited and it was shown that over ground objects can be removed from LiDAR data thus leaving behind only the points on the ground which form the bare earth model. Various conceptual algorithms were discussed along with their limitations. In the following lecture Dr. Lohani touched upon the concepts of building identification from LiDAR data. He presented several algorithms which have been attempted by researchers and discussed in detail the approach of Hough Transform.

Dr. D C Mason made a special presentation which covered the various tools of remote sensing and the method of spatial modeling. The genetically modified crops may pose a danger to the ecology by a possibility of mutating the genes of vegetation in their neighborhood. Dr. Mason showed how remote sensing methods were employed to carry out investigation to test this hypothesis.

The second half of the last day was completely dedicated for laboratory exercises. Mr. Arttu Soininen conducted exercises using Terra software which included, classifying LiDAR data in ground, low and high vegetation, low points etc. The parameters used in these methods and their effect on result were discussed. Participants carried out all these exercises themselves on the machines provided to them. A major part of LiDAR processing is still data editing. The various tools available in Terra software were employed for this purpose. Further, the orthophotos were included in all above exercises for validation and as an extra source of information.

Valedictory session:

The valedictory session was organized at the end of the last day in which the course coordinator, Dr. Bharat Lohani described the various activities performed during this course. He also listed the achievements of this course. Professor Bithin Datta, the Head, Department of Civil Engineering expressed pleasure in successful completion of the course and wished that the participants would make use of what was learnt. Certificates were distributed to the participants by Prof. Bithin Datta. Each participant was also provided with a course CD and a group photograph of the course. At the end of the session Dr. Bharat Lohani, put on record the support received for this course from Department of Science and Technology and expressed gratitude to the officials (Dr. Shiv Kumar and Dr. Bhoop Singh, in particular) for their support and encouragement for the course. He also thanked the IIT Kanpur faculty and facilities for help in conducting the course. Dr. Lohani further thanked the faculty members who contributed in this course and the participants for their enthusiastic participation. He also acknowledged the help provided by the M. Tech students and staff of Civil Engineering Department in conducting this course.

Some other features of the course:

Interactive course:

With the conscious efforts of coordinators, help from faculty members and proactive participation of attendees it became an interactive course. This was remarkable as several problems were discussed by all. Varied backgrounds of participants and their expertise in one or other field further helped in these discussions.

Feedback:

Feedbacks were invited from the participants informally and formally at the end of course. The formal feedbacks were in the form of a questionnaire which was completed by the participants. The statistical evaluation of feedbacks revealed the following:

1. The course was neither too perfunctory nor too heavy.
2. The contents were illustrated with fair no. of examples.
3. The course contents compared to participants expectations were balanced, means theoretical as well as experimental.
4. The course exposed to new techniques/ new ways of thinking and organizing/ new knowledge.
5. Most participants would like to recommend this course strongly to their colleagues.
6. The delivery of the material was clear.
7. The use of blackboard/ teaching aids was fairly effective.
8. The course material handed out was very appropriate.
9. The instructors encouraged communication and were helpful.

The results of course feedback are given in Appendix IV.

Course material:

The course material was organized in the form a CD, which included the lectures notes provided by faculty members, the power point presentation slides and other interesting material about LiDAR technology. Some more material, including LiDAR data, Optech's manuals, instrument specifications, softcopies of lecture notes etc. were also included.

Besides this, from time to time the participants were given different material in the form of Xerox copies.

Public awareness:

For the percolation of technology to grassroots it is important that more and more people from general public and authorities in government and industry know about it. Keeping this in mind the Information Cell of IIT Kanpur performed an excellent job of reporting the activities of this course in the local and national media. Further, the media also showed keen interest in the proceedings of the course and published theme articles on this course and related area. Appendix V shows a few of these reports.

