



Software Tools for Environmental Field Studies (STEFS)



ENVIT Student Group at MIT
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1.992 Special Studies in Civil and
Environmental Engineering



Welcome to ENVIT!

- ENVIT Student Group at MIT is composed of undergraduate and graduate students interested in utilizing new technological tools for environmental studies.
- Prior projects include developing tools for hydrology lab utilizing GIS and Java.
- Current project is called Software Tools for Environmental Field Study (STEFS). Sponsored by the MIT/Microsoft I-campus project.



Welcome to ENVIT!

- Introduction of project personnel:
 - Enrique R. Vivoni, '96, '98
 - Mario A. Rodriguez, MIT MS '01
 - Richard Camilli, MIT MS '99
 - Daniel Sheehan, MIT Information Systems
 - Sheila Frankel, Parsons Lab
 - Prof. Dara Entekhabi, Principal Investigator
- Additional support:
 - UROP researchers (Keyuan Xu, Rose Liu, Kan Liu)
 - M.Eng Projects (Environmental & IT)



Vision

- Environmental and Civil Engineering Require the Collection of Field Data.
- Advances in Mobile Computing allow the development of Tools to Aid Data Collection.
- Platform is expandable to include Advanced Data Collection Technologies: GIS, GPS, RS and Telemetry.



Current Technology



Paper & Pencil Paradigm

- Time-consuming
- Inaccurate
- Prone to Human Error
- Static Medium
- Inefficient for Expensive Field Work.



New Technologies

Hand-held Paradigm

- Mobile Applications
- Computational Capability
- Data Storage & Memory
- Syncing with Desktop
- Data & Location Accuracy
- Expandability
- Reusability
- Standardization
- Custom-tailored





Applications in Environmental Field Data Collection

Traditional Field Data:

- Hydrological Data
- Water Quality Sampling
- Weather Observations
- Site Assessments
- Ecological Studies
- Flora&Fauna Study
- Environmental Chemistry
- On-site Engineering

Emerging Field Data:

- Wireless GIS Mapping
- GIS Theme Features
- GPS Sampling
- Remote Sensing Data
- Telemetered Data



Other Applications

Civil Engineering:

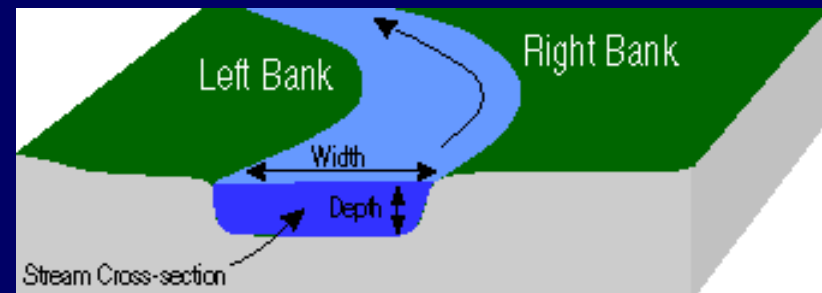
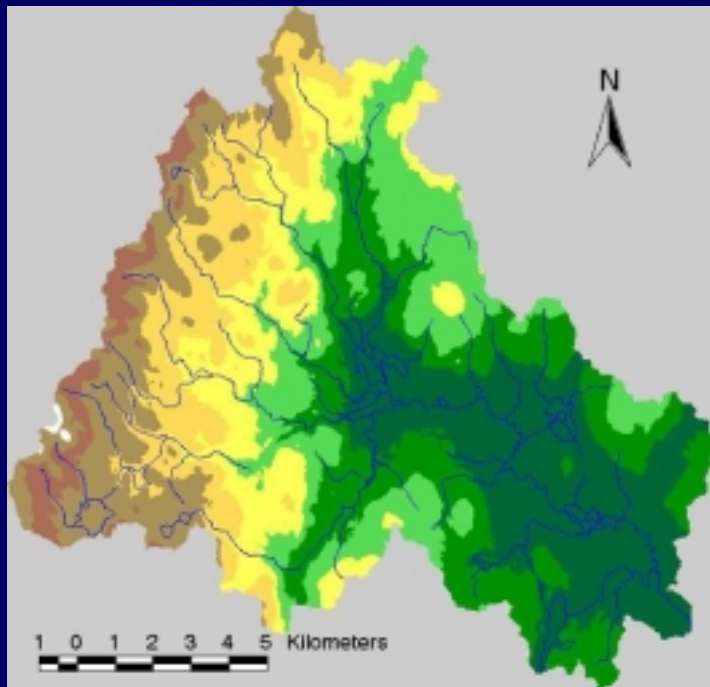
- Project Management
- Site Assessments
- Transportation Studies
- Infrastructure Surveys
- Utility Management
- Noise/Acoustic Sampling
- Surveying
- Bridge Design

