

## **2008 Summer@CENS Research Project Summary**

### **Bibliometrics/ Social Networks Modeling**

Lead Mentor: Alberto Pepe

High School Team: Ashley Davis, Gamer Kesheshe

This project will involve collection and preliminary analysis of data relative to CENS researchers and their scholarly publications.

Students involved in the project will learn how to research data, store it in a database, convert it into a format suitable for bibliometric and social network analysis. The project will consist of two parts. In the first part, the list of publications presented by CENS teams at the 2008 Annual Report will be converted into a machine-readable format (DublinCore, BibTeX) to allow a batch submission into the eScholarship repository. The generated bibliographic metadata will be implemented with specific contextual information (e.g. employed models, sensor types, deployment venues, etc) extracted from the full texts via manual and semi-automated procedures. Besides bibliometric analysis, this information will feed into future work directed at the construction of a sensor network taxonomy (in conjunction with data available in the CENSDC). In the second part of the project, an existing directory of CENS researchers will be populated with current and past information relative to specific social, academic and demographic parameters. These data will be collected via content analysis and will inform an ongoing social network study.

### **Budburst – Plant Phenology**

Mentors: Eric Graham & Eric Yuen

High School Team: Adam Brenner, Guadalupe Hernandez

Undergraduate Team: Saro Meguerdichian, Edi Rocha

Project BudBurst is a national citizen science field campaign in its second year. By having citizens record the timing of stages of development (phenology), such as leafing and flowering of native tree, shrub, and herbaceous species each year, the prevailing climatic characteristics can be determined for locally, regionally, and nationally. With the help of citizen scientists, Project BudBurst will be compiling valuable environmental information that can be compared to historical records to illustrate the effects of climate change.

Hundreds of citizen scientists from across the country participated in the inaugural pilot test of Project BudBurst in 2007, collecting useful scientific data in a consistent manner. The enthusiastic response and robust participation in the pilot effort made it clear that there is sufficient interest from the American public to expand Project BudBurst in 2008. [http://www.windows.ucar.edu/citizen\\_science/budburst/index.html](http://www.windows.ucar.edu/citizen_science/budburst/index.html)

For Project BudBurst we will design a tool for recording daily plant phenology observations with auxiliary data, such as verification photos, hemispherical canopy images, geo-tagging, commenting, etc. Students will be collecting daily measurements of tagged individual plants of their choice on their routes to and from school or in the CENS courtyard. These plants do not necessarily have to be on the list of Project Budburst target plants but will be used in the tool creation. Daily observations will be recorded with 2 or 3 Cyclops cameras already at the James Reserve (possibly also for transplanted specimens to the CENS courtyard) of Common Yarrow, a target species.

### **CENS Deployment Center**

Mentors: Matt Mayernik & Jillian Wallis

High School Team: Nataly Parra

The CENS Deployment Center is a web-based tool for planning sensor deployments and capturing vital metadata to support data interpretation.

Interns will be responsible for identifying possible ways of integrating live data feeds and maps into the existing CENS Deployment Center interface to provide meaningful views of information pertinent to CENS deployments. We are looking to augment the current deployment plans with sensor and network status information, fault detection, and most recent data, so that users can understand the state of the deployment at a glance. Adding maps and mapping features will allow for better understanding of network status and navigating through past, current, and future deployments. And finally we would like to devise a system to allow for logging from the field. The intern will assess the needs for each of these potential developments, and devise plans for implementation.

### **CycleSense for a Healthier Bike Commute**

Mentors: Nithya Ramanathan, Sasank Reddy, Vids Samanta, Katie Shilton

High School Team: Ian Cinnamon, Isaac Kim, Brendan Kutler

Undergraduate Team: Suming Chen, Nan Jia, Victor Shia, Senglong Taing, Kelsey Whitesell

Add system components to the [Campaignr framework](#) to support the [bikeability campaign](#) in Los Angeles. The goal is to infer the bikeability of routes from a single mobile combined with GIS information where possible. We can instrument bikes but that's typically expensive and not possible in a lot of situations. Plan to infer noise estimates from the phone for "traffic" noise, use the accelerometer as a way to measure the "roughness" of a route, use GPS altitude measure to get elevation information, and get input from the user in terms of "traffic estimates", problems with route paths etc..