Appendix: I

List of faculty:

| S.No | Name | Organisation |
|-------------|--------------------|---------------------------------|
| 1 | Dr. David C Mason, | The University of Reading, UK |
| 2 | Mr. K. Kalyanraman | NRSA, Hyderabad |
| 3 | Mr. Arttu Soininen | Terrasolid Ltd., Finland |
| 4 | Mr. Subhro Basu | Bentley Systems India Pvt. Ltd. |
| 5 | Dr. Onkar Dikshit | IIT Kanpur |
| 6 | Dr. Bharat Lohani | IIT Kanpur |

Appendix II

List of participants:

| S.No | Name | Designation | Organisation |
|------|--------------------------------|-------------------------------|--|
| 1 | Dr. Y.S. Rao | Senior Research Scientist | I.I.T. Bombay |
| 2 | Mr. U.N. Mishra | Superintending Surveyor | Survey of India |
| 3 | Dr. Vazeer Mahammood | Associate Professor | G.I.T.A.M. College of Engineering Sri Venkateswara University |
| 4 | Mr. D.V.Satyanarayana Murthy | Associate Professor | College of Engineering, Tirupati |
| 5 | Mr. Anil Kumar, G | Scientist/Engineer -SD | NRSA |
| 6 | Mr. Jagannadha Rao. C.V.K.V.P. | Scientist/Engineer -SD | NRSA |
| 7 | Dr. Naved Ahasan | Lecturer | Jamia Millia Islamia, New Delhi |
| 8 | Dr. Biswajit Sarma | Sr. Lecturer | Jorhat Engineering College |
| 9 | Dr. Virendra Pathak | Sr. Lecturer | IET, Lucknow |
| 10 | Mr. Yogesh Singh | Member Technical Staff | C-DAC |
| 11 | Dr. D. Thirumalaivasan | Assistant Professor | Institute of Remote Sensing |
| 12 | Dr. Prakash Sinha | Reader | University of Allahabad |
| 13 | Mr. Chauhan Hasmukh Jinabhai | Lecturer | BVM Engineering College |
| 14 | Mr. Anurag Ohri | Lecturer | I.T., BHU, |
| 15 | Mr. V. Emayavaramban | Lecturer | Bharthidasan University, Department Of Geography |
| 16 | Mr. Durgesh Nandan Pathak | Dep. Supdt. Surveyor | Survey of India |
| 17 | Mr. D. Syama Rao | Scientist/Engineer -SD | NRSA |
| 18 | Sub. Maj. Satish Kumar Rana | Subedar Major | Army |
| 19 | Naib Sub. Naresh Pal | Instructor | Army (Defence) |
| 20 | Wg. Cdr. R.N. Jayasimha | Joint Director (Intelligence) | Indian Air Force |
| 21 | Dr. A. K. Singh | Scientist | DST |
| 22 | Mr. Dhiraj Goel | Team Leader (Development) | ESRI India |
| 23 | Mr. Srikantha M. S. | Sr. Product Executive | PIXEL INFOTEK PVT LTD |
| 24 | Mr.Ravikumar C. B | Product Executive | PIXEL INFOTEK PVT LTD |
| 25 | Dr. Rudraraju Trinadha R | Project Leader | GeoRIST |

Appendix III

Course schedule:

| DAY 1: MONDAY :: 17 October 2005 | | | |
|----------------------------------|--|-----|-----------|
| 9:00 AM – 09:30 AM | Registration | | PBCEC |
| 09:30 AM – 10:30 AM | Inaugural Function | | PBCEC |
| 10:30AM – 11:00 AM | Inaugural Tea | | PBCEC |
| 11:00 AM – 12:00 PM | Basic Introduction to LiDAR technology | BL | PBCEC |
| 12:00 PM – 1:00 PM | Keynote address: <i>Airborne mapping in India with special emphasis on LiDAR mapping</i> | KK | PBCEC |
| 1:00 PM – 2:30 PM | Lunch | | VH Dining |
| 2:30 PM – 3:30 PM | LiDAR: Comparison with other technologies and advantages and disadvantages | BL | PBCEC |
| 3:30 PM – 4:30 PM | Basic interaction of light/laser with earth surface features | OD | PBCEC |
| 4:30 PM – 5:00 PM | Evening Tea | | PBCEC |
| 5:00PM – 6:00 PM | Applications of LiDAR: An overview | BL | PBCEC |
| 6:00 PM – 7:00 PM | Applications: Use of LiDAR data in flood modelling | DCM | PBCEC |

