❖ CSSTEAP Newsletter ❖

Quarterly Newsletter of Centre for Space Science and Technology Education in Asia and the Pacific (Affiliated to UN)

Volume 6 Issue 4 December, 2003

TELEMEDICINE

Sudhir Agarwal & Ravi Saksena
Space Applications Centre, Ahmedabad

Telemedicine can be defined as doing anything related with health from a distance. It may be as simple as two health professionals discussing a case over the telephone, or as sophisticated as using satellite communication for transfer of patient data with video conferencing for a consultation. Even a remote surgery is possible from one location controlling a robotic arm in another location.

Telemedicine concept is based on the fact that most of the health problems do not require operation and if patient is not be operated on he need not be touched. If patient is not be touched then by remotely seeing patient and knowing his/her medical history the disease can be diagnosed and treated.

As most medical expertise are focused at urban area, and the majority of population are living in rural area (80% of population in India lives in villages), this causes the difficulty for rural people to come to hospital and visit doctors, especially the medical expertise. Instead of having the physicians or patients to travel between the facilities, a telemedicine system is used to transport the necessary information about the patient via a telecommunications channel. It combines computer, video, and network communication technologies, and enables health care providers to deliver efficient and cost effective quality care to persons at some distance from the provider. The purpose of Telemedicine is to support people in their own environment.

Some of the benefits of Telemedicine are: Improved access to health care in unserved or under-served areas. Reduced travel cost of patients & doctors/professionals and equipment cost of not having specialty care facility in all rural hospitals. Reduced isolation for referring doctors in remote places and continuing medical education. Improved quality of care, allows consultation to take place among the referring physician, the consulting physician, and the patient.

Two technologies make most of the telemedicine applications in use today. The first, called store and forward data/digital images are first captured stored locally and then transferred from one location to another. The other is two-way real-time interactive with videoconferencing, it is used when a 'face-to-

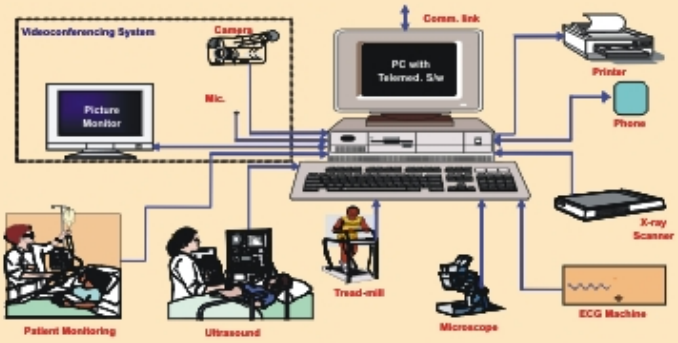


Figure 1 A typical Patient End Terminal

Inside this issue

Wish all the readers of the CSSTEAP Newsletter a very Happy and prosperous 2004

face' consultation is necessary. Telemedicine involves conversion of medical data like ECG, EEG, pathological slides, X-ray, sonography, angiography, etc. into electronic form. Transmission of these electronic data from Patient end to Expert end. At the expert end patient's data is analyzed and expert Doctor's recommendations/ prescription are transmitted back to patient end.

Tele-medicine has many different applications, some of them are: Tele-education (Teletraining/Telementoring/Telesupport), Teleconsultation, Telediagnosis (Teleradiology, Telepathalogy, Teledermatology etc.), Telemonitoring (Telecare, Homecare or Telenursing), Telesurgery, etc.

Fig 2. A typical Specialist Doctor Terminal

Telemedicine consists of Patient end Terminal, Specialists Terminal and Hub. Patient end Terminal has a PC with H/W interfaces, Video Conferencing System and Diagnostics instruments like ECG unit, X-ray scanner, Microscope with Digital camera for pathology etc. Other optional equipment can also be attached depending upon requirement, like; Sonography/ultrasound, Echo-cardiogram, CT scan, Endoscopes, Blood pressure monitor, Stethoscope and CCD camera - PTZ, for dermatology. A typical patient end terminal is shown in figure 1.