Want to Document

- Route Proximity to Traffic. See these two links [here](#) and [here](#)
- Route Particulate Exposure. How exposed you get to car fumes; leverage PEIR here directly.
- Route Exercise Monitoring. A lot of these sites simply use your speed and elevation as a measure of how hard the route is or how much exercise it can provide. Could we infer this from GPS altitude information and maybe use accelerometer in some smart way?
- Route Safety Marking. Places where there are problems - ie. bad roads, bumps, difficult intersections, etc...

Data source: GPS data, Tag Initial Campaign Users: 10-15 Target: Daily commuters Duration: 1 month (Ready-August) Nokia Workshop Mid August

Some useful websites:

<http://www.mapmyride.com/create> - They let you add routes here by drawing. Kind of neat and you can add waypoints.

[http://www.cicle.org/cicle\\_content/pivot/entry.php?id=698#wl](http://www.cicle.org/cicle_content/pivot/entry.php?id=698#wl) - Interesting site where you can submit routes.

<http://www.nycbikemaps.com/> - This shows bike routes in NYC, the nice thing here is the UI they used.

<http://www.alivetec.com/products.htm>

### **EcoPDA**

Mentors: Christine Lee, Nithya Ramanathan, Taimur Hassan

High School Team: Paul Ashla, Shreyasi Ghosh, Taylor Savage, Christian Rodriguez (Christine)

Undergraduate Team: Charisse Carter, Jennifer Chandler, Oscar Herrera

The EcoPDA application has been commissioned by Conservation International (CI) to improve data collection by field researchers. Currently, the task is carried out in two steps. First, researchers travel to the collection area and manually collect data according to a prescribed 'protocol' on an official form. Next, they travel back to the field station and manually enter the data into spreadsheets that serve as a template for transmission to a central repository in Washington DC belonging to CI through a web form. The spreadsheet has scripts that check the validity of the data entered and alert the researchers when inconsistent data is entered. Despite the error checking errors often find their way into the database, such as in the case of date formats or incorrectly recorded data at the collection area. To overcome this and other issues such as loss of time, low productivity, EcoPDA is being developed at CENS. It is written in C# for Windows Mobile based PDAs for use at multiple 'sites' around the globe that represent forests where CI has a presence such as Caxiuna and Volcan Barva, (located in Costa Rica and Brazil respectively). Within each site there are multiple *sampling blocks*, special grids prepared for data collection. Within each sampling block there are *plots* where scientists can carry out data collection according to prescribed 'protocols', which define when, where and how data should be collected by the researchers. Four protocols being accommodated by EcoPDA are, butterfly, vegetation, avian and primate which cover data collection for five specimen types (butterfly, tree, vine, avian and primate) located within the sampling blocks. In the butterfly protocol, researchers visit special butterfly trap located in certain plots within sampling blocks and record each butterfly's genus, species and sex, as well as any identification information and comments. The avian and primate butterfly are similar, each recording different attributes such as angle of observation, distance from observation point and even multimedia data about bird and primate specimen found within a sampling block. The vegetation protocol is slightly different since researchers carry out an annual census of the trees and vines at a plot as well as compare the vegetation's state and growth rate with previously recorded data. EcoPDA uses a SQL Server Mobile Edition database on-board the PDA to serve as a platform for comparison and analysis in addition to data storage.

### **NESL Team**

Lead Mentor: Young Cho

High School Team: Carlos Gomez

NESL Team Project will require the students to help in R&D effort for building and testing inexpensive and accurate clock source for sensor network nodes. Accurate and stable sensor is crucial in time synchronization aspect of sensor nodes and the research will be in building one with a performance in the order of 1 ppm (parts-per-million) stability or better. Temperature compensated crystals of that performance would cost 10 to 200 time more than what we are using to obtain the same result.

**Portable Image Platform (PIP)**

Mentors: Teresa Ko, John Hicks, Eric Graham

High School Team: Sophie Gerrick, Jeff Lee

Undergraduate Team: Joey Degges, Mike Wilson

We will be developing a portable image platform for rapid deployment scenarios in the natural environment. Natural environments are inherently challenging due to severe lighting changes and nuisance movements. The focus of this summer will be in developing a system which balances the computation needed to handle such challenges and the power/latency constraints of real-time deployments.

We will begin by creating a simple data logger that captures and stores images on the Portable Image Platform which can then be downloaded later en masse. The focus of this step is to ensure an easy mechanism to gather data for experimentation.

We will then investigate the power/latency cost of embedding a novel object detector onto the Portable Image Platform. Rather than storing entire images on the device, we will look into the cost of shipping or storing only novel parts of the image.