| DAY 2: TUESDAY :: 18 October 2005 | | | |
|-----------------------------------|--|----|-----------|
| 9:00 AM – 10:00 AM | Basic concepts of LiDAR | BL | PBCEC |
| 10:00 AM – 11:00 AM | Basic concepts of LiDAR | BL | PBCEC |
| 11:00AM – 11:30 AM | Morning Tea | | PBCEC |
| 11:30 AM – 1:00 PM | Geodesy and datum transformation as applicable to LiDAR data | OD | PBCEC |
| 1:00 PM – 2:30 PM | Lunch | | VH Dining |
| 2:30 PM – 3:30 PM | Introduction to Microstation for data processing | SB | PBCEC |
| 3:30 PM – 4:30 PM | Georeferencing of laser footprint | BL | PBCEC |
| 4:30 PM – 5:00 PM | Evening Tea | | PBCEC |
| 5:00PM – 6:00 PM | LiDAR Errors: sources and types | BL | PBCEC |
| 6:00 PM – 7:00 PM | LiDAR Errors: identification and minimization | BL | PBCEC |

| DAY 3: WEDNESDAY :: 19 October 2005 | | | |
|--|---|-----|----------------|
| 9:00 AM – 10:00 AM | Terrasolid-Laboratory exercise* | AS | CC |
| 10:00 AM – 11:00 AM | Terrasolid-Laboratory exercise* | AS | CC |
| 11:00AM – 11:30 AM | Morning Tea | | CC |
| 11:30 AM – 1:00 PM | Terrasolid-Laboratory exercise* | AS | CC |
| 1:00 PM – 2:30 PM | Lunch | | VH Dining |
| 2:30 PM – 3:30 PM | Algorithms for information extraction-BEM | BL | PBCEC |
| 3:30 PM – 4:30 PM | Data processing theoretical concepts | AS | PBCEC |
| 4:30 PM – 5:00 PM | Evening Tea | | PBCEC |
| 5:00PM – 6:00 PM | Applications-Channels and bird population | DCM | PBCEC |
| 6:00 PM – 7:00 PM | Discussion hour | All | PBCEC |
| 8:00 PM onwards | Course Dinner | All | PBCEC Lawns |

| DAY 4: THURSDAY :: 20 October 2005 | | | |
|---|--|------------|--------------|
| 9:00 AM – 10:00 AM | Algorithms for information extraction: BEM/Buildings | BL | PBCEC |
| 10:00 AM – 11:00 AM | Algorithms for information extraction: Buildings | BL | PBCEC |
| 11:00AM – 11:30 AM | Morning Tea | | PBCEC |
| 11:30 AM – 1:00 PM | Gene flow determination using remote sensing | DCM | PBCEC |
| 1:00 PM – 2:30 PM | Lunch | | VH Dining |
| 2:30 PM – 3:30 PM | Terrasolid-Laboratory exercise* | AS | CC |
| 3:30 PM – 4:30 PM | Terrasolid-Laboratory exercise* | AS | CC |
| 4:30 PM – 5:00 PM | Evening Tea | | CC |
| 5:00PM – 6:00 PM | Terrasolid-Laboratory exercise* | AS | CC |
| 6:00 PM – 7:00 PM | Valedictory | BL | PBCEC |

