

**THE DYNAMICS OF DISTANCE: EMPLOYING GIS TO ADDRESS HEALTH
SERVICE DELIVERY CHALLENGES IN NORTHERN BRITISH COLUMBIA
COMMUNITIES**

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PROJECT OVERVIEW

PURPOSE

The purpose of the project was to improve upon the prototype Distance Analytical Interface (DAI), created in 2003 to allow users to calculate road network distance (in kilometres) and travel time (in minutes) between any two locations (in longitude and latitude or UTM grid points) in the provinces of British Columbia or Alberta.

RESEARCH OBJECTIVES

- 1.) To provide greater flexibility, extensibility and robustness to users of the DAI
- 2.) To develop a web interface that will allow multiple users access to the database
- 3.) To create secure access and data uploads/downloads, in respect of site licensing agreements.
- 4.) To field test the DAI and web interface to determine where further refine the system.

OUTCOMES

- 1.) A review of the previous model was performed with recommendations put forth in designing the next version.
- 2.) An environmental scan examining existing tools available was performed as well as a literature review on potential computer science methods and mathematical algorithms to employ in the design. A design document was provided recommending the strategies to carry forward in development.
- 3.) Based on the results of the environmental scan and literature review, an open standards approach using open source software was employed to meet user needs

Web page development made use of XML pages using W3C ([World Wide Web Consortium](#)) standards for XML.

The JAVA programming language was implemented in providing a computer program that built road networks used to calculate shortest path results (both in linear distance and in time).

An open source database that supports spatial objects (such as GIS networks and point locations) was selected and implemented. This Object Relational Database Management

System ([Postgresql](#)) was enhanced by software developed by [Refractions Research](#) (PostGIS) following standards set forth by the [Open GIS Consortium](#).

Data uploading, user management and query tools were built using the open source web language [PHP](#) (Pre Hypertext Programming Language). These pages were designed to verify user privileges, allow users to provide their own data to the JAVA program and present users with options for downloading results.

4.) The DAI was tested to give indication as to where improvements could be made to the system. Many modifications were made to the JAVA program to improve performance and reliability. Despite these changes improper results were still produced. It was discovered that the data used for building the distance/time networks had incorrect values resulting in data clean up procedures. Subsequent to these data input modification, the DAI constantly produces correct results and can accommodate relatively large data requests.

EXTENSION ACTIVITIES (2003/2004)

1. Presentations at Academic Conferences

Kelly KD, Hanlon N, Voaklander D, Carroll S, Emmons S, Koning A, Whittleton E. "Dynamic distance measurement of rurality in British Columbia: a GIS implementation approach." Presented at the 5th International Symposium, Future of Rural Peoples. Saskatoon, SK, October 2003.

McGregor, J., and Hanlon, N. "If ambulances had wings: putting provincial standards of emergency care access to the test in northern British Columbia." Presented at the Annual Meetings of the Western Division of the Canadian Association of Geographers. Medicine Hat, AB, March 2004.

2. Information Sharing – Non-Academic Conferences

McGregor, J., Hanlon, N., Emmons, S., and Voaklander, D., "Applications of GIS in health geography: fine tuning estimates of accessibility in northern BC." Presented at the Northern BC GIS Users Group Conference, June 2004.

3. Information Sharing – DAI Users

Koning, A, Distance Analyzer Interface User Manual (forthcoming)

McGregor, J., On-Line Tutorial, Distance Analyzer Interface (forthcoming)

4. Journal Articles

McGregor, J., Hanlon, N., Emmons, S., Voaklander, D. (in preparation) If ambulances could fly: putting provincial standards of emergency care access to the test in northern British Columbia.

5. Courses Confirmed to Employ the DAI in 2004/2005

Geography:

GEOG 204-3	Introduction to GIS for the Social Sciences
GEOG 428-3	Advanced Medical Geography
GEOG 499-3/6	Independent Studies
GEOG 720-12	Research Thesis

Health and Human Science:

HHSC 680-3/6	Directed Studies
HHSC 799-6	Thesis

It is anticipated that the number of courses and programs using the DAI and web interface will continue to grow over time.

6. Community Outreach

Interest has been expressed by various senior administrators in the Northern Health Authority and the officials with the BC Ministry of Health Services. Future applications of the DAI involving research collaborations with these organizations are anticipated. Future outreach activities will target municipal governments, Regional Districts, and other government agencies and community groups throughout northern BC.