Software Tools for Environmental Field Studies (STEFs)

ENVIT Student Group at MIT
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
STEFS 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
  - Project Documents
  - Technology
  - Seminar and Trip Information
  - Market Research

- Fact Sheet

- .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 geopositional 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