Specialists Terminal has a PC for displaying and processing of diagnostic data, Video conferencing system. It is possible to send specialist's comments in text, hand written, audio or video form back to patient end. A typical Specialists terminal is shown in figure 2. Hub basically provides connectivity to different terminals in the network and also performs Database management, storing & forwarding of data files and Video conferencing management. Figure 3 depicts telemedicine network through Hub using Satellite Communication.

Basic telemedicine applications can most often be accomplished at low bit rates, with available compression and processing hardware. However, real-time consultation and diagnosis applications require higher bit rates and specialized hardware. The time and cost to reach rural communities using "traditional" fixed wire line, fiber, and microwave-based solutions were prohibitive, so those who could most benefit from telemedicine may not have access to it. For this reason, robust and expandable satellite based communication networks are emerging as the best option for providing telemedicine facility to remote villages. Using satellite communication, it is possible to tele-refer a person in a remote Indian village to the best available super-specialist in the country when the need arises.

ISRO, is envisaged to provide, under the Telemedicine Mission, best health care system in the remotest village of rural India to improve the quality of life. Under the Telemedicine project, hospitals/health centers in remote locations are linked using VSATs via INSAT satellites, with super specialty hospitals at major towns/cities. Around fifty terminals are already operational

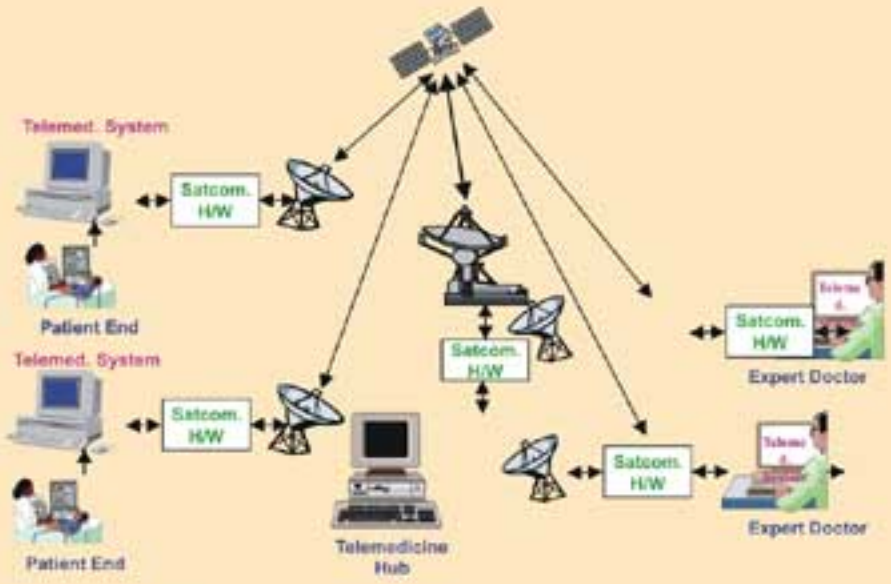


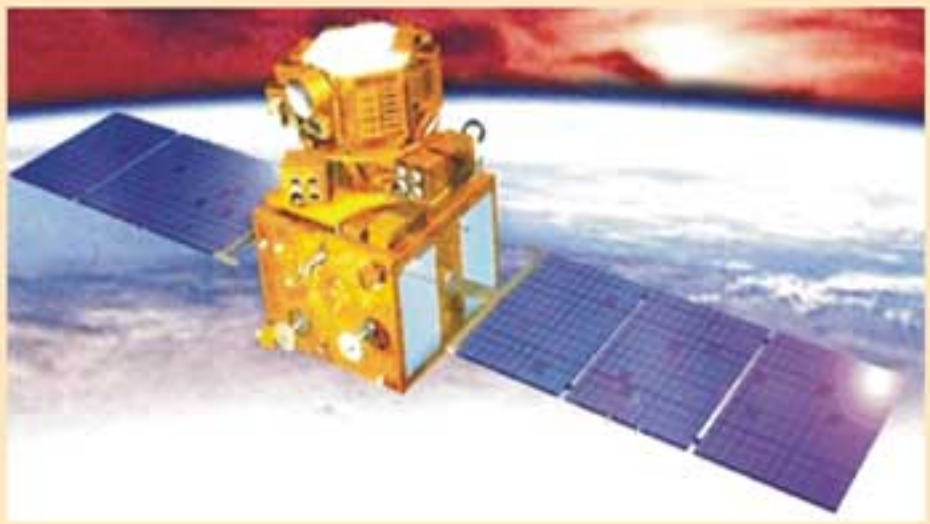
Figure 3. Telemedicine Network through a Hub using Satellite Communication

