IOC/IODE - NIO Training Course on Oceanographic Data and Information Management

National Institute of Oceanography, Goa, India
17-27 October 1998
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1. INTRODUCTION

During the International Oceanographic Data and Information Exchange (IODE) Officers, held in Goa, India between 10 and 13 February 1998, the National Institute of Oceanography offered to host a regional data management training course for countries in the IOCINDIO (IOC Regional Committee for the Central Indian Ocean) region. Responding to this kind offer the IOC was able to allocate funds for supporting travel and accommodation for participants and international resource persons. NIO offered to cover local organizational expenses and travel and accommodation expenses for local resource persons.

The objectives of the Training Course were:

- to provide an introduction to, and raise awareness for, the IODE Programme
- to familiarize participants with IODE projects and products
- to provide participants with basic knowledge and experience about data management systems and their utilization in oceanographic data, metadata and information management
- to provide participants with basic knowledge about new technologies related to serving users with information and data over the Internet
- to stimulate intra-regional collaboration in the field of oceanographic data and information management
- to provide training to recently established National Oceanographic Data Centres (NODC) and Designated National Agencies (DNA)
- to stimulate countries in the region to establish National Oceanographic Data Centres (NODC) or Designated National Agencies (DNA)

The Course was also used as a second occasion to receive comments and recommendations on the ‘IODE Resource Kit’ through the draft product ‘ODINEA CD-ROM’ which was developed during the ‘IOC Regional Training Course in Oceanographic Data Management for the IOCINCWIO region’, held in Mombasa, Kenya (1-11 December 1997). On the basis of the collected comments and recommendation a comprehensive training tool will be developed to be used during (and after) IODE training courses to ensure long-term impact of IODE training activities.

The Course was opened on Saturday 17 October at 09:00

2. PARTICIPANTS

Eleven participants were selected from 7 countries in the Indian Ocean region (and Western Pacific), namely Bangladesh, India, Malaysia, Mauritius, Qatar, Sri Lanka, and Vietnam. Participants were all actively involved in marine science, marine services or related specialties. Unfortunately the participants from Pakistan and Iran were not able to participate due to late reception of their application by the IOC.

A total of 12 resource persons from Australia, India, The Netherlands and IOC (lecturers and practical exercise support) participated in the Course.

The List of Participants and Resource Persons is provided in Annex II.

3. THE COURSE PROGRAMME

The Course Programme attempted to provide an as wide possible overview of the tasks and operations of National Oceanographic Data Centres and hereby trying to conserve a balance between theoretical lectures and practical exercises within the (short) available timeframe. The Course Programme was
developed jointly between IOC and NIO with IOC selecting the international lecturers and NIO identifying Indian lecturers and resource persons.

The following topics were covered during the Training Course:

SESSION 1: THE IODE SYSTEM
- Introduction to IODE and the IOC Regional Programmes
- The IODE institutional components and the international ocean data system
- The IODE data flow and monitoring procedures
- IODE Data Products and Operational Projects
- Establishing a National Oceanographic Data Centre

SESSION 2: DATA, METADATA AND INFORMATION MANAGEMENT
- New technologies for data acquisition: remote sensing
- Global Oceanographic Data Archeology and Rescue (GODAR)
- Marine data management at the RNODC-INDO
- The continuum data, metadata and information
- Metadata management: the MEDI Pilot Project
- Information management: the IODE Marine Information Management programme

SESSION 3: DATABASE MANAGEMENT SYSTEMS
- Advances in database management systems: from relational to object-oriented and beyond
- Advances in database management systems: distributed database management systems
- Numerical databases vs text-oriented databases

SESSION 4: USING RDBMS IN OCEANOGRAPHIC DATA MANAGEMENT
- Introduction to Microsoft Access
- Searching the database: introduction to SQL
- Examples of databases and data products: GEBCO, GLOSS etc

SESSION 5: DATA PROCESSING AND PRODUCT DEVELOPMENT
- Oceanographic Data Exchange formats
- Quality Control Procedures
- Data Processing and statistics
- Data product development tools: GIS

SESSION 6: IODE AND THE INTERNET
- Introduction to the Internet
- Serving information to users over the WWW
- Serving numerical databases to users over the WWW
- Serving textual/factual information databases over the WWW

SESSION 7: SOFTWARE FOR OCEAN DATA AND INFORMATION MANAGEMENT
- The IODE Resource Kit
4. LECTURE NOTES

In order to provide a clear overview of the wide variety and scope of the Training Course and to provide an opportunity to those who were not able to participate to share in the many interesting lectures we are providing some copies (or summaries) of the lectures given during the Course in Annex III.

5. COURSE EVALUATION

In order to constantly improve the quality of the IODE training courses participants were requested to evaluate the lectures in terms of:

- the relevance of the lecture to the course objectives
- the clarity of the presentation
- the quality of the presentation

The most appreciated lectures (>= 8/10) in terms of their relevance to the course objectives were:

- Introduction to IODE and the IOC Regional Programmes
- The continuum data, metadata and information
- Practical exercise on MEDI
- Practical exercise on MS Access & Practical exercise on SQL
- Oceanographic Data Exchange formats
- Introduction to the Internet
- Practical exercise on HTML
- The IODE Resource Kit

The least appreciated lectures (<= 4/10) in terms of their relevance to the course objectives were:

- IODE Data Products and Operational Projects
- Numerical Databases vs text-oriented databases (traditionally interest of data managers for text-based information management is low)
- Web databases (this lecture was considered too theoretical)
- Demonstration INODC on INGRES DBMS (it was observed that none of the participants used the INGRES DBMS and as such relevance was considered as small)
- Data Processing and statistics (this lecture was considered too theoretical)
- Demonstration ArcView at INODC
- Serving numerical databases to users over the WWW (this low score was attributed to the observation that insufficient time was spent on this subject)

Additional comments provided on the evaluation sheet and during the discussions are summarized as follows:

- More emphasis should be put on practical exercises;
There were too many lectures and lecturers;

- In some cases it was regretted that the presentations (slides) were of poor quality. Presentations should be of high quality;
- Presentation hand-outs should be distributed prior to the lecture so participants with language problems can better prepare;
- Lecturers should use 'real-world' examples;
- The course should include individual or group projects;
- More attention should be given on how to establish an NODC or DNA with special emphasis on minimum requirements and possibilities for institutions with minimal resources.

6. CLOSING OF THE SESSION

During his closing speech Mr Peter Pissierssens, on behalf of the IOC Executive Secretary, thanked Dr. E. Desa, Director of the National Institute of Oceanography, Goa for the substantial support provided by NIO which enabled IOC to organize this course. He also thanked the lecturers and other resource persons, as well as all NIO staff who had been involved in the excellent support for the training course.

He noted that the IOCINDIO region was still a relatively young regional body which had regrettably not been very active so far. However, he stressed that personal contacts established during training courses such as this one are instrumental in generating collaboration and exchange and he invited the participants to share their experiences with colleagues back home.

Dr. J.S. Sarupria announced that NIO will set up a 'listserv' to enable participants to the training course to continue communicating and to create a platform which can be used for future collaboration, assistance and exchange of experience.

In their closing comments on the Course the participants were all unanimous in their high appreciation for the course which they considered as a most useful contribution to their professional activities. Several participants pledged to contact the relevant authorities in their country to promote the establishment of a National Oceanographic Data Centre (NODC) or Designated National Agency (DNA).

Dr E. Desa, Director NIO, invited the participants to visit NIO again and welcomed them to spend some time at NIO.

All participants were provided with a certificate of participation.

The IOC/IODE - NIO Training Course on Oceanographic Data and Information Exchange was closed on Tuesday 27 October 1998 at 11h00.
ANNEX I

AGENDA AND TIMETABLE

SATURDAY - 17 OCTOBER 1998
0900 - 0915 REGISTRATION
0915 - 1030 Presentation of the participants
1030 - 1100 TEA BREAK

SESSION A : IOC/IODE SYSTEM (TRAINING HALL)
1100 - 1115 Introduction to IODE & IOC regional policy (P. Pissierssens) [ paper presented during ITO98]
1115 - 1200 IODE’s institutional components and international ocean data system (P. Geerders)
1200 - 1230 IODE data flow, monitoring procedures (P. Geerders)
1230 - 1300 IODE data products and operational projects (P. Geerders)
1300 - 1400 LUNCH BREAK
1400 - 1500 PRACTICAL EXERCISE on ROSCOP forms (Geerders)
1500 - 1530 TEA BREAK
1530 - 1615 Establishing an IODE NODC (G. Reed)

SUNDAY - 18 OCTOBER 1998 - HOLIDAY

MONDAY - 19 OCTOBER 1998

SESSION B : DATA, METADATA AND INFORMATION MANAGEMENT
0925 - 1020 New technology for data acquisition: remote sensing, data buoys etc. (P. Geerders)
1020 - 1045 GODAR project and achievements (P. Geerders)
1045 - 1115 The continuum data, metadata and information (G. Reed)
1115 - 12:00 Metadata: The MEDI pilot project (G. Reed)

TUESDAY - 20 OCTOBER 1998
0930 - 1000 Marine Information Management (Pisssierssens)
1000 - 1100 Marine data management system at RNODC-INDO (JS Sarupria)
1100 - 1130 TEA BREAK
1130 - 1300 PRACTICAL EXERCISE: Metadata Practical exercise (G. Reed)
1300 - 1400 LUNCH BREAK

SESSION C : DATABASE MANAGEMENT SYSTEMS
1400 - 1430 Numerical DBMS vs textual DBMS (MP Tapaswi)
1430 - 1500 Advances in DBMS: distributed database management systems (G. Reed)
1500 - 1530 TEA BREAK
1530 - 1700 DBMS systems - Database directions (P. Sadanandan, NCST, Bangalore)
WEDNESDAY - 21 OCTOBER 1998

SESSION D: USING RDBMS IN OCEANOGRAPHY
0900 - 1000 Data warehousing (P. Sadanandan, NCST, Bangalore)
1000 - 1100 Web databases (P. Sadanandan, NCST, Bangalore)
1100 - 1130 TEA BREAK
1130 - 1300 PRACTICAL EXERCISE: MS Access: Creating database tables, Searching the database (J. Pattainak, JS Sarupria, P.Pissierssens)
1300 - 1400 LUNCH BREAK
1400 - 1430 Demonstration to other global data sets such as GEBCO etc. (PD Kunte)
1430 - 1500 Introduction to global data sets and demonstration (CD-ROM - WDC-A, etc) (GVReddy)
1500 - 1530 TEA BREAK
1530 - 1700 PRACTICAL EXERCISE: MS Access self training

THURSDAY - 22 OCTOBER 1998

SESSION E: DATA PROCESSING AND PRODUCT DEVELOPMENT
(TRAINING HALL)
0900 - 1000 Oceanographic data exchange formats (JS. Sarupria)
1000 - 1100 Quality control procedures (T. Pankajakshan)
1100 - 1130 TEA BREAK
1130 - 1200 Data product development tools (GIS, etc.) (PD. Kunte)
1200 - 1300 Visit to IODC (Demonstration use of INGRES DBMS (L. Ratnakaran) and ArcView GIS (J. Pattanaik))
1300 - 1400 LUNCH BREAK
1400 - 1500 PRACTICAL EXERCISE on MS Access & SQL
1500 - 1530 TEA BREAK
1530 - 1730 PRACTICAL EXERCISE (continued)

