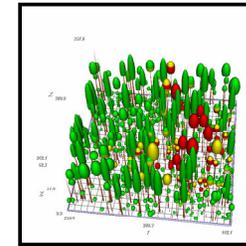
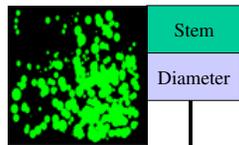


# The CanopyView Visualization Project

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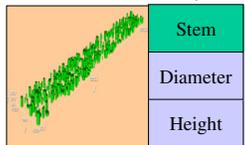


## Visualizations and Ecology Field Data Primitives



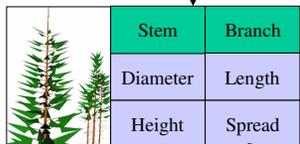
Stem
Diameter

**Stem Map** – this simple visualization can be generated from any data set that lists locations and diameters of trees.



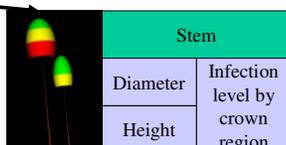
Stem
Diameter
Height

With the addition of data from a “height” primitive, *CanopyView* offers the ecologist a new visualization incorporating her data.

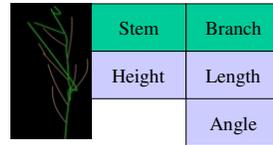


Stem	Branch
Diameter	Length
Height	Spread

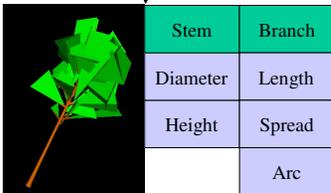
Data from a second entity primitive leads to more complex visualization choices for the ecologist.



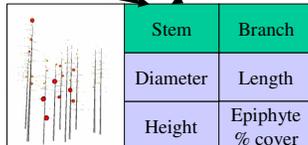
Stem
Diameter
Height
Infection level by crown region



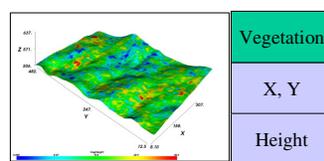
Stem	Branch
Height	Length
	Angle



Stem	Branch
Diameter	Length
Height	Spread
	Arc



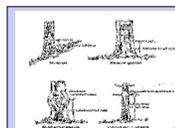
Stem	Branch
Diameter	Length
Height	Epiphyte % cover



Vegetation
X, Y
Height



**Entities** correspond to structural components of the forest canopy, such as a tree, branch, leaf, or plot.



**Observations** correspond to particular measurements taken on an entity by the ecologist, such as DBH (diameter at breast height), length, or height.

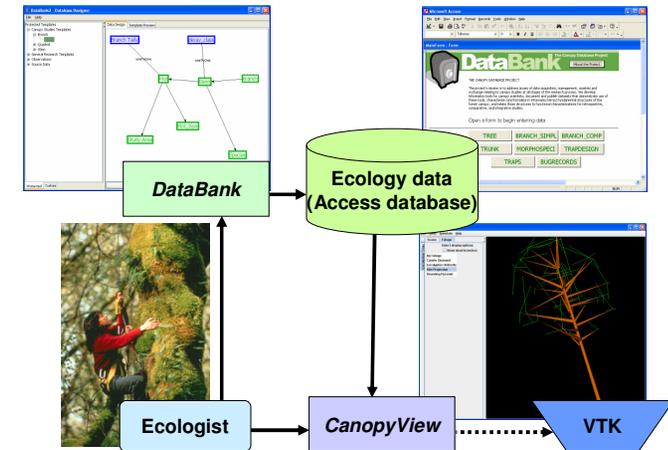
**The Goal:** Making **data-driven** visualizations accessible to ecologists working with forest canopy structure and function datasets.

**Objectives:** Develop user-friendly database & visualization tools to increase individual forest canopy researcher productivity.

**Process:**

1. A researcher creates a dataset with *DataBank*, a program that generates databases from **entity** and **observation** primitives representing common concepts in field ecology.
2. Ecologists populate the dataset with field-collected data.
3. *CanopyView* generates visualizations of the ecologist's data by querying a populated *DataBank* database to determine which visualizations suit the dataset based on *CanopyView*'s knowledge of ecological primitives. It allows selection and combining of multiple visualizations.

## Architecture



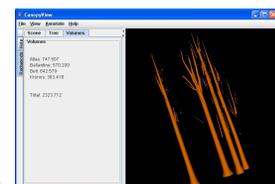
- *CanopyView* is written in Java and uses The Visualization Toolkit (VTK) for graphics.

## Issues

- **Schema mapping** for datasets that don't use predefined *DataBank* entity/measurement templates is difficult.
- **Microsoft Access** cannot handle some of the larger databases in use. In addition, the lack of a good interface driver between Java and Access limits some analysis of databases by *CanopyView*.
- **Idiosyncratic measurement** practices in ecology limit comparability of data sets.
- **Statistical measures** are not yet linked to visualizations.

## Future Work

- **Analysis** – Incorporate links to statistical scripts in R to provide typical and new data analyses (e.g., wood volumes, surface area).
- **Integration** – Facilitate importing of datasets in different formats to *CanopyView*.
- **Modular Visualizations** – More flexible visualization primitives and better adaptation to new observations and measurements (e.g., show forest function as well as structure).



**Additional Contributors:** Michael Finch, Youngmi Kim, Emerson Murphy-Hill, Aaron Crosland, Dave Maier, Lois Delcambre, Travis Brooks, Jim Thomas.

Funded by NSF DBI-0417311 CISE 01-31952, BIR 99-75510, 96-30316, BIO 96-30316, 99-75510.

For more information visit: <http://canopy.evergreen.edu/canopyview/> or contact: zemanl, judyc, nadkarnn, fialaa@evergreen.edu