and many more are in the process of installation. Presently ISRO provides connectivity using VSATs with 3.8-meter antenna and using SPACENET hub at Bangalore for network control. Two type of connectivity are provided: point-to-point and server based. Super specialty hospitals are provided with multiple stations connected through LAN in different departments like radiology, pathology, and cardiology etc.

It is envisaged that in next 10 years, around 10,000 more terminals will be installed providing connectivity from village hospitals to district hospitals and to super-specialty hospitals in cities in hierarchical mode. In order to make large numbers of transponders available, ISRO is planning to launch 'Health Sat' satellite exclusively for telemedicine applications.

ISRO LAUNCHES RESOURCESAT-1 (IRS-P6)

On October 17, 2003, ISRO's (Indian Space Research Organization) Polar Satellite Launch Vehicle, PSLV-C5, successfully launched the Indian Remote Sensing Satellite, RESOURCESAT-1 (IRS-P6) into 821 km high Polar Sun Synchronous Orbit. The 1,360 kg RESOURCESAT-1 is most advanced and the heaviest remote sensing satellite built and launched by ISRO, so far. This also marks the seventh successive success of PSLV. The objectives of the mission are to provide continued remote sensing data services on an operational basis for integrated land and water resources management at



RESOURCESAT-1

micro-level, with enhanced spectral and spatial coverage and stereo-imaging; to further carryout studies in advanced areas of user applications like improved crop discrimination, crop yield, crop stress, pest/disease surveillance, disaster management etc.

RESOURCESAT-1 carries three cameras

i) A multi-spectral high spatial resolution camera, namely, Linear Imaging Self Scanner-4 (LISS-4) providing a spatial resolution of 5.8 m and a swath of 23 km. It operates in the Visible and Near Infra Red spectral bands. LISS-4 can also be operated in mono-chromatic (black and white) mode providing a spatial resolution of 5.8 m and a swath of 70 km. Besides, the camera can be steered across track to take stereoscopic imagery.

(ii) A multi-spectral Linear Imaging Self Scanner-3 (LISS-3), which has a spatial resolution of 23 m and a swath of 141 km. It operates in the Visible, Near Infra Red and Short Wave Infra Red spectral bands.

(iii) A multi-spectral Advanced Wide Field Sensor

(AWiFS) with a spatial resolution of 56 m providing a swath of 740 km. The camera operates in the Visible, Near Infra Red and Short Wave Infra Red spectral bands. AWiFS is a unique camera having the capability to take the imagery of the world repeatedly every 5 days with a very high radiometric resolution. RESOURCESAT-1 also carries a Solid State Recorder with a capacity of 120 Giga Bits to store images taken by its cameras which can be read out later to the ground stations.

RESOURCESAT-1, is the tenth in the Indian Remote Sensing (IRS) Satellite series and will not only continue the services of IRS-1C and IRS-1D, but also enhance the remote sensing services by providing imagery with improved spatial resolution and additional spectral bands.