FRIDAY - 23 OCTOBER 1998

SESSION F: IODE AND THE WWW
0900 - 1000 Data processing tools interpolation, interpolation, etc. (R. Mahadevan)
1000 - 1045 The Internet - Introduction, Evolution and Tools (A. Ghosh)
1045 - 1115 TEA BREAK
1115 - 1145 Serving information to users over the WWW: HTML (P.Pissierssens)
1145 - 1200 Serving numerical databases over the WWW (V. Chavan)
1200 - 1300 Serving textual/factual database over the WWW (MP Tapaswi / P.Pissierssens)
1300 - 1400 LUNCH BREAK
1400 - 1500 PRACTICAL EXERCISE on HTML
1500 - 1530 TEA BREAK
1530 - 1630 PRACTICAL EXERCISE (continued)
1630 - 1700 The IODC NIO CDROM Demo (PD. Kunte)

SATURDAY - 24 OCTOBER 1998 - HOLIDAY
SUNDAY - 25 OCTOBER 1998 - HOLIDAY
MONDAY - 26 OCTOBER 1998

SESSION G: SOFTWARE FOR OCEAN DATA AND INFORMATION MANAGEMENT (IODC)
0900 - 1100 PRACTICAL EXERCISE on format conversion (JS Sarupria)
1100 - 1130 TEA BREAK
1130 – 1230 PRACTICAL EXERCISE: The ODINEA CD-ROM (IODE Resource Kit) (P.Pissierssens)
1230 - 1300 Library visit (Tapaswi)
1300 - 1400 LUNCH BREAK
1400 - 1500 PRACTICAL EXERCISE: The ODINEA CD-ROM (IODE Resource Kit) continued
1500 - 1530 TEA BREAK
1530 - 1630 The IODE XBT quality control software demo (Pankajakshan)
1630 - 1730 Evaluation of the Training course

TUESDAY - 27 OCTOBER 1998

0930 - 1100 Discussions on evaluation and recommendations
1100 CLOSING CEREMONY (SEMINAR HALL)
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ANNEX III : LECTURE NOTES

LIST OF ATTACHED LECTURE NOTES:

1. Session A : Introduction to IODE & IOC regional policy (P.Pissierssens)
2. Session A: IODE Institutional Components and the International Ocean Data System (P. Geerders)
4. Session A: IODE Operational Projects (P. Geerders)
5. Session A: NODC: Tasks & Responsibilities (G. Reed)
6. Session B: Data, Information and Metadata (G. Reed)
7. Session B: A Metadata Directory System for Marine Data (G. Reed)
8. Session C: Numerical Vs Textual Databases (M.P. Tapaswi)
9. Session C: Distributed Database Management Systems (G. Reed)
10. Session E: Quality and Quality Control of Oceanographic Data (Pankajakshan Thadathil)
11. Session E: Geographic Information System (GIS) (P.D. Kunte)
13. Session F: HyperText Markup Language (P.Pissierssens)
14. Session F: Numerical Databases Over WWW (V. Chavan)
15. Session F: Serving Textual / Factual databases on the web (M.P. Tapaswi)
16. Session F: Dynamic Database publishing using Filemaker Pro (P.Pissierssens)
1. INTRODUCTION TO IODE & IOC REGIONAL POLICY (P.Pissierssens, IOC)

Slide 1

Growing towards a new era

Slide 2

• IODE Yesterday
• IODE Today
• IODE Tomorrow

In order to address the question ‘what will IODE be tomorrow’ we first need to look at IODE yesterday and IODE today.
Going back 37 years, IODE is one of the oldest IOC programmes, established in 1961. The IOC (Intergovernmental Oceanographic Commission) is a part of UNESCO. The relationship with UNESCO is a bit more complicated than that, because although IOC is part of UNESCO, it has its own governing bodies: an assembly and executive council. IOC also has its own Member States which are sometimes different from the UNESCO Member States (e.g., the United States are a Member State of IOC but not of UNESCO). Currently, the IOC has 126 Member States.

What is unique about the IOC is that it is the ONLY United Nations body that deals ONLY with the Oceans. Many other UN agencies have activities related to the Oceans but the Oceans are only part of their mandate, sometimes peripheral. The IOC deals only with the Oceans.
Slide 5

IOC Activities

- Global Programmes
  - Ocean Science
    - OSLR, OSNLR, Ocean Mapping, Marine Pollution, ICZM
  - IOE
    - Tsunami Warning System
    - Global Ocean Observation (GOOS, IGIOSS)
    - Training & Education (TEMA)

- Regional Programmes

Slide 6

IOC Regional Programmes
IODE has also been one of the most active programmes of the IOC. I am showing you a list of IODE milestones. I will not even try to go through all of these.

The IODE has been established with the objective to "enhance marine research, exploration, and development by facilitating the exchange of oceanographic data and information between participating Member States."
Now let us have a look at the structure of the IODE system. We can distinguish three types of structure:
1- the physical structure
2- the organizational structure
3- the operational structure

1- physical structure: here we have to remember that the IODE system was developed in a time when there was no Internet. Physical structures therefore had to be built in a centralized manner: we had world data centres, national oceanographic data centres and responsible NODCs (I am coming back to these individually in a moment)

2- organizational structure: in order to develop, maintain and manage the system, IODE set up an IODE Committee, appointed IODE Officers and brought together a number of Groups of Experts

3- operational structure: defining the data flow
Looking at the physical structure, during its 37 years of existence the IODE system has been able to set up 56 national data centres (including NODCs and DNAs) in 53 countries - Oceanography.

There are 56 National Oceanographic Data Centres, Designated National Agencies and World Data Centre (Oceanography) in 53 countries: Argentina, Australia, Brazil, Bulgaria, Canada, Chile, People’s Republic of China, Colombia, Republic of Croatia, Ecuador, Arab Republic of Egypt, Finland, France, Germany, Ghana, Greece, Guatemala, Guinée, Iceland, India, Islamic Republic of Iran, Ireland, Italy, Japan, Kenya, People’s Democratic Republic of Korea, Republic of Korea, Malaysia, Mexico, Morocco, Netherlands, Nigeria, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Seychelles, South Africa, Spain, Sweden, United Republic of Tanzania, Trinidad & Tobago, Turkey, Ukraine, United Kingdom, United States of America, Uruguay, Venezuela, Vietnam
None in Mauritius, Qatar, Bangladesh
Let’s look at the Data Centre tasks:

A National Oceanographic Data Centre (NODC) will:

- acquire, process, quality control, inventory, archive and disseminate data in accordance with national responsibilities.
- be responsible for conducting international exchange
- actively seek and acquire from national sources those data which are exchangeable internationally, and to process and quality control the data and submit them in a timely fashion to the appropriate WDC for Oceanography or RNODC.
- provide ocean data/information in a usable form to a wide user community
- participate in meetings of IODE

Some Member States, that have not established an NODC, have instead identified Designated National Agencies (DNAs).

NODC can receive data or inventory information from the WDCs for Oceanography or RNODCs.
• USA, Russian Federation, China
• Receive & archive oceanographic data & inventories from NODCs, RNODCs, marine science organizations, and individual scientists.
• provide data, inventories and publications to NODCs/ DNAs, to RNODCs & to international co-operative programmes
• Monitor performance IODE system

A special case is the RNODC. They are NODCs which have also accepted some additional responsibilities. These can be to deal with specific data types eg drifting buoys data, marine pollution data, etc
or they can take responsibility for specific geographic regions eg Southern Oceans, Indian Ocean (such as the IODC), Western Pacific etc.
Let's proceed with the Organizational structure:
First of all we have an IODE Committee. This is composed of representatives from each data centre and of course also the IODE officers.
The IODE officers include a Chairman and Vice-Chairman, elected by the Committee (the current Chairman is Ben Searle who is with us this week). Officers also include the Chairpersons of the Groups of Experts and the Heads of the 3 WDCs.
We also have Groups of Experts. For specific areas within the mandate of IODE the Committee has established Groups of Experts. As the name implies these Groups are composed of experts. They are people identified by their own country following a request from the IOC secretariat. They then meet at regular periods (every 2-3 years) to discuss specific issues. They often prepare action plans and carry out programmes. One example is the GE-MIM of which we have a member here ie Mr Murari Tapaswi.
Finally we have a few task teams. These deal with specific topics and usually have a limited lifespan.
Just a few words about the operational structure ie the data flow. In this very simplified diagram you can see how data flow through the IODE system.

Full and open sharing
Free or low-cost data services
Data available within 1 year after collection
Data archiving commitment
Apply Standards!!
Now, through the years a giant distinction has been made between data management on one side (numerical data) and information management on the other side (textual information). Rarely would these two meet. However, in the past few years a new creature (or so it seems) has surfaced ie meta data. Textual Information describing Numerical Data and data sets. We therefore need to consider these three as a continuum.

Data Management: data types
IODE deals with a wide variety of data types:
Are data centres just archives of data? No, although many started out that way, many data centres now produce data products. GEBCO, many other examples around us this week.

Standards: library management systems (eg software), standards for directory type databases, monitoring of technological advancements for information exchange such as ILL
MIM networks: RECOSCIX-WIO, -CEA, GLODIR, OceanPilot, MEDI, ASFA
Assistance: the IOC assists member states that wish to set up national data management infrastructure by sending experts (from within the system) to assess the national situation, discuss options and assist with the planning. Training and Education: training courses and workshops, at national or regional level (next week). Eg these can be organized following the mission I just mentioned. New NODCs are welcomed into the data management family: more mature NODCs accept internships from newly established NODCs for periods of 2-3 months. Most of the time the NODCs don’t charge for this assistance although it must be considered as on-the-job training. IOC provides the air ticket and living expenses. New strategy: training and education should be organized within project framework: abandon one-hit training activities without follow-up. (eg ODINAFRICA)
WE have all witnessed the wide variety of products and services developed in many of the NODCs present here with us.

Do we serve our customers. First who are our customers?
Yesterday and today: mainly scientists
Today and tomorrow: ...

The new customers will increasingly want ‘operational oceanography’ data. Traditionally IODE deals with delayed-mode data: often cruise based. The IODE system’s major added value is the quality control mechanism, set up throughout the IODE system.
A programme which is much more aimed at real-time data management is the WMO’s Integrated Global Ocean Services System IGOSS.
To get the both of both worlds IODE and IGOSS are therefore growing closer to each other.
This has led to the drafting of joint IGOSS/IODE Marine Data Management and Exchange Statement which says that...

IGOSS and IODE will continue efforts in gaining a reputation for excellence in the management and processing of marine data and in the generation and distribution of data, information and products through a well supported, science endorsed, highly focussed and technically competent distributed group of data centres and related agencies.
Add: Regional and global marine related programmes are seen as major customers for both IGOSS and IODE data management and exchange capabilities. This is in addition to the more traditional needs of supporting national interests.
There will thus be a major and fundamental change in IODE. The main data streams will result from ‘permanent’ monitoring activities rather than from the traditional ‘ad hoc’ research cruise. Of course the cruise based data streams will still exist and will remain very important.

Data management, data distribution and provision of products are key result areas for GOOS. In fact, what is GOOS: GOOS is conceived as...
Slide 32

What is GOOS?

- a sustained, co-ordinated international system for gathering data about the oceans and seas
- a system for processing such data, with other relevant data from other domains, to enable the generation of beneficial analytical and prognostic environmental information services;

... created by the IOC Assembly in 1991.

Slide 33

GOOS Objectives

- Specify data needed by users of ocean environment
- develop strategy for gathering and exchange of data
- facilitate product development
- facilitate access by dev countries
- ensure GOOS integration in global strategies
The ETEDM implies a known or definable pathway of connections between a basic observational element and the end use or purpose to which the observation is applied. Typically each type of observation has a range of potential applications, and most applications need more than one observation type. So, in designing a system to serve a given range of end-uses, it is important to know how the observation will be used, processed and combined with other observations to deliver and observational product, of value to the end user.