Appendix IV

Participant's Feedback

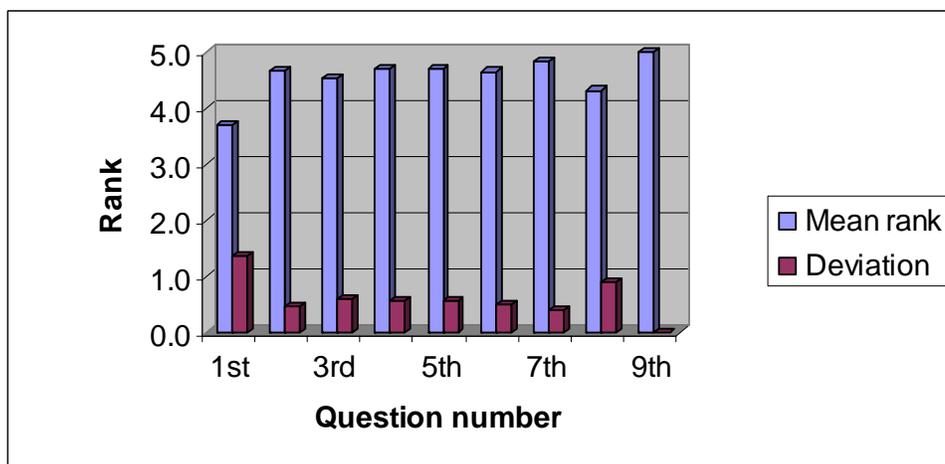
Questions asked in questionnaire:

1. The course was neither perfunctory (done routinely or carelessly) nor too heavy.
2. The contents were illustrated with fair no. of examples.
3. The course contents compared to participants expectations were balanced, means theoretical as well as practical.
4. The course exposed to new techniques/ new ways of thinking and organizing/new knowledge.
5. Participants would like to recommend this course strongly to their colleagues.
6. The delivery of material was clear.
7. The use of blackboard / teaching aids was effective.
8. The course material handed out was appropriate.
9. The instructor encouraged communication and was helpful.

| Ranks to be given Scale(1 - 5): |
|---------------------------------|
| 1- Not at all |
| 2 -Not quite true |
| 3- Fairly true |
| 4- Quite true |
| 5- Very True |

Result of feedback:

| Q. No. | Mean Rank | Std. Deviation |
|--------|-----------|----------------|
| 1st | 3.7 | 1.4 |
| 2nd | 4.7 | 0.5 |
| 3rd | 4.5 | 0.6 |
| 4th | 4.7 | 0.6 |
| 5th | 4.7 | 0.6 |
| 6th | 4.7 | 0.5 |
| 7th | 4.8 | 0.4 |
| 8th | 4.3 | 0.9 |
| 9th | 5.0 | 0.0 |



Appendix V

Newspaper coverage:

TIMES CITY
 WEDNESDAY, OCTOBER 19, 2005
 NO ONE COVERS KANPUR LIKE WE DO, ALL THE NEWS IN DETAIL, DEPTH AND COLOUR

IIT organises course on LiDAR technology

A four-day short-term course on airborne altimetric LiDAR organized by the geoinformatics group of the Indian Institute of Technology Kanpur (IITK) was inaugurated on Monday. The geoinformatics group of civil engineering department of the institute has organized the programme for students.

Speaking on the occasion, course coordinator Dr Bharat Lohani spoke about the significance of LiDAR technology for a developing country like India. He stressed the need for collecting extensive research and training in this area so that the country could make best use of this technology.

He further said that the course was second in the series and aimed at providing training on fundamentals of this technology to the participants.

Professor Biswas, head, civil engineering, emphasized the need of accurate topographic data in user agencies have shown keen interest to use LiDAR technology.

He narrated several projects where the user agencies had shown keen interest to use this technology. He further expressed the need for research and training in this area so the problems could be solved and trained human resource was available in order to implement the technology at national level.

It may be mentioned here that though of recent origin, this technology has been taken the topographic data collection industry by storm and has registered manifold growth in the last few years worldwide. This is mainly because of its ability to collect high-resolution topographic data accurately and at high speed. Unfortunately, this technology is still not being used in India at operational levels. However, it is expected that the technology will be available to the users in the near future. This course thus is aimed at playing a major role in this direction.