The cameras were tested for their performance during October 25-November 5, 2003. The sample images have been generated from the data acquired from RESOURCESAT-1 and processed at National Remote Sensing Agency, Hyderabad

(Source : Space India, ISRO, July-September, 2003 issue, ISRO website(www.isro.org) & Interface, NDC, NRSA, 13(4), October December, 2002 issue).

FOURTH POST GRADUATE COURSE ON SATELLITE COMMUNICATIONS

The fourth SATCOM course of CSSTEAP, commenced on August 1, 2003 at the New SAC Campus, Bopal, of Space Applications Centre (SAC), Ahmedabad.

The aspects of Satellite Communication Systems were covered by experts from SAC in Module # 2. While, the Satellite sub systems part of Module # 2 were covered by the subject experts at ISAC, Bangalore during the study tour to South. The presentations on various Satellite sub systems were highly appreciated and were well supported by the practical demonstrations at ISAC Bangalore. The participants were immensely benefited by the exposure given to them by the experts at ISAC Bangalore.

Dr. Madhavendra Richharia, INMARSAT UK, guest faculty delivering lecture.

The participants also visited Master Control Facility at Hassan, ISRO Tracking Centre (ISTRAC), Bangalore and Mr. Abdul Nazir Saab State Institute of Development, Mysore. The participants were also taken to various places of tourist importance,

Participants at Taj Mahal, Agra during their educational trip

museums etc. during the tour. The remaining portion of Module # 2 was completed during the last week of September. The participants were back in Ahmedabad for the Navratri (the traditional dance festival of Gujarat). The participants were delighted by the spirit and also actively participated in the festival.

Module # 3 & 4 which deals with Earth Station

Technology and Transmission, Multiplex & Multiple Access respectively was covered during the month of October and the first week of November. Topics in these two modules were covered by the subject experts at SAC and some of the eminent faculty members invited were, Prof. V. Sinha, Director, LNM Institute of Information Technology, Jaipur and Mr. K. G. Matapurkar, former DDG, Telecom Engineering Centre, Dept. of Telecommunications. Module # 4 & 5 were handled by Mr. C. Lal former Course Director, SATCOM III. Module # 5 covered a wide variety of topics starting from Colour Television, Compression standards, HDTV, DAB, Multicasting and Multimedia. The participants were also shown some of the Radio and TV studio installations at Ahmedabad.

In the Module # 6 in addition to the experts at SAC external experts such as Mr. L.R. Meena, Director IMD, Mr. K. G. Matapurkar, Mr. S. Barathy, Vice President, HCL Comnet and Mr. K.V. Venkatachary, Former Director, ISTRAC ISRO were invited to deliver lectures. Dr. Madhavendra Richharia, INMARSAT UK, had also accepted invitation and gave an excellent presentation on Mobile Satellite Services and Modern Trends in Mobile Satellite Services. After completion of this Module the participants left for Study Tour to North India on 12th Dec.2003.

Participants visited Delhi Earth Station of SAC, Essel Shyam VSAT HUB & Earth Station Equipment manufacturer and Network Operation Control Centre at Sikandrabad. The participants later visited the famous Taj Mahal at Agra and Fatehpur Sikri. The participants proceeded further north to CSSTEAP Headquarters at Dehradun and visited various facilities of IIRS.

EIGHTH REMOTE SENSING & GIS COURSE (2003-2004)

The eighth Post Graduate Course on 'Remote Sensing and Geographic Information System (RS & GIS)' of CSSTEAP is in progress at Indian Institute of Remote Sensing (IIRS), Dehradun. The course commenced on October 01, 2003 and is being attended by 21 participants from 16 countries of Asia-Pacific region (Azerbaijan 2; Bangladesh-1; China-1; Fiji-1; Indonesia-2; Kyrgyz Republic-2; Mongolia-1; Maldives-1; Myanmar-1; Nepal-1; Philippines-1; Sri Lanka-1; Thailand-1; Uzbekistan-2; Vietnam-2 and India-1).