The ETED concept is already used by GTSSP (global temperature and salinity profile program) operated jointly by IGOSS and IODE. GTSSP uses a continuously managed database to provide for the integration of the real-time (low resolution) data stream with the delayed mode (generally high resolution) data stream.
But here the concept of the cruise will be replaced with a specific monitoring activity at the instrument or system level.
move the data management closer to the sensor
support quality control of ocean data and retain all available metadata
integrate real-time and delayed mode data and information processing
increase coordination between data centres and promote the sharing of data,
software and responsibilities between centres
simplify merging local data sets to form global data sets and
develop a continuously updated database
support merge oceanic with atmospheric & terrestrial data to link GOOS with WWW,
GCOS, GTOS and Distributed Data Base.
What has been done today?

IGOSS/IODE use cruise summary reports
We have the Marine Environmental Data Inventory (MEDI) which has been given a new lease of life through efforts by the AODC and BODC.
And we have the continuously managed database of GTSP monitoring the capture of real-time and their transmission around the world.
The challenge for the IGOSS/IODE tandem is therefore to build on this model, improving the linkages, removing bottlenecks caused by duplication or data format incompatibility problems and develop capabilities (eg establishing new data centres) through capacity building.
Read

add: volunteer work. The fact that we deal with volunteer work has the advantage that we can access a tremendous amount of know how. For example whenever we hold group of experts meetings, or we organize the IODE Officers or IODE Committee meeting extremely fascinating issues are discussed often it the really technical level. However, although we then draft really interesting workplans, the day-to-day duties of the experts make that progress is very slow. We do really need an implementation mechanism such as the one proposed by Ben Searle. The fact that we don’t have a standard training toolkit is really an impediment to the development of new data centres.
2. IODE INSTITUTIONAL COMPONENTS AND THE INTERNATIONAL OCEAN DATA SYSTEM
(P. Geerders)

The International Oceanographic Data and Information Exchange (IODE) system has been established in 1961 to:

"enhance marine research, exploration, and development by facilitating the exchange of oceanographic data and information between participating Member States."

Rationale:
- Ocean basin and global processes
- Availability of an international exchange system to provide data and information from all available sources.
- Local processes

The economic benefit of obtaining data by exchange as opposed to collecting it oneself is huge.

Critical success factors:
- Support of participating Member States,
- Involvement of many individual institutions and marine scientists,
- Contribution of data and the necessary expertise to maintain and further develop the IODE system.
IODE provides ....

- an infrastructure, a network not only of people but also physical e.g. through the Internet (E-mail, Web Sites, FTP)
- tools such as procedures and guidelines for information and data handling (submission of planned research, completed research, available datasets, publications, formats for exchange and archival)
- services such as: information, data, referral, advice and assistance

* potential commercial value of information and data needs to be kept in mind *

IODE network ....

- managed and guided by committee under IOC of UNESCO
- maintains close links with other intergovernmental and international bodies (UN, WMO, UNEP, EC, IAEA, IMO, FAO, ....)
- focuses on scientific aspects but increasingly also supports management of the marine and coastal environment and its resources
IODE network consists of

- WDC’s: World Data Centres (Silver Spring-USA, Moscow-Russia, Tianjin-China)
- NODC’s: National Oceanographic Data Centres (56 around the world)
- RNODC’s: Responsible NODC’s (10)

Tasks of WDC

- receive oceanographic data and inventories from NODCs, RNODCs, marine science organizations, and individual scientists. These data are collected and submitted voluntarily from national programmes, or arise from international co-operative ventures.

- provide copies of data, inventories and publications to NODCs/DNAs, RNODCs and to international co-operative programmes, as appropriate, in exchange, or with a charge not to exceed the cost of providing the service.

- monitor the performance of the international data exchange system and report their findings to the IOC Secretariat and the C-IODE. The Committee can use this information to take appropriate action to correct deficiencies in the international exchange system.

NOTE: In general, the exchange of internationally significant data holdings and data inventory information between WDCs for Oceanography and their counterparts is expected to take place on a regular basis without charge in order to keep the data holdings of the Centres identical.
Tasks of NODC

- centralized facility
- providing ocean data/information
- on a continuing basis
- in a usable form
- to a wide user community.
- acquires, processes, quality controls, inventories, archives and disseminates data in accordance with national responsibilities.
- normally charged with the responsibility for conducting international exchange.
- actively seek and acquire from national sources those data which are exchangeable internationally, and to process and quality control the data and submit them in a timely fashion to the appropriate WDC for Oceanography or RNODC.
- can request and receive from the WDCs for Oceanography or RNODC's similar data or inventory information which they need for their own (national) requirements.

Some Member States, that have not established an NODC, have instead officially assigned the responsibility of international exchange of oceanographic data and information to a Designated National Agency (DNA).

Tasks of RNODC

Responsible National Oceanographic Data Centres are National Oceanographic Data Centres who have accepted additional special responsibilities. These can include specific data types (e.g. Drifting Buoys data) or specific regions (e.g. Southern Oceans).

- RNODC-SOC (Southern Oceans)
- RNODC for Drifting Buoys Data
- RNODC for IGOSS (BATHY and TESAC)
- RNODC for MARPOLMON
- RNODC for WESTPAC (Western Pacific)
- RNODC for Waves
- RNODC for JASIN
- RNODC - Formats
- RNODC - ADCP (Acoustic Doppler Current Profilier)
IODE committee work done by

- Groups of Experts
  [meet periodically, continuous activity]
- Task Teams
  [work only by correspondence, work limited in time]
- Plenary Session (about every 2-3 years)
  [representatives of WDC’s, NODC’s and RNODC’s with observers of related organisations]

* SEE IODE HANDBOOK*

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IODE Activities

**Marine Data Management**
- Global Oceanographic Data Archaeology and Rescue Project (GODAR)
- Oceanographic Data and Information Network for Africa (ODINAFRICA)

**Marine Information Management**
- Development of Standards for Marine Information Management
- Development of Marine Information Management Networks in developing regions
- Development of Global Directory of Marine (and Freshwater) Scientists
- Development of Ocean Pilot database
- Development of Marine Metadata Management System
- Development of Marine Bibliographic Tools: Cooperation in ASFA
- Cooperation with IAMSLIC and its regional groups
- Information Technology know-how sharing
- Development of Electronic Information Services
IODE Tools for:

**METADATA MANAGEMENT**
- Blue Pages
- Irish EDMED

**DATA MANAGEMENT**
- ArcExplorer
- ATLAST
- OceanPC
- ROSWin
- SURFER

IODE’s Data and Information Sources

IODE helps you to find:

- marine scientists and institutions (GLODIR)
- marine science related web sites (OceanPilot)
- marine science related Internet discussion lists (ListServs)
- information on marine science related conferences and meetings
- what does an abbreviation (acronym) stand for? (OceanAcronyms)
- a scientific publication (bibliography)
- marine science libraries (IDALIC)
- useful websites (Training & Tools: KnowHow-KnowNow)
- ocean data (Datasets)
iode Training Tools

IODE Resource Kit

- specific methods, tools, and systems (principally concerned with databases and software) that can be applied to all types of coastal programs.
- a broad suite of training and orientation services.
- the web version is a demonstration model of the full version which is being made available on CD-ROM.

KnowHow-KnowNow

In this quick referral section you will find places to go when you need know-how to carry out marine information or marine data related tasks.

Data & Information Management Tools

- specific marine data or marine information management methodology and technology.
- information on a wide variety of software tools, where to get information, how much they cost.
- in some cases the software tools are available from our server. In other cases we provide links to the author or company that distributes/sells the product.
3. IODE DATA FLOW AND MONITORING PROCEDURES (P. Geerders)

Slide 1

IODE Data Flow and Monitoring Procedures

Paul Geerders
P. Geerders Consultancy
IJsselstein
The Netherlands

Slide 2

Phases of a data acquisition activity

- planning => DNP/NOP
- completion => ROSCOP
- pre-processing => QA/QC
- processing => MEDI/Blue Pages
- interpretation
- publication => ASFA/ASFIS
- archival
- exchange => IODE network

Data access conditions:
- free and open sharing
- at no or low cost
- available < 1 year after collection
- commitment for permanent archival
- application of standards
4. **IODE OPERATIONAL PROJECTS**  
(P. Geerders)

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**IODE Operational Projects**

Paul Geerders  
P. Geerders Consultancy  
IJsselstein  
The Netherlands

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**IODE Projects**

- GTSPP Global Temperature and Salinity Project  
- IGOSS Integrated Global Ocean Services System (with WMO)  
- GOOS Global Ocean Observing System  
- GODAR Global Ocean Data Archeology and Rescue Project  
- QC Quality Control Manual  
- periodic training opportunities in information and data management  
- advice on and assistance with information and data management
GODAR Project and Achievements

Paul Geerders
P. Geerders Consultancy
IJsselstein
The Netherlands

IODE GODAR project

GODAR - WHAT IS GODAR?
IOC’s GLOBAL OCEANOGRAPHIC DATA ARCHAEOLOGY AND RESCUE PROJECT

GODAR - WHY?
- fundamental importance and value of the data
- risk of being lost to future use
- for compilation of global oceanographic databases

GODAR - AIMS?
- digitisation of data which is still in manuscript form
- archival of the data at two or more international data centres in digital form
- compilation of catalogues (inventories) of:
  - data now available only in manuscript form;
  - data now available only in analogue form;
  - digital data not presently available
- making all data accessible on various media including CD-ROMs

GODAR - WHICH DATA HAS PRIORITY?
- hydrographic casts including all chemical and biological observations;
- salinity-conductivity temperature-depth casts;
- expendable bathythermograph casts;
- mechanical bathythermograph casts.

GODAR - RESULTS AT PRESENT?
- atlases
- technical reports
- workshop reports (5)
- CD-ROM's

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GODAR - RESULTS AT PRESENT?
- atlases
- technical reports
- workshop reports (5)
- CD-ROM's
New technology for data acquisition:
Remote Sensing
Data Buoys

Paul Geerders
P. Geerders Consultancy
IJsselstein
The Netherlands

New technologies ....

some examples:

• Remote Sensing from aircraft and from space
• Automated Systems on data buoys and remote fixed platforms
• ADCP
• towed ondulating systems

common aspects:

• high spatial coverage and/or
• high temporal coverage, but mostly
• non-standard output products
Slide 7

Common system elements

- transducer (from geophysical variable to electronic variable: current, voltage, frequency)
- digitising (from analogue to digital form)
- multiplexing (combine several datastreams into one)
- recording (record data on board for later transmission or retrieval)
- transmission (transmission of full datastream to receiving centre)
- reception (reception of transmitted datastream)
- de-multiplexing (separation of data from different sensors/transducers)
- pre-processing (translation of data into geophysical units and quality control)
- processing (conversion into required format, including computation of averages, etc.)
- presentation (display of the data in various forms and formats for specific applications)
- archival (permanent or semi-permanent archival of the data)
- distribution (to users and applications)

Slide 8

Some aspects of Remote Sensing

- 3 windows:
  - visible 400-800 nm => colour
  - infrared 1-100 micron => temperature
  - microwaves 1-100 cm => "waterstructure"
- passive versus active techniques
- platforms
  - satellite (geostationary or polar orbit)
  - aircraft
  - high towers or locations
- sensors and their data structure
  - radiometers => point data
  - scanners => line data
  - CCD matrix => image
  - Synthetic aperture => image
- product generation requires
  - field data for calibration and validation
  - atmospheric correction (esp. visible and infrared)
  - algorithm to translate RS data into relevant geophysical parameter
6. **Data, Information and Metadata**  
(G. Reed, AODC, Australia)

Slide 1

**Data, Information and Metadata**

Slide 2

**Data and Information**

- Data is the raw material
- The raw material is processed
- The result is information
Slide 3

**An Information System**

- An information system is defined as a set of rules used to process data and convert it into information.
- The information system processes the raw data is useful people.
- The relationship between data and information is often summarised in the Input-Process-Output Model.