The LiDAR technology has applications in several areas like water resource development, flood monitoring, coastal zone management, urban planning and management and utility, telecommunication, mining, forestry and agriculture and several other areas where topographic data is the basic requirement.

This technology can prove very useful for a developing country like India in the development of urgently needed infrastructure, mapping disasters and managing the highly clustered urban centres.

PIONEER NEWS SERVICE KANPUR

IIT NEWS

Stress on research in LIDAR tech

A FOUR-DAY short term course on airborne altimetric LiDAR was inaugurated by Dean Academic Affairs, Prof Gautam Biswas on Monday.

The course is being organised by the Geoinformatics Group of Civil Engineering Department of the Indian Institute of Technology, Kanpur. This course is sponsored by the Department of Science and Technology.

Addressing the gathering, the course coordinator, Dr Bharat Lohani informed the significance of LiDAR technology for a developing country like India.

He stressed the need of conducting extensive research and training in this area so that the country could make the best use of this technology. He added that the course aimed at providing training in fundamentals of this technology to the participants.

Prof Gautam Biswas stressed the need to continue education so that faculty members from other institutes could also learn about the new frontiers in technology development. He further spoke about the ongoing activities in IIT Kanpur in the area of continuing education.

Mr K Kalyanaraman of NRSA outlined the activities of NRSA in the area of LiDAR technology.

He narrated several projects where the user agencies had shown keen interest to use this technology. He further expressed the need for research and training in this area so the problems could be solved and trained human resource was available in order to implement the technology at national level.

It may be mentioned here that though of recent origin, this technology has been taken the topographic data collection industry by storm and has registered manifold growth in the last few years worldwide. This is mainly because of its ability to collect high-resolution topographic data accurately and at high speed. Unfortunately, this technology is still not being used in India at operational levels. However, it is expected that the technology will be available to the users in the near future. This course thus is aimed at playing a major role in this direction.

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KANPUR

A LiDAR that can take on calamities

HT Correspondent Kanpur, October 17

THE COUNTRY has adopted the latest technology for implementing a disaster management plan and predict the possible natural calamities affecting Earth.

Talking to *Hindustan Times*, general manager, Aerial Services and Digital Mapping at the National Remote Sensing Agency (NRSA), Dr K Kalyanaraman, said Light Detecting and Ranging (LiDAR), the latest ever technology for disaster management plan was adopted by the NRSA some six months ago. The new technology has proved to be very helpful in the Indian context.

He said, "Several of our problems will be solved by applying this technology. At present the technology helps in gathering information on floods, linking of rivers, ascertaining surging ocean storms, estimating forest terrain, surveying water supply lines, power supply lines and urban planning."

He said, "We have more than 14 projects relating to LiDAR application but at present only four projects pertaining to flood, river linking and storm surging studies were undertaken as they posed serious threats to human life and national property."

He said, "We are collecting data on floods from different parts of the country. The collected data will enable us to predict the gravity and frequency of floods in different rivers by mapping the ground terrain through LiDAR. Similar projects where the user agencies had shown keen interest to use this technology. He further expressed the need for research and training in this area so the problems could be solved and trained human resource was available in order to implement the technology at national level.

It may be mentioned here that though of recent origin, this technology has been taken the topographic data collection industry by storm and has registered manifold growth in the last few years worldwide. This is mainly because of its ability to collect high-resolution topographic data accurately and at high speed. Unfortunately, this technology is still not being used in India at operational levels. However, it is expected that the technology will be available to the users in the near future. This course thus is aimed at playing a major role in this direction.

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TECH TO FORETELL NATURAL DISASTERS

On floods
 We are collecting data on floods from different parts of the country. The collected data will enable us to predict the gravity and frequency of floods in different rivers by mapping the ground terrain through LiDAR. Similar projects where the user agencies had shown keen interest to use this technology. He further expressed the need for research and training in this area so the problems could be solved and trained human resource was available in order to implement the technology at national level.

Participants at the weeklong short-term course on 'Airborne Altimetric LiDAR', which began at the Indian Institute of Technology, Kanpur, on Monday