Chief Guest releasing the Lecture Notes volumes

The course was formally inaugurated by Dr. A.K.S. Gopalan, Visiting Scientist, ISRO and Former Director, Space Applications Centre (SAC), ISRO, Ahmedabad, on October 06, 2003. Director, CSSTEAP and Dean, IIRS also graced the occasion. Printed lecture notes volumes (six nos.) covering course curriculum of six optional thematic applications disciplines of Module-II were also released by the Chief Guest during the inaugural function.

The course is of nine months duration and is made up of three modules each of three months duration. The Module-I covering theory, practicals and tutorials on Principles of Remote Sensing, GIS and GPS completed on December 31, 2003. In the first week of the course, an introductory program consisting of lectures on Geographic Perspective of India, Social Systems, Custom and Festivals of India, Overview of Space Science, Technology and Applications, Natural Resources and Environmental Assessment were organized. The core faculty of this module consists of experienced faculty of Photogrammetry & Remote Sensing and Geoinformatics Divisions of IIRS. Several Internationally reputed scientists viz., Prof.

K. Jacobsen (University of Hannover, Germany); Dr. Rene Thomas (GDTA, CNES, France) and Dr. D.P. Rao (Former Director, NRSA, India) were also invited to deliver lectures on specialized topics like sensors for mapping, mapping from space and Remote Sensing applications in applied geomorphological mapping and sustainable natural resource development.

Several field excursions were also arranged during this module for ground truth collection and demonstration of various ground truth instruments and these informations were utilized for interpretation and analysis of satellite data. Academic performance of the course participants was evaluated through periodic class test, tutorials, written and practical examinations.

The course participants also attended the International Workshop on "Spatial data infrastructure for urban planning and management" under Working Group IV/IV of ISPRS, during October 6-8, 2003 at IIRS, Dehradun. In this module, an educational visit to Agra and Delhi cities was also organized to give exposure to the participants about urban development and rich historic and cultural heritage of India.

On the social front, the participants had glimpse of Indian festivities by their active participation in various festivals during these three months, such as Dussehra, Diwali (Festival of Lights), Id-ul-fitr, Christmas etc.

Course participants along with the dignitaries at the inaugural function

VISIT OF CHINESE DELEGATION

A three member high level delegation consisting of Mr. Tu Senlin, Director General, Department of Human Resource and Training, CNSA (China National Space Agency); Mr. Xu Yansong, Deputy Director, Department of Foreign Affairs, CNSA and Mr. Wang Lanyl, Official, Department of Human Resource and Training, CNSA, visited CSSTEAP Headquarters at IIRS, Dehradun during November 10-11, 2003. The purpose of this visit was to explore the future cooperation between CNSA and CSSTEAP and strengthening international linkage in the Asia Pacific region.

Chinese delegation discussing with Deputy Director, CSSTEAP

The delegates made presentations, highlighting Chinese Space Program scientific and technical aspects and areas of applications. Deputy Director, CSSTEAP also briefed the visiting team the objectives, goal, achievements and future plans of CSSTEAP.

CSSTEAP DAY

November 1 CSSTEAP DAY

As you are aware, the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), affiliated to the United Nations, came into existence consequent to the UN General Assembly's endorsement of the recommendations of the UNISPACE 82, on an initiative and from active support of UN-OOSA. A UN team, identified for this purpose, recommended that India should host this Centre. Department of Space, on behalf of the Government of India, agreed to host the Centre and is providing necessary funds and its existing facilities at Indian Institute of Remote Sensing, Dehra Dun, Space Applications Centre and Physical Research Laboratory at Ahmedabad for successfully carrying out its programs.

The Centre has been regularly organizing courses of varying duration in the fields of Remote Sensing and GIS, Satellite Communications, Satellite Meteorology and Global Climate and Space and Atmospheric Science for the working scientists and university educators in the region with a view to enhancing capacity at local level in those areas which can advance their social and economic development.