---

Slide 4

**What is Data Management**

“**Data Management** is the process of planning, coordinating and controlling an organisation’s data.”
Slide 5

**What is Data Management**

- Data management is a philosophy of
  - managing data as an organisational resource
  - treating data as an important, sharable resource
- Data management is the mechanism for delivering information to decision makers

Slide 6

**Data Management**

- The scope of data management ranges from data acquisition to the production of some kind of output
- Data management covers the storage, transport, transformation, combination, aggregation of data and making it available to those who need it and have the right to access it
- Data management ends when data becomes information
What are Metadata?

• “Information about data”
• Metadata describes the content, quality, condition, and other characteristics of data
• Not the actual dataset itself

Example of Metadata

• A library catalogue:
  – Title of book
  – Author
  – Publication date
  – Unique reference number
  – Where to find it
Slide 9

**Importance of Metadata**

- Provides a means to discover that a dataset exists and how it can be accessed
- Documents the *content, quality and features* of a dataset and gives an indication of its usefulness
- Makes data more accessible
- Reduces duplication of data collection

Slide 10

**Metadata for Marine Data**

Metadata elements include:

- Identification
  - name of dataset; geographic area of coverage; themes; currency; restrictions
- Data quality
  - positional and attribute accuracy; completeness
- Distribution
  - who holds the data; formats and media
Slide 11

**Metadata Standards**

Two different approaches:

- Comprehensive definition of data elements to define metadata, including data transfer
- Minimum number of core elements to adequately describe metadata

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Slide 12

**Examples of Metadata Standards**

- Federal Geographic Data Committee (FGDC)
  - standard specifies structure and content of some 220 items to describe digital datasets
  - lengthy
  - compliance is difficult to achieve
  - terminology and length of standard discourages its use
Examples of Metadata Standards

- International Organisation for Standardisation (ISO)
  - draft international standard for metadata
  - defines 2 levels of compliance
    - Compliance Level 1 - minimum metadata required to uniquely identify a dataset
      - title, responsible party, date, language, abstract, purpose, progress, extent, keywords, use constraints, spatial reference system, distribution media and format
    - Compliance Level 2 - metadata to fully describe a dataset
      - Level 1 plus detailed data quality, processing and citation information

Examples of Metadata Standards

- Australia New Zealand Land Information Council (ANZLIC)
  - uses a “pages” concept to describe spatial information
  - Page 0 defines the mandatory elements to allow users to identify and determine suitability of a dataset
  - Page 1 describes additional thematic metadata
  - Page 2 describes additional agency metadata
The “Pages” Concept

IODE and Metadata

- MEDI - Marine Environmental Data Information Referral System

- MEDI Objectives:
  “MEDI will provide the marine community with referrals concerning the availability, location and characteristics of marine environmental data to meet their specific needs” (1979)
MEDI Catalogue

- First published in 1979 - contained 86 dataset descriptions from 40 institutions in 20 countries
- Second edition published in 1985 - contained 219 datasets from 64 institutions in 32 countries
- Third edition published in 1993 - contained 247 datasets from 40 institutions in 27 countries
- All three editions were made available in printed format only (as IOC Manual and Guides)

MEDI Pilot Project

- 15th Session of IODE (1996) recommended the setting up of a pilot project to:
  “Test ways and means of applying modern technology to the further development of the MEDI system and, on the basis of these investigations, to draft a specification for a revised MEDI”
Existing Marine Metadata Systems

- Review of three marine metadata directory systems has been undertaken:
  - European Directory of Marine Environmental Data (EDMED)
  - Marine & Coastal Data Directory of Australia (Blue Pages)
  - Extended EDMED for Ireland
- Similar structure for all these directories - only minor variations

The Blue Pages Data Directory

- Main function is management of marine metadata
- Contains only the metadata needed to decide if a dataset exists and is useful
- Compliant with ANZLIC “Page 0” metadata guidelines
- Additional “Page 1” metadata to describe marine datasets
The Blue Pages Software

- Uses MS Access 7 as the DBMS
- Includes a spatial query tool written in Visual C++
- Two versions of the software:
  - compiled version requires MS Access 7 licence
  - run-time version does not require MS Access
- Software can be downloaded from:
  http://www.AODC.gov.au
7. **A Metadata Directory System for Marine Data**  
(G. Reed, AODC, Australia)

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**Slide 1**

A Metadata Directory System for Marine Data

Greg Reed  
Australian Oceanographic Data Centre

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**Slide 2**

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Metadata for Marine Data

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The “Pages” Concept

Diagram of the “Pages” Concept

Network of datasets connected through national, jurisdictional, and agency metadata directories.
Directories for Marine Data

- A successful Marine Data Directory must be:
  - complete
  - easy to use
  - reliable
- Should contain enough information for a user to determine the suitability of a dataset

The Blue Pages Data Directory

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Slide 15

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Slide 16

Conclusion

- Metadata is fundamental - not incidental
- Metadata directories should contain sufficient detail for users to identify suitable datasets
- Metadata directories containing only core metadata elements are easier to populate and maintain
- Ease of use and flexible search tools are essential to encourage use of metadata directories
8. Numerical Vs Textual Databases
(M.P. Tapaswi, NIO, Goa, India)

Slide 1

Numerical Vs Textual Databases
Murari P. Tapaswi
murari@csnio.ren.nic.in

Slide 2

DBMS

- Structured information storage & retrieval software
- Initially came into being for handling of numerical data like
  ⇒ Stores inventory control
  ⇒ Salary management
  ⇒ Accountancy, etc.
- Notable examples of well known softwares: Dbase, FoxPro, Access
Slide 3

**TEXTUAL DBMS**

- Deal with data whose major constituent is text
- Offer many features normally found in word processing softwares
  - Cut - Paste
  - Insert - Replace mode
  - Cursor movement
    - by arrow keys
    - word by word
    - to beginning & end of the field
  - Delete field contents from cursor position onwards or whole field

Slide 4

- Handle fields of varying length
  - Optimal utilization of HD space
  - Freedom for defining maximum length of a field
  - Freedom of defining databases for complex structure
  - Linking two records from same database
  - Storage of data in ISO - 2709 format
Slide 5

..textual DBMS

- Offer sub-field facility
  - Conglomerate date elements of single concept under one roof (field) keeping their identity
  - Generate indexes on the desired subfields only

- Offer repeatable field facility
  - To accommodate data elements of the same field occurring more than once

Slide 6

DATA ENTRY

- Support multiple data entry worksheets
- Automatically recall of last modified record or search result(s) for editing
- Control characters for filing information and search term delimiters
  - using < > // within the data fields
- Scrolling fields for data entry of longer elements
Slide 7

..data entry

• Pick-list assistance for data with standard structure
• Help messages to assist data entry

Slide 8

DISPLAY FORMATS

• Multiple display formats
• Line break at word level
• Data display formats to include commands which produce
  ⇒ Data (contents of given field)
  ⇒ Actions (skipping to new line, leaving blank lines & columns, lower - upper case, etc.)
Slide 9

..display formats

- Support different type of expressions & functions
  - Numerical
  - String
  - Boolean
  - String function help to link two records to display data as if it is from single record

Slide 10

..display formats

- Allow escape sequences to print data in bold, italics, etc.,
- Sorted output
Slide 11

DATA INVERSION / INDEXING

• Use of single index to allow search for a given term in any field

• Index on
  ⇒ Whole field
  ⇒ Specific subfield(s) of a field
  ⇒ Words in a field
  ⇒ Phrases

Slide 12

..data inversion

• Index terms for efficient retrieval backed up by efficient index noting
  ⇒ Record number
  ⇒ Field of occurrence
  ⇒ Occurrence number
  ⇒ Sequence number

• ‘Stopword’ file to prevent indexing of words not likely to be searched (like a, an, the, or, not, and, their, these, etc.)
Slide 13

SEARCH

• Search expressions based on Boolean algebra consisting of search operators OR, AND, NOT

• Search expressions built on
  ⇒ Precise terms (words, phrases, numbers, etc.)
  ⇒ Right truncated terms
  ⇒ ‘Any’ terms (a collective term standing for set of predefined search terms)

Slide 14

..search

• Field level and proximity search operators
  ⇒ Same field
  ⇒ All repeatable fields as single field (G)
  ⇒ Within a single repeatable field (F)
  ⇒ Terms within the field not longer than ‘n’ words apart (e.g. A...B (maximum two words between A & B))
  ⇒ Terms within the field exact ‘n’ words apart (e.g. A$B (exactly one word apart)
Slide 15

..search

• Parenthesis for expressive syntax
• Specified field or group of fields in which the term to appear (e.g. A/(350, 351)
• Free text search for fields not indexed, beyond Boolean logic
• Display of searched results in desired format

Slide 16

..search

• Search by
  ⇒ Typing search expression
  ⇒ Picking up terms from the dictionary (indexed list of terms)
  ⇒ Recalling previous search expression (and editing if required)
  ⇒ Recalling previous search set
Slide 17

RETRIEVAL

• Sort and print retrieved records in desired format
• The desired format can be predefined or to be defined for case specific

Slide 18

..retrieval

• Printing to support page layout parameters required for a particular print run
  ⇒ Headings / sub-headings
  ⇒ Page numbers or no page number
  ⇒ Number of columns
  ⇒ Line width / column width
  ⇒ Lines / page
  ⇒ End of column tolerance
  ⇒ Data indentation
DATA TRANSFER AND PROGRAMMING

- Import & export records from / to other databases
- Take backup
- Programming with high level languages with additional library of certain functions and procedures
9. Distributed Database Management Systems (G. Reed, AODC, Australia)

Slide 1

Distributed Database Management Systems

Slide 2

Background
What is a Distributed Database System?

- A distributed database (DDB) is a collection of multiple, logically interrelated databases distributed over a computer network.
- A distributed database management system (D-DBMS) is the software that manages the DDB and provides an access mechanism that makes the distribution transparent to the users.
- Distributed database system (DDBS)=DDB+D-DBMS

Centralised DBMS on a Network

![Diagram of a centralised database management system on a network](image-url)
A DBMS manages data stored on several computers (usually geographically distributed) through various communication media (usually networks).