Other Engineering:

- Delivery Tracking
- Mobile Workforce
- Ubiquitous Computing
- Location-based Services



Hydrologic & Geospatial Field Data Collection



Field Hydrology Data Collection:
Stream Geometry & Velocity
Discharge Computations
Water Quality Sampling



Goal and Objective

- Develop environmental software applications for hand-held, portable computers to be used directly for gathering, storing and manipulating environmental and geopositional data.
- Through the electronic journal, field personnel will be able to record data automatically.
- Such advances will increase the efficiency of costly field work and lead to improvements in sampling and data accuracy.



Technology

COMPUTING



Compaq IPAQ
Windows CE
eMbedded VB, VC++
Microsoft Access

SENSING



HydroLab Probe
Teletype GPS
Chemistry Kits
Flow Meters



STEFES Undergraduate Seminar

- Experimental, hands-on, software design workshop
- Focus on Product Development
- Entrepreneurial Atmosphere
- Discuss three main topics:
 - Programming on the Windows CE
 - Technologies for Field Studies
 - Beyond the Prototype
- Prototype development and Testing

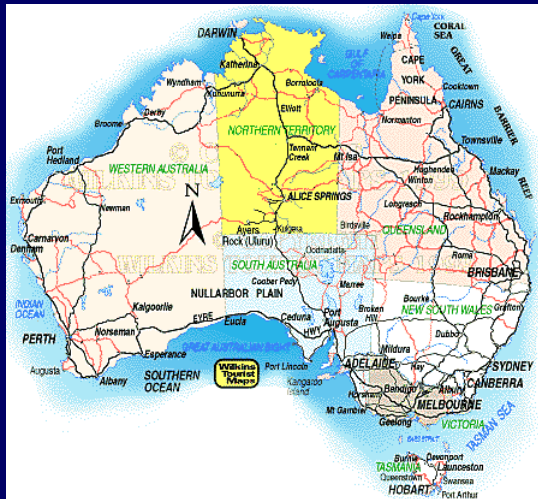


Multidisciplinary Topics

- Information Technologies
 - Geographic Information Systems (GIS)
 - Software development using Visual Studio
 - Global Positioning System (GPS)
- Environmental Engineering
 - Watershed Modeling
 - Water Quality Sampling and Stream Gauging
 - Remote Sensing Data
- Entrepreneurship
 - Product development
 - Business Plans



IAP Field Trip



Australia 2002



Water Quantity and Quality
Sampling in Australian Watersheds



Resources

- ENVIT Student Group is leading the effort as part of MIT/Microsoft Icampus project
- ENVIT Core Team has developed initial prototype
- Three UROP researchers
- Master of Engineering IT and ENV Projects
- Multidisciplinary, collaborative environment across various degrees and levels



Project Deliverables

- Commercially-viable software and integrated hardware system.
- Field tested product in various climates and ecosystems.
- GIS and Field data collection and verification.



More Information?

- ENVIT webpage
 - <http://web.mit.edu/envit/www/>
 - Project Documents
 - Technology
 - Seminar and Trip Information
 - Market Research
- Fact Sheet
 - <http://web.mit.edu/envit/www/stefsfactsheet.pdf>
- .NET Collaboration site
 - <http://www.learningwebservices.com/icampus/stefs/>



WorkingGroups

- The goal of each WorkingGroup project is to deliver a portion of the STEFS prototype.
- Teams of 2-3 people with advisor
- Examples:
 - Development of the GUI for manual measurements.
 - Development of scripts for GPS geositional data.
 - Development of query system for water probe.
 - Development of database components.
 - Development of hardware for field deployment.



Project Status

- Conceptual design and Planning completed.
- Core Team and UROP researchers have created initial parts of prototype.
- Two mockups have been created:
 - Power Point GUI design
 - GPS/ArcPad Demo
- Further tasks to be assigned.
- Important deadlines established.



Short Demos

- Compaq IPAQs
- Teletype GPS
- ArcPad GIS
- HydroLab



Important Seminar Dates

- September 7 First seminar day
- **September 14** *WorkingGroups formed*
- October 5 Add Date
- **October 19** *WorkingGroup Plan Presentations*
- November 21 Drop Date
- November 23 No class, Thanksgiving holiday
- **November 30** *WorkingGroup Final Presentations*
- December 14 Last seminar day