CSSTEAP has so far conducted seven Post Graduate Courses in Remote Sensing and GIS (eighth course is presently ongoing), three courses in Satellite Communications (fourth is currently ongoing), three courses each in Satellite Meteorology and Space Science and several short terms courses/workshops after its inauguration on November 1, 1995. CSSTEAP is 8 years old. As such November 1 is a special day for every member of the CSSTEAP family consisting Chairman, Governing Board, Advisory Committe, faculty and staff of IIRS, SAC, PRL and no doubt participants of various courses and everyone who believes in the ideals of UN.

Today, on November 1, 2003, I urge the entire CSSTEAP family to stay true to its mission, and to work harder than ever to alleviate suffering in the region.

It is my great pleasure to greet you all on this day on behalf of Mr. G Madhavan Nair, Chairman, CSSTEAP GB and Chairman, ISRO/Secretary, Department of Space.

Every year on this day, we mark the anniversary of the CSSTEAP to get encouragement and move ahead with greater determination. I know as we move forward, we can rely on the cooperation and support from all of you. You are the cultural ambassadors of your countries and education ambassadors of CSSTEAP. The CSSTEAP is you, and we exist to serve you.

DIRECTOR, CSSTEAP

BACKGROUND OF CSSTEAP

In response to the UN General Assembly Resolution (45/72 of 11th December, 1990) endorsing the recommendations of UNISPACE-82 the United Nations Office for Outer Space Affairs (UN-OOSA) prepared a project document (A/AC.105/534) envisaging the establishment of Centres for Space Science & Technology Education in the developing countries. The Objective of the Centres is to enhance the capablities of the member states in different areas of space science and technoloy that can advance their social and economic development. The first of such centres, named as Centre for Space Science & Technology Education in Asia & the Pacific (CSSTEAP) was established in India in November 1995. Department of Space, Government of India

has made available appropriate facilities and expertise to the Centre through the Indian Institute of Remote Sensing (IIRS) Dehradun, Space Applications Centre (SAC) & Physical Research Laboratory (PRL) Ahmedabad. The Centre is an education and training institution that is capable of high attainments in the development and transfer of knowledge in the fields of space science & technology. The emphasis of the Centre is on in-depth education, training and application programmes, linkage to global programmes / databases; execution of pilot projects, continuing education and awareness and appraisal programmes. The Centre offers Post Graduate level and short courses in the fields of (a) Remote Sensing and Geographic Information System, (b) Satellite Communications and GPS, (c) Satellite Meteorology and Global Climate, (d) Space and Atmospheric Sciences. A set of standard curricula developed by the United Nations is adapted for the educational programmes.

The Centre is affiliated to the United Nations and its education programmes are recognised by Andhra University, Visakhapatnam, India for awarding M.Tech degree. (after completion of 1 year project).

Ongoing Courses

- Fourth 9 month Post Graduate course in Satellite Communications at SAC, Ahmedabad from August 1, 2003.
- Eighth 9 month Post Graduate course in RS & GIS at IIRS, Dehradun from October 1, 2003.

Forthcoming Courses

- Fourth 9 month Post Graduate course in Satellite Meteorology at SAC, Ahmedabad from August 1, 2004.
- Fourth 9 month Post Graduate course in Space Science, PRL, Ahmedabad from August 1, 2004.
- Short course in RS & GIS at IIRS, Dehradun in Aug-Sept, 2004
- Ninth 9 month Post Graduate course in RS & GIS, IIRS Dehradun from October 1, 2004.

CSSTEAP (Affiliated to UN)
Headquarters IIRS Campus,
4, Kalidas Road,
Dehra Dun-248001, INDIA
Ph: +91-135-2740737, 2740787,
Fax: +91-135-2740785
Email: cssteap@iirs.gov.in,
Website: www.cssteap.org

CSSTEAP welcomes the views and opinions of the readers of Newsletter. Short Communications on space science and technology education which may be relevant to Asia Pacific Region are also welcome. Views expressed in the articles of the newsletter are those of the authors.

Printed at Shiva Offset Press Dehradun Ph. 2655748