Types of transactions:
- **Local Transaction**: accesses data only at one site which it was submitted.
- **Global Transaction**: Accesses data either at different site than the submission site or accesses data at several sites.
Applications of DDBS

• Electronic Funds Transfer (EFT)
• Airlines
• Hotel chains
• Corporate MIS
• Military command and control
• Any organisation which has a decentralised organisation structure

Advantages of DDBS

• Data sharing
  – users at one site can easily access data at other sites
• Greater availability
  – failure at one site does not mean that the whole database is unavailable
• Autonomy of operation and control of local data
  – reduces problems of data management and data access to local component of DBMS
Advantages of DDBS

- Ease of reconfiguration and extension
  - new databases and processors can be added to the network without changing existing systems
- Lower costs
  - smaller computers can be used at each site

Disadvantages of DDBS

- Complexity
  - network architecture
- Cost
  - additional hardware required, communication costs
- Distribution of control
  - no one person/department in control
- Lack of experience
  - need specialised skills to implement and run
Slide 11

**Network Architecture**

- Specifies how sites in the system are connected to each other
  - fully connected
  - tree
  - star
  - ring
  - partially connected
- Network types:
  - LAN - local area network
  - WAN - wide area network

Slide 12

**Distributed DBMS Architecture**

- distribution - the degree to which the database is distributed
- heterogeneity - the degree to which the DBMSs at each site are different
- autonomy - the degree to which the DBMSs at each site have control over their operation
Distribution Strategies

Data replication
- stores a relation at two or more sites

• Advantages
  - availability

• Disadvantages
  - increased overhead on update

Distribution Strategies

Data fragmentation
- horizontal
**Slide 15**

**Distribution Strategies**

Data fragmentation

- vertical

**Slide 16**

**Distribution Strategies**

Data replication and fragmentation

- combination of the two
- fragments can be replicated
- replicates can be fragmented
Network Transparency

Transparency
• the degree to which users can remain unaware of the details of the design of the distributed system

Goal
• to maximise transparency so that users view the distributed database as a single database

Distributed Query Processing

The distributed database should look like a single database to users (transparency)

• a query may require data from several sites
• factors to consider
  – cost of data transmission
  – reliability of data communications
10. Quality and Quality Control of Oceanographic Data
(Pankajakshan Thadathil, Goa, India)

Slide 1

Slide 2

“Oceanographic data is like an infant. Unless care is taken, it is susceptible to injuries (errors). However, unlike infants, data is immortal. Once it is collected it remains as a source of information for ever”
Slide 3

<table>
<thead>
<tr>
<th>Different Stages</th>
<th>Sources of Errors</th>
<th>Human (H) / Non-H Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Collection preparation</td>
<td>Instruments Calibration</td>
<td>H - Factor</td>
</tr>
<tr>
<td></td>
<td>Reagents Preparation, etc.</td>
<td></td>
</tr>
<tr>
<td>Data Collection</td>
<td>Instrument Malfunctions</td>
<td>N-H Factor</td>
</tr>
<tr>
<td>Data Recording</td>
<td>Degitisation of Analogue to digital, parallelax error, error in analysis, etc.</td>
<td>H and N-H</td>
</tr>
<tr>
<td>Data Transfer</td>
<td>From hard copy to computer, from remote sensors to receiving station’s computer.</td>
<td>H and N-H</td>
</tr>
</tbody>
</table>

Slide 4

Errors, in general, can be classified as

Random Error

and

Systematic Error
Slide 5

General Quality Checks Involved in Oceanographic Data

Inventory Level Checks:
Position, Date/time, Vessel Speed, Duplicate, and Sounding.

Data Level Checks:
Visual Inspection, Range Check, Climatology Check, Inversion Check, Neighbourhood Check, Spikes, Stability Check, Depth Reversal, Duplicate, etc.

Slide 6

Typical Random and Systemtic Error

- Random error = (St. Dev. / Sq. rt. of No. Obs.)
- Systematic Error = Bias
An Interactive System for XBT Quality Control and Visualisation

ISO9 XBT Data

Quality Control Module

Inventory-level Check

Date Time, Position, Vessel Speed, Duplicates, Station Numbering

Data - Level Check

Visual Inspection, Surface Transient, Spike, Fall Rate, Temperature Inversion, Neighbourhood, Wire Break, Wire Stretch, Climatology, Nub

Visualisation

Vertical Profile, Vertical Section, Horizontal Distribution

Assignment of Quality Code

IGOOS Quality Codes

0 No Quality Control (QC) has been performed on this element.
1 QC has been performed: Element appears to be correct.
2 QC has been performed: Element appears to be inconsistent with other elements.
3 QC has been performed: Element appears to be doubtful.
4 QC has been performed: Element appears to be erroneous.
5 The value has been changed as a result of QC.
6, 7, and 8 Reserved.
9 The value of the element is missing.
11. Geographic Information System (GIS)  
(P.D. Kunte, NIO, Goa, India)

Slide 1

Data Product Development Tools

Geographic Information System (GIS)

Pravin D. Kunte

e-mail: kunte@csnio.ren.nic.in
Data & Information Div.
National Institute of Oceanography
Dona Paula, Goa - 403 004.

Slide 2

Geographic Information System

is a suit of hardware & software
which has capability to handle both spatial and Non-spatial data concurrently.

Four Major components are:

- Database Module
- Analysis Module
- Presentation Module
- Capture Module
Slide 3

GIS Data types and Modules

Geographic data

- Physical Dimension
- Geographic location
- Any Qualifying data

ATTRIBUTE DATA -- Qualifies Spatial data
SPATIAL DATA -- Physical Dimension & Location

Geometric Entities: Point, line, Polygon

Representation of Data: VECTOR Vs. RASTER

Slide 4

DATA CAPTURE

- Keyboard entry
- Manual digitization
- Automated input
- Importing Images
- Importing Data
- Voice Input

Steps in Data Inputting:

1. a) Digitizing Operation
   b) Auto Scanning (Point or stream mode)
2. Import data from other sources
   1. Projection
   2. Scale
3. Raster & Vector.
GIS DATABASE DESIGN

ATTRIBUTE DATABASE CREATION

Conceptual Design
- Application Requirements
- End-utilization Goals
- Target Users.

Logical Design
- Database specification
- Database Elements
- Database Structure
- Database updation procedure

Physical Design: Hardware, Software requirements

GIS Package
Dependent-----/|

Slide 6

Spatial DATABASE CREATION

- Define reference point and extent for study site
- Create Map in Polyconic Unit
- Digitize Theme from Thematic data
- Edit and Topology Building
- Check for Errors
- Create separate Themes … Theme1, Theme2, etc.
- Associate other Attributes if any…
- Theme ready for Analysis

Define Relation between Spatial and Non-Spatial data.
SPATIAL ANALYSIS TECHNIQUES
Overlay Operations in Raster & Vector based System

1. Feature Combination: Union & Intersect
2. Feature Extraction: Erase, Clip & Split
3. Feature Combination & Extraction:
   1. Update
   2. Identity
   3. Proximity Aggregation
   4. Spatial Aggregation
   5. Generalization

MODELING IN GIS
Modeling is a process of doing a systematic and logical enquiry of the data for establishing the relationships between the variables.

1. Methodological Models:
   How a desired function could be worked out using different operations in a sequential or in a logically related manner.
2. Mathematical Model:
   1. Binary models using nominal variables
   2. Weighting models at an ordinal level
   3. Quantitative models using intervals & ratio.
Slide 9

**QUERIES IN GIS**

All Kinds of SQL Queries at following three levels,

1. Point mode
2. line mode
3. Polygon mode

Three levels of Queries,

1. Logical
2. Spatio-logical

Slide 10

**3D IN GIS**

Digital Surface Modeling (DSM) encompasses task like,

# Understanding of Surface Characteristics
- DSM Generation
- DSM analysis for derivatives
- DSM Application

# The Derivatives Obtained are,
- 3D visualization of Surface
- Planner derivatives like slopes, aspects, ranges etc.
- Spot heights & surface distances

# Application
- 3D display of bottom topography
- Cut & Fill estimations
- Comparisons of different terrain
Network is a set of connected lines which are conduits for resources movement and are connected to each other at nodes.

Elements are,

Applications of Networking
1. Path determination 2. Resource allocation
3. Distribution analysis 4. Utility locating

GIS can be used in numerous ways....
- for processing & integrating spatial data
- archiving & managing data
- for displaying & generating thematic maps
- for building scenarios
- for predicting impacts
- to simulate & animate operations & processes

and also to develop models to represent REAL life situation.
Oceanography, being a multidisciplinary study of dynamic media within which various processes take place and interact over a wide range of space and time, has tremendous potential.

State-of-the-art:
ASFA indicates only 55 studies in Oceanography as compared to over 2000 land-based application.
Out of 55 studies ---
1. 63% (35) studies pertain to coast.
2. 16% (9) Near shore region
3. 9% (5) Open Ocean.

Hurdles:
1. GIS are designed and built for land application.
2. Limited availability of good quality data of temporal nature and uniform density coverage.
3. Diversified parameters: lat-long, time, season, depth
4. Relatively less physical objects, few topo features.
5. Media is highly volatile, dynamic, complex, 4 dimensional
Slide 15

Thanks
12. **Internet: Evolution, Spread, Prospects and Tools**  
(A. Ghosh, NIO, Goa, India)

**Slide 1**

**Internet: Evolution, Spread, Prospects and Tools**

Aravind Ghosh K.  
National Institute of Oceanography  
Dona Paula, Goa 403 004, India  
e-mail: garvind@ce.nio.res.in  
URL: http://www.nio.org

**Slide 2**

**What is Internet?**

- Collection of thousands of computer networks
- More than 100 million users
- Growth rate 10% per month
Slide 3

Things to know about Internet

- Medium for effective communication
- Research Support with information retrieval mechanism
- Cost and Feature flexibility
- Local as well as International Entity
- Heterogeneous infrastructure and appearance and usage
- Not owned by any one

Slide 4

Internet: Origin

- 2 Jan. 69 - Work on ARPANET started
- 2 Sept. 69 - Four ARPANET sites started operating
- 1970’s - NCP was replaced by TCP/IP
- 1983 - ARPANET and MILNET
- July 88 - NSF upgraded backbone to 1.5 Mbps
- 1985 - Agreement with 4 corporate agencies to strengthen NSFNET
- April 95 - NSFNET was replaced with NAPS
Slide 5

**Internet : Front Leaders**
- The Internet Society
- Commercial Internet Exchange
- FARNET

Slide 6

**Internet : Social Developments**
- Internet Worm
- Slovenia Independence
- Russian Coup
- Internet & Personality
Slide 7

**Internet: Retrieval Tools**

- E-mail
- Telnet - Remote Login
- FTP - File Transfer Protocol
- ARCHIE
- GOPHER and Veronica
- USENET and Discussion Lists
- Wide Area Information Servers
- Internet Relay Chat
- World Wide Web (WWW)
- Talk

Slide 8

**World Wide Web (WWW)**

- Legitimate way of publishing
- Distributed object management system
- Unstructured and serendipitous browsing
- Search Tools/Engines
Slide 9

SEARCH TOOLS: TYPES

SUBJECT TREES
- structured and organized hierarchy of categories
- Maintained manually
- Keyword searchable indexes

Slide 10

SEARCH TOOLS: TYPES

SEARCH ENGINES
- index size
- update frequency
- search options
- search retrieval speed
- result set presentation
- relevance of items in result set
- ease of use
Slide 11

**SEARCH ENGINES: CATEGORIES**

- Spiders/V robots/W orms
- Meta (MetaSearch Engines)
- WebCrawler
- Informational (Subject/Topic)
- URL/Web Search Engines
- Directory
- V eBook Search Engines
- Yellow Page Search Engines
- White Page Search Engines
- Site Search Engines
- Subject Search
- Specialized Subject Engines

Slide 12

**Spiders/R obots/W orms**

<table>
<thead>
<tr>
<th>Spiders/Robots/Worms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AltaVista</td>
<td><a href="http://www.altavista.digital.com">http://www.altavista.digital.com</a></td>
</tr>
<tr>
<td>Excite</td>
<td><a href="http://www.excite.com">http://www.excite.com</a></td>
</tr>
<tr>
<td>HotBot</td>
<td><a href="http://www.hobot.com">http://www.hobot.com</a></td>
</tr>
<tr>
<td>InfoSeek</td>
<td><a href="http://www.infoseek.com">http://www.infoseek.com</a></td>
</tr>
<tr>
<td>Lycos</td>
<td><a href="http://www.lycos.com">http://www.lycos.com</a></td>
</tr>
<tr>
<td>OpenText</td>
<td><a href="http://www.opentext.uunet.ca/8080">http://www.opentext.uunet.ca/8080</a></td>
</tr>
</tbody>
</table>
Directory based/Subject Trees (Catalogues)

A2Z
EINet Galaxy
InfoSeek
Signetian
Point.com
Tradewave Galaxy
Yahoo

http://a2z.lycos.com
http://galaxy.einet.net
http://www.infseek.com
http://www.mckinley.com
http://www.pointcom.com
http://galaxy.einet.net
http://www.yahoo.com

WWW SEARCH ENGINES
### Meta Searchers

- MetaList: [http://www.herbison.com/herbison/iap_meta_list](http://www.herbison.com/herbison/iap_meta_list)
- Thedirectory: [http://www.thedirectory.org/areacode.htm](http://www.thedirectory.org/areacode.htm)

### ISP Search Engines

<table>
<thead>
<tr>
<th>Name</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BoardWatch Map</td>
<td><a href="http://www.boardwatch.com/isp/isp.jsp">http://www.boardwatch.com/isp/isp.jsp</a></td>
</tr>
<tr>
<td>Thedirectory</td>
<td><a href="http://www.thedirectory.org/areacode.htm">http://www.thedirectory.org/areacode.htm</a></td>
</tr>
<tr>
<td>MetaList</td>
<td><a href="http://www.herbison.com/herbison/iap_meta_list.html">http://www.herbison.com/herbison/iap_meta_list.html</a></td>
</tr>
</tbody>
</table>
USENET SEARCH ENGINES

<table>
<thead>
<tr>
<th>Search Engine</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AltaVista (Usenet)</td>
<td><a href="http://www.altavista.digital.com/">http://www.altavista.digital.com/</a></td>
</tr>
<tr>
<td>DejaNews</td>
<td><a href="http://www.dejanews.com">http://www.dejanews.com</a></td>
</tr>
<tr>
<td>Infoseek (Usenet)</td>
<td><a href="http://www.infoseek.com">http://www.infoseek.com</a></td>
</tr>
<tr>
<td>Reference.com</td>
<td><a href="http://www.reference.com">http://www.reference.com</a></td>
</tr>
<tr>
<td>NetNews</td>
<td><a href="http://harvest.cs.colorado.edu/Harvest/brokers/usenet/">http://harvest.cs.colorado.edu/Harvest/brokers/usenet/</a></td>
</tr>
<tr>
<td>Usenet Info Centre</td>
<td><a href="http://sunsite.unc.edu/usenet-i/">http://sunsite.unc.edu/usenet-i/</a></td>
</tr>
</tbody>
</table>

FTP/SOFTWARE SEARCH ENGINES

<table>
<thead>
<tr>
<th>Search Engine</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ArchiePlex at NASA</td>
<td><a href="http://www.lerc.nasa.gov/archieplex/doc/form.html">http://www.lerc.nasa.gov/archieplex/doc/form.html</a></td>
</tr>
<tr>
<td>DOWNLOAD.COM</td>
<td><a href="http://www.download.com">http://www.download.com</a></td>
</tr>
<tr>
<td>Filez</td>
<td><a href="http://www.filez.com">http://www.filez.com</a></td>
</tr>
<tr>
<td>FTPSearch95</td>
<td><a href="http://ftpsearch.unit.no/ftpsearch">http://ftpsearch.unit.no/ftpsearch</a></td>
</tr>
<tr>
<td>Igumbo</td>
<td><a href="http://www.igumbo.com">http://www.igumbo.com</a></td>
</tr>
<tr>
<td>Shareware.com</td>
<td><a href="http://www.shareware.com">http://www.shareware.com</a></td>
</tr>
<tr>
<td>Snoopie</td>
<td><a href="http://www.snoopie.com/query.html">http://www.snoopie.com/query.html</a></td>
</tr>
<tr>
<td>TwoCow</td>
<td><a href="http://www.twocow.com">http://www.twocow.com</a></td>
</tr>
<tr>
<td>ZD Net Software Library</td>
<td><a href="http://www.hotfiles.com">http://www.hotfiles.com</a></td>
</tr>
</tbody>
</table>
### Yellow Pages Search Engines

<table>
<thead>
<tr>
<th>Service</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Yellow Pages</td>
<td><a href="http://www.lookupusa.com/lookupusa/oyp/oyp.html">http://www.lookupusa.com/lookupusa/oyp/oyp.html</a></td>
</tr>
<tr>
<td>AT800</td>
<td><a href="http://www.tollfree.att.net/dir800/">http://www.tollfree.att.net/dir800/</a></td>
</tr>
<tr>
<td>BigBook</td>
<td><a href="http://www.bigbook.com">http://www.bigbook.com</a></td>
</tr>
<tr>
<td>BigYellow</td>
<td><a href="http://b17.bayyellow.com">http://b17.bayyellow.com</a></td>
</tr>
<tr>
<td>World Pages</td>
<td><a href="http://www.worldpages.com/">http://www.worldpages.com/</a></td>
</tr>
<tr>
<td>ON'VILLAGE's Yellow Pages</td>
<td><a href="http://www.onvillage.com/onvillage/onyp/">http://www.onvillage.com/onvillage/onyp/</a></td>
</tr>
<tr>
<td>SuperPages</td>
<td><a href="http://yp.ise.net/">http://yp.ise.net/</a></td>
</tr>
</tbody>
</table>

### White Pages Search Engines

<table>
<thead>
<tr>
<th>Service</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AltaVista</td>
<td><a href="http://www.altavista.digital.com/">http://www.altavista.digital.com/</a></td>
</tr>
<tr>
<td>CEGO Phonebook Gateway</td>
<td><a href="http://www.cego.co.uk/">http://www.cego.co.uk/</a></td>
</tr>
<tr>
<td>Edge411</td>
<td></td>
</tr>
<tr>
<td>Finger Gateway at MIT</td>
<td><a href="http://www.esd.co.uk/">http://www.esd.co.uk/</a></td>
</tr>
<tr>
<td>Four11</td>
<td><a href="http://www.four11.com/Shind.html">http://www.four11.com/Shind.html</a></td>
</tr>
<tr>
<td>Local Space People Search</td>
<td><a href="http://296.129.166.101/people.html">http://296.129.166.101/people.html</a></td>
</tr>
<tr>
<td>Internet Address Finder</td>
<td><a href="http://www.ifa.net">http://www.ifa.net</a></td>
</tr>
<tr>
<td>Netland</td>
<td><a href="http://ds2.internic.net/withfind.html">http://ds2.internic.net/withfind.html</a></td>
</tr>
<tr>
<td>Switchboard! People</td>
<td><a href="http://www.switchboard.com/">http://www.switchboard.com/</a></td>
</tr>
<tr>
<td>X.500</td>
<td><a href="http://www.switchboard.com/x.500/">http://www.switchboard.com/x.500/</a></td>
</tr>
<tr>
<td>WHOIS</td>
<td><a href="http://ds2.internic.net/whois.html">http://ds2.internic.net/whois.html</a></td>
</tr>
<tr>
<td>World E-mail Directory</td>
<td><a href="http://www.worldemail.com/">http://www.worldemail.com/</a></td>
</tr>
<tr>
<td>White Pages</td>
<td></td>
</tr>
<tr>
<td>Yahoo! People Search</td>
<td>Phone.yahoo.com</td>
</tr>
</tbody>
</table>
Mailing List Directories

<table>
<thead>
<tr>
<th>List</th>
<th><a href="http://www.liszt.com">http://www.liszt.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TileNet</td>
<td><a href="http://www.tile.net/tile.listserv/viewlist.html">http://www.tile.net/tile.listserv/viewlist.html</a></td>
</tr>
</tbody>
</table>

Subject Tress

<table>
<thead>
<tr>
<th>Category</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Information by Subject</td>
<td><a href="http://www.nlc-bnc.ca/caninfo/caninfo.htm">http://www.nlc-bnc.ca/caninfo/caninfo.htm</a></td>
</tr>
<tr>
<td>EINet Galaxy</td>
<td><a href="http://galaxy.Einet.net/galaxy.html">http://galaxy.Einet.net/galaxy.html</a></td>
</tr>
<tr>
<td>Internet Public Library</td>
<td><a href="http://ipl.sils.umn.edu">http://ipl.sils.umn.edu</a></td>
</tr>
<tr>
<td>Internet Sleuth</td>
<td><a href="http://www.imbc.com/sleuth">http://www.imbc.com/sleuth</a></td>
</tr>
<tr>
<td>Maple Square</td>
<td><a href="http://www.canadas.net/Maple/Square/">http://www.canadas.net/Maple/Square/</a></td>
</tr>
<tr>
<td>Planet Earth</td>
<td><a href="http://www.nosc.mil/Planet_earth/info.modern.html">http://www.nosc.mil/Planet_earth/info.modern.html</a></td>
</tr>
<tr>
<td>Scott Yanoff's Internet Services List</td>
<td><a href="http://www.uwm.edu/Mirror/inet.services.html">http://www.uwm.edu/Mirror/inet.services.html</a></td>
</tr>
<tr>
<td>WWW Virtual Library</td>
<td><a href="http://www.w3.org/hypertext/DataSources/bySubject/overview.html">http://www.w3.org/hypertext/DataSources/bySubject/overview.html</a></td>
</tr>
<tr>
<td>WebSurfer</td>
<td><a href="http://www.infohiway.com/way/">http://www.infohiway.com/way/</a></td>
</tr>
<tr>
<td>Yahoo</td>
<td><a href="http://www.yahoo.com">http://www.yahoo.com</a></td>
</tr>
</tbody>
</table>
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Geographical Search Tools

| CityNet | http://www.city.net/ |
| GeoSurfer | http://www.infohiway.com/way/ |
| Virtual Tourist2 | http://www.vtourist.com/vt/ |

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Reviewing Sites

| Magellan | http://www.mckinley.com/ |
| NetReviews | http://www.excite.com/Subject/ |
| Point Communications | http://www.pointcom.com |
Slide 25

Specialized Subject Categories

<table>
<thead>
<tr>
<th>ArchNet</th>
<th><a href="http://spirit.lib.uconn.edu/archaeology.html">http://spirit.lib.uconn.edu/archaeology.html</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill's World</td>
<td><a href="http://www.io.org/~jgcom/Overview.html">http://www.io.org/~jgcom/Overview.html</a></td>
</tr>
<tr>
<td>Clearinghouse</td>
<td><a href="http://www.lib.umic.edu/chhome.html">http://www.lib.umic.edu/chhome.html</a></td>
</tr>
<tr>
<td>Argus Clearing House</td>
<td><a href="http://www.clearinghouse.net/">http://www.clearinghouse.net/</a></td>
</tr>
</tbody>
</table>

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Search Engine Evaluation: Constraints

- Growth rate of search tools
- Dis-similarity in content and functioning
- Non-uniform search options (Boolean, concept, phrase, fuzzy matching, relevance ranking)
- Degree of precision
- Performance of tools due to exponential growth, refinement of search algorithms
- Blur in search engine and subject trees
Search Engines: Prominent Characteristics

- WWW vs. Internet Resource Search
- Metasearchers - single/multiple combinations
- fast, comprehensive, current vs. noise-signal ratio (e.g. altavista)
- text and subject indices, keyword or concept searching (e.g. excite)
- natural language searching (e.g. webcrawler)
- multiple queries in rapid succession (e.g. EZ- Find)

Cont'd...

Search Engines: Prominent Characteristics

- Case Sensitive (e.g. Infosoeek)
- Point rating system (e.g. Lycos)
- Categorisation of results and redundant URL elimination (e.g. MetaCrawler)
- ability to multiple field search (e.g. OpenText)
- hierarchical/reviewed arrangement (e.g. Yahoo)
- full text pages and update frequency (e.g. Altavista, hotbot)
**Slide 29**

**Indian Search Tools**

- [Dnje](http://www.dnje.com)
- [Sama mukar](http://www.sama_mukar.com/)
- [Mazed](http://www.mazed.com)
- [Modula](http://www.modula.com)
- [Khurandh](http://www.khurandh.com)
- [127 km in](http://www.127km.in)
- [Aqua](http://www.aqua.com)
- [SAIL](http://www.sail.gov.in)
- [Modula-WebSale](http://www.modula-web.com)
- [D2Dmerra](http://www.d2d.com)
- [Semk](http://www.semk.in)
- [Modula canal ru](http://www.modula-canal.ru)
- [Methan](http://www.methan.com)

**Slide 30**

**Future of Search Tools**

- Meta-searchers to play vital role
- Integrated tools by individual search engines
- Subject/region/language specific search engines
- Use of expert systems
- Speech recognition and multi-lingual searches
13. HyperText Markup Language
(P. Pissierssens, IOC)

Slide 1

HyperText Markup Language

Slide 2

HyperText Markup Language

- **Webserver** =
  - PC (or other computing system)
  - Operating system (Windows NT server or UNIX)
  - Webserver software (IIS, Apache, ...)
  - content: html pages, databases, ...
  - Internet link
- Special case: personal (offline) webserver
HyperText Markup Language

- **HTML?**
- **Simple !!**
- **How to create HTML pages?**
  - Notepad or any text editor
  - HTML editor

---

HyperText Markup Language

```html
<TITLE>My first webpage</TITLE>
Hello there

Save as name_of_file.htm`
Slide 5

**HyperText Markup Language**

- Dressing it up!!
- start: `<attribute>`
- stop: `</attribute>`
- `<p>` = new paragraph = default
- `<br>` = new line
- `<hr>` = horizontal rule

Slide 6

**HTML Header Styles**

```html
<H1>Style 1</H1>
<H2>Style 2</H2>
<H3>Style 3</H3>
<H4>Style 4</H4>
<H5>Style 5</H5>
<H6>Style 6</H6>
<P>Normal</P>
```
Slide 7

**HTML Attributes**

- `<p>Normal</p>`
- `<p><b>Bold</b></p>`
- `<p><i>Italics</i></p>`

Slide 8

**HTML Color**

- `<p><font color="#FF0000">This line is red</font></p>`
- `<p><font color="#00CC00">This line is green</font></p>`

- `#FF0000 = yellow`
- `#9900CC = purple`
- `#0000FF = blue`
- `#000000 = black`
Slide 9

**HTML Lists**

```
<OL>
  <LI>numbered list line 1</LI>
  <LI>numbered list line 2</LI>
</OL>

<UL>
  <LI>bulled list line 1</LI>
  <LI>bulled list line 2</LI>
</UL>
```

Slide 10

**HTML Alignment**

```
<P ALIGN=right>This is right aligned</P>

<CENTER>This is center aligned</CENTER>
```
Slide 13

**HTML : Hyperlink !**

```html
<P><A HREF="personal_page.htm">Click here to visit my personal page</A>

<P><A HREF="http://ioc.unesco.org/default.htm">Click here</A> to visit the IOC home page
```

Slide 14

**HTML: including images**

- GIF (Graphics Interchange Format)
- JPG (short for JPEG: Joint Photography Experts Graphics)

```html
<IMG SRC="./images/iyosm.gif">
```
Slide 15

Website managers

Slide 16

Frontpage Editor
Time to try!!
14. **Numerical Databases Over WWW**
(V. Chavan, CMMB, Hyderabad, India)

Slide 1

Numerical Databases Over WWW

Vishwas Chavan
Scientist
Centre for Cellular and Molecular Biology
Hyderabad, India

Slide 2

Databases over Web:
Approaches
- db files to flat/ascii files
- Import and Host
- Live Connectivity
Flat / ascii files on WWW

- Oceanline ver. 1.0
- Publications ver 1.0

Oceanline ver. 1.0

- OCEANLINE is an online public access catalogue of books, monographs, technical reports, conference proceedings, maps and atlases, etc. available at NIO Library
- Files in Oceanline:
  - HTML files in /var/www/htdocs/Oceanline
    1. index.html is the main page
    2. classearch.html allows you to perform search Oceanline according to the various classes
- CGI scripts in /var/www/cgi-bin/Oceanline
  1. For the main search:
    - fsearch.cgi performs the start search
    - nsearch.cgi performs the search for next set of matches
    - psearch.cgi performs the search for previous set of matches
  2. For the search according to classes:
    - fclassearch.cgi performs the start search
    - nclassearch.cgi performs the search for next set of matches
    - pclassearch.cgi performs the search for previous set of matches
Slide 5

Oceanline ver. 1.0

- DATA files in /var/www/htdocs/Oceanline/data

<table>
<thead>
<tr>
<th>Category</th>
<th>Data file</th>
</tr>
</thead>
<tbody>
<tr>
<td>All areas</td>
<td>tot.iso</td>
</tr>
<tr>
<td>Books/Monographs</td>
<td>b.iso</td>
</tr>
<tr>
<td>Standards</td>
<td>c.iso</td>
</tr>
<tr>
<td>Maps &amp; Atlases</td>
<td>g.iso</td>
</tr>
<tr>
<td>Conf. proceedings Volumes</td>
<td>k.iso</td>
</tr>
<tr>
<td>Dictionaries</td>
<td>l.iso</td>
</tr>
<tr>
<td>Numerics &amp; tables</td>
<td>n.iso</td>
</tr>
<tr>
<td>Technical Reports</td>
<td>r.iso</td>
</tr>
<tr>
<td>Thesis</td>
<td>u.iso</td>
</tr>
<tr>
<td>Bibliographies &amp; Abstracts</td>
<td>z.iso</td>
</tr>
</tbody>
</table>

- isis.fdt is the field tags identification file.
- To add new data to Oceanline use the following commands at the prompt
  1. cp olddata.iso temp.iso
  2. cat newdata.iso temp.iso >olddata.iso
  3. rm temp.iso

Slide 6

Import and Host

- Stores db - FoxPro
- Import to Lotus 123
- Fetch into Notes Document base
- Host on WWW through Domino Server
Slide 7

Live Connectivity

- mSQL
- MS ACCESS
- ORACLE

Slide 8

mSQL

- Manthan ver. 1.0
- Daryavardi ver. 1.0
- Animalia ver. 1.0
Manthan ver. 1.0

- Directory-based search engine for Oceanographic information over the web.
- Implemented using msql has a database called ‘manthan’ and has a single table called ‘man1’
- Database = manthan
- Table = man1

Slide 10

Manthan ver. 1.0

- In /var/www/htdocs/manthan/
  - index.html is the main page.
  - man1put.html allows you to add records to manthan database.
  - editman.html can be used to edit the records already entered in the database.
  - ocnlnks.html lists some oceanography and marine related sites on the web.
  - manthan.html gives mythological background of samudra manthan.
  - About_Manthan.html this document.

- Lite scripts are in /samudra/Hughes/www/manthan
  - man1in.html for accepting data into the database
  - man1out.html for querying the database
  - man1edit.html for editing the records.
  - man1up.html for updating the records.
  - showall.html displays all records in the database.
Manthan ver. 1.0

- Database is in /samudra/Hughes/msqldb/manthan and has following files
  - man1.dat is the main data file.
  - man1.def is field definition file.
  - man1.idx is index field file.
  - man1.idx-url_in is the main index file.

MS ACCESS

- Plantae ver. 1.0
  - Win NT (Server Version) - 4.0
  - Internet Information Server (IIS) ver 3.0 - Web Server
  - MS-Access'97 (ver. 8.0) - Database
  - Active Server Pages (ASP) - Scripting language
Slide 13

ORACLE

- SPMIS at CCMB
  Workgroup version of Oracle 8.0 as RDBMS
  MS Visual Basic 6.0 as front end
  ActiveX controls (OLE controls) facilitate visualization of Visual Basic application on WWW
  ActiveX controls are in-built with MS Visual Basic 6.0

Slide 14

Thank You

Have a Happy Data Management!
15. Serving Textual / Factual databases on the web
(M.P. Tapaswi, NIO, Goa, India)

Slide 1

Serving Textual / Factual databases on the web
Murari P. Tapaswi
murari@csnio.ren.nic.in

Slide 2

TEXTUAL / FACTUAL DATABASES

• Primary resources
  ⇒ Living resources e.g. Flora / Fauna
    (taxonomic / morphological / distribution /
     gene-banks , etc.)
  ⇒ Non-living resources e.g. Geographically
    referenced databases (satellite images of
    physiography, temperature, salinity, etc.)
Slide 3

...Textual / Factual databases

- Secondary resources
  - Metadata: Catalogue of cruise tracks, sampling stations, etc.
  - Human / institutional: Personnel directory, research projects, job opportunities, etc.
  - Bibliographic: OPAC, published literature
  - Links to websites: Related institutions, Electronic journals, Full text documents, etc.

Slide 4

...Textual / Factual databases

- Tertiary resources
  - Socio-economic resources: Policy instruments / treaties, Fish market information, Exporters, Importers, etc.
Slide 5

KEY ITEMS

- Database
- Search, retrieve and display software (CGI)
- User interface (HTML pages)

Slide 6

DATABASE

- Structured information in any form
- Reliable data
- Sizeable number of records
- Frequency of update
- Multimedia component
  ⇒ Graphics: JPEG, GIF files of pictures and film clippings
  ⇒ Audio clippings: 5 minutes audio captured at 22 kHz in 16 bit stereo - 5mb: .WAV or .AU files
Slide 7

**AUDIO CLIPPING FREWARE**

- Real Audio Encoder (http://www.real.com/) to generate compressed .RA files from .WAV and .AU
- For best results install Real Audio Player plug on the users browser
- HTTP streaming to enable reasonable fast loading of audio files to the client machines
- Real Audio Streaming server: High Costs

Slide 8

**SEARCH, RETRIEVE AND DISPLAY INTERFACE**

- Dictionary of keywords / terms
  - Keywords from all fields/ specific field
- Open search expressions
- Boolean logic
- Ideal to retain information about previous transactions
  - Use of ‘Input Type Hidden’ feature supported by HTML and to carry the details of query terms in HTML forms through the search session
Slide 9

...Search, retrieve and display interface

- Search on index files pointing to appropriate records in the database for retrieval
- Programs linked to HTML search forms as well as HTML output for display

Slide 10

USER INTERFACE (HTML pages)

- **Home page**
  - Less than 32 k size HTML file
  - Column structure than full screen
  - Use of frames feature supported by HTML to divide screen in two parts
  - Left part: Table of contents
  - Right part: Information page
Slide 11

...User interface (HTML pages): Table of contents

- Introduction to database (origin, purpose, ownership, copyrights, updating frequency, etc.)
- Overview (contents, building search strategy, charges for search and retrieval if any, contact for further support, etc.)
- Data entry form
- Data display: Presentation formats
- Access to database
- List of previous search sets in current session

Slide 12

...User interface (HTML pages): Right part of screen

- Opening page
  - Database title, subtitle / logo
  - Other related products (product on other media, subsets, etc.)
  - Ownership (Developers, funding agency, software)
  - Navigator choice and screen resolution
...User interface (HTML pages): Right part of screen

• Search tools
  ⇒ Broad group of data-sets
  ⇒ Keywords / Term index
  ⇒ Geographical co-ordinates

• Menu items
  ⇒ Pointers to last screen
  ⇒ Next screen
  ⇒ Sources starting with letters
  ⇒ Buttons for submission / cancellation

...User interface (HTML pages): Right part of screen

• Display formats
  ⇒ Indicative / informative
  ⇒ Graphics / film clip
  ⇒ Audio background
16. **Dynamic Database publishing using Filemaker Pro**
(P.Pissierssens, IOC)

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**Slide 1**

Dynamic Database publishing using Filemaker Pro

---

**Slide 2**

Step 1: create your database
Step 1.1: populate your database

- 64 K field length!
- Repeatable fields
- Calculated fields

Step 2: create the html pages

- Strategy:
  - online create new record
  - online edit record
  - online search record

Let’s do this
Slide 5

Writing the html pages

- Default.htm
- Search.htm
- Search_results.htm

Slide 6

Writing the html pages

- **Default.htm**
  
  `<A HREF="FMPro?-db=testdb.FP3&-lay=web-&format=search.htm&-view">Search the Database</A>`

  - database
  - Layout to use
  - Output format
  - action

  **ACTION!!**
Slide 7

Writing the html pages

• **Search.htm** - step 1: the actions

```html
<FORM ACTION="FMPro" METHOD="post">
  <INPUT TYPE="hidden" NAME="-DB" VALUE="testdb.fp3">
  <INPUT TYPE="hidden" NAME="-Lay" VALUE="web">
  <INPUT TYPE="hidden" NAME="-format" VALUE="search_results.htm">
  <INPUT TYPE="hidden" NAME="-error" VALUE="search_error.htm">
  <INPUT TYPE="hidden" NAME="-SortField" VALUE="surname">
  <INPUT TYPE="hidden" NAME="-SortOrder" VALUE="Ascending">
  <INPUT TYPE="hidden" NAME="-SortField" VALUE="firstname">
  <INPUT TYPE="hidden" NAME="-SortOrder" VALUE="Ascending">
  <INPUT TYPE="hidden" NAME="-SortField" VALUE="country">
  <INPUT TYPE="hidden" NAME="-SortOrder" VALUE="Ascending">
  <INPUT TYPE="hidden" NAME="-max" VALUE="20">
</FORM>
```

Slide 8

Writing the html pages

• **Search.htm** - step 2: the search form

```html
Surname: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=surname VALUE="" SIZE=22">
Firstname: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=firstname VALUE="" SIZE=17>
Job Title: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=job_title VALUE="" SIZE=22>
Job Type: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=job_type VALUE="" SIZE=22>
Organization: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=organization VALUE="" SIZE=22>
Type: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=type VALUE="" SIZE=22>
City: <INPUT TYPE="hidden" NAME="-op" VALUE="bw">
  <INPUT TYPE=text NAME=city VALUE="" SIZE=22>
Country: <INPUT TYPE="hidden" NAME="-op" VALUE="eq">
  <INPUT TYPE=text NAME=country VALUE="" SIZE=23>
Activities: <INPUT TYPE="hidden" NAME="-op" VALUE="eq">
  <INPUT TYPE=text NAME=activities VALUE="" SIZE=58>
```
Writing the html pages

• **Search.htm** - step 3: the action buttons

- Match all words between fields (AND)
- Match any words between fields (OR)

<input type="radio" name="lop" value="AND" checked/> Match all words between fields (AND)  
<br />
<input type="radio" name="lop" value="OR"/> Match any words between fields (OR)  
<br />
<br />
<input type="submit" name="-Find" value="Start Search">  
<input type="reset" value="Reset this form">  

---

Writing the html pages

• **Search_results.htm**

[FMP-RECORD]  
Name:[FMP-FIELD: Title]  
[FMP-FIELD: firstname]  
[FMP-FIELD: middle_name];  
[FMP-FIELD: surname]<br>  
Gender:[FMP-FIELD: gender]<br>  
Degrees:[FMP-FIELD: degree]<br>  
Job Title:[FMP-FIELD: job_title]<br>  
Job Type:[FMP-FIELD: job_type]<br>  
Organization:&nbsp;[FMP-FIELD: organization]<br>  
Organization type:[FMP-FIELD: organization_type]<br>  
Department:&nbsp;[FMP-FIELD: department]<br>  
Address:[FMP-FIELD: street_address]<br>  
City:[FMP-FIELD: city]<br>  
Country:[FMP-FIELD: country]<br>  
Activities:[FMP-FIELD: activities]<br>  

[FMP-RECORD]
The query

```
Http://scppli:591/testdb/FinPro?-DB=testdb.fp3&-Lay=web&
format=search_results.htm&-error=search_error.htm&
SortField=surname&SortOrder=Ascending&SortField=firstname&
SortOrder=Ascending&SortField=country&SortOrder=Ascending&
max=20&op=bw&surname=&op=bw&firstname=&op=bw&job_title=&
op=bw&job_type=&op=bw&organization=&
op=bw&organization_type=&op=bw&city=&op=eq&country=india&
op=bw&activities=&op=AND&Find=Start+Search
```

The result

Search Results

Displaying records 1 through 12 of 12 records found.

Name: Mr. Narayan BHASKAR
Gender: male
Degrees: Master of Fisheries Science (M.F.Sc.) Bachelor of Fisheries Science (B.F.Sc.)
Job Title: Scientist
Job Type: Research
Organization: Central Food Technological Research Institute
Organization type: Department: Meat, Fish and Poultry Technology
Address:
City: Mysore
Country: India
Activities: 1. Have worked on incidence of bacteria of public health significance in the cultured shrimps, Penaeus monodon, during both the farming and harvest phases. 2. Have worked on the shelf life and quality characteristics of the shrimp, Penaeus indicus, during ice storage. 3. Is associated with the study on the food and feeding habits of the shrimp, Penaeus stylirostris. 4. Have worked on the preservation of salted dried mackerel (Rastrelliger kanagurta Cuvier) using film-forming gums. 5. Is associated with the study on the extension of shelf life of sea and mackerel steaks using lactic fermentation. 6. Has studied the biochemical aspects of the underutilised crustacean species squilla (Oratosquilla nepa Latreille) from the point of view of processing. 7. Recently I have proposed projects on the isolation and characterisation of transglutaminase from the Indian fish/crustacean species for the production of surimi; utilization of the underutilised crustacean species squilla (Oratosquilla nepa Latreille) for producing value added products; evaluation of cultured and wild caught Indian major carps for the incidence of bacteria of public health significance.

[end of this record]
Creating a new record?

**Step 1: new.htm**

```
<FORM ACTION="FMPro" METHOD="post">
  <INPUT TYPE="hidden" NAME="-DB" VALUE="testdbFP3">
  <INPUT TYPE="hidden" NAME="Lay" VALUE="web">
  <INPUT TYPE="hidden" NAME="format" VALUE="new_reply.htm">
  <INPUT TYPE="hidden" NAME="error" VALUE="new_error.htm">
  Title: <INPUT TYPE=text NAME=title VALUE="" SIZE=12></FONT>
  Firstname: <INPUT TYPE=text NAME=firstname VALUE="" SIZE=19>
  Middle Name: <INPUT TYPE=text NAME="middle_name" VALUE="" SIZE=19>
  Surname: <INPUT TYPE=text NAME=surname VALUE="" SIZE=30>
  continue here for other fields
  UserID: <INPUT TYPE=text NAME=userid VALUE="" SIZE=30>
  Password: <INPUT TYPE=text NAME=password VALUE="" SIZE=30>
  <INPUT TYPE="submit" NAME="-New" VALUE="Save your Record and Proceed to next Step">
  <INPUT TYPE=reset VALUE="Reset this form">
</FORM>
```

Creating a new record?

**Step 2: new_reply.htm**

A record has been added to the database

```
<a href="default.htm">Go back to menu</a>
```
Editing a record?

- **OPTION 1:** without security
  - include field for unique identifier
  - edit record
  - confirm edit is received

- **OPTION 2:** with security
  - Verify userid and password
  - list entries for that userID and password
  - allow selection of record to edit
  - edit record
  - confirm edit is received

**TRY!!**

---

```html
<form action="FMPro" method="post">
  <input type="hidden" name="-DB" value="testdb.FP3">
  <input type="hidden" name="-Lay" value="web">
  <input type="hidden" name="-format" value="new_reply.htm">
  <input type="hidden" name="-error" value="new_error.htm">
  <label>Title: </label><input type="text" name="title" value="[FMP-Field: title]" size=12>
  <label>Firstname: </label><input type="text" name="firstname" value="[FMP-Field: firstname]" size=19>
  <label>Middle Name: </label><input type="text" name="middle_name" value="[FMP-Field: middle_name]" size=19>
  <label>Surname: </label><input type="text" name="surname" value="[FMP-Field: surname]" size=30>
  <input type="submit" name="-New" value="Save your Record and Proceed to next Step">
  <input type="reset" value="Reset this form">
</form>
```
Error?

[FMP-IF: CurrentError.eq. 509]
Required Value Error
Sorry, required information is missing. Please check your submission and try again.

[FMP-ELSE]
New Record Error
There was an error adding a record to the database. Please check your submission and try again.

[FMP-CURRENTERROR]#9;
dispy.
Press the <B>Back</B> button in your browser.

Error codes:
500 Date value does not meet validation entry options
501 Time value does not meet validation entry options
502 Number value does not meet validation entry options
503 Value in field does not meet range validation entry options
504 Value in field does not meet unique value validation entry options
505 Value in field failed existing value validation test
506 Value in field is not a member value of the validation entry option value list
507 Value in field failed calculation test of validation entry option
508 Value in field failed query value test of validation entry option
509 Field requires a valid value

[FMP-IF]
Press the <B>Back</B> button in your browser.
### LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASFA</td>
<td>Aquatic Science and Fisheries Abstracts</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Compact Disk – Read Only Memory</td>
</tr>
<tr>
<td>DNA</td>
<td>Designated National Agency</td>
</tr>
<tr>
<td>GEBCO</td>
<td>General Bathymetric Chart of the Oceans</td>
</tr>
<tr>
<td>GE-MIM</td>
<td>Group of Experts on Marine Information Management</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GLODIR</td>
<td>Global Directory of Marine (and Freshwater) Professionals</td>
</tr>
<tr>
<td>GLOSS</td>
<td>Global Sea Level Observing System</td>
</tr>
<tr>
<td>GOOS</td>
<td>Global Ocean Observing System</td>
</tr>
<tr>
<td>GODAR</td>
<td>Global Oceanographic Data Archeology and Rescue</td>
</tr>
<tr>
<td>GTSPP</td>
<td>Global Temperature and Salinity Profile Programme</td>
</tr>
<tr>
<td>IGOSS</td>
<td>Integrated Global Ocean Services System</td>
</tr>
<tr>
<td>IOC</td>
<td>Intergovernmental Oceanographic Commission (of UNESCO)</td>
</tr>
<tr>
<td>IOCINCWIO</td>
<td>IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean</td>
</tr>
<tr>
<td>IOCINDIO</td>
<td>IOC Regional Committee for the Central Indian Ocean</td>
</tr>
<tr>
<td>IODE</td>
<td>International Oceanographic Data and Information Exchange</td>
</tr>
<tr>
<td>MEDI</td>
<td>Marine Metadata Management System</td>
</tr>
<tr>
<td>NIO</td>
<td>National Institute of Oceanography (India)</td>
</tr>
<tr>
<td>NODC</td>
<td>National Oceanographic Data Centre</td>
</tr>
<tr>
<td>ODINEA</td>
<td>Oceanographic Data and Information Network</td>
</tr>
<tr>
<td>ODINAFRICA</td>
<td>Oceanographic Data and Information Network for Africa</td>
</tr>
<tr>
<td>RNODC-MEDI</td>
<td>Responsible National Oceanographic Data Centre – MEDI</td>
</tr>
<tr>
<td>WDC-A</td>
<td>World Data Centre-A</td>
</tr>
<tr>
<td>WWW</td>
<td>World-Wide Web</td>
</tr>
</tbody>
</table>