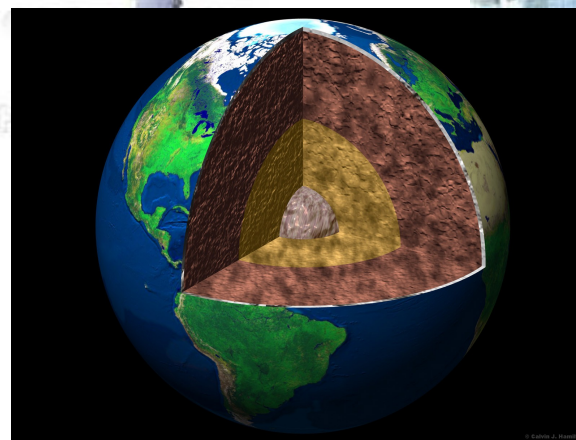


**LINUX**



# Evaluation of Data Conversion of Vectorial Geographic Features in Topographic Maps using Free Software Tools

Helton Nogueira Uchôa, Maurício Carvalho Mathias de Paulo, Luiz Carlos Teixeira Coelho Filho, Paulo Roberto Ferreira



# Introduction

- In the mid-eighties, most geographic services around the World were converting their huge sets of cartographic databases to a digital format;
- At that time, there were not many solutions to do this, and all of them were proprietary;
- It is, still, a heavy task to convert those files to an open format, or, at least to a format that serves as a “lingua franca”, like the ESRI shapefile;
- Vectors might be lost, erasing relevant information regarding the features that exist in the mapped area;
- This article describes an experiment undertaken in order to evaluate the quality of a conversion between standard DGN (Design File) formats using Free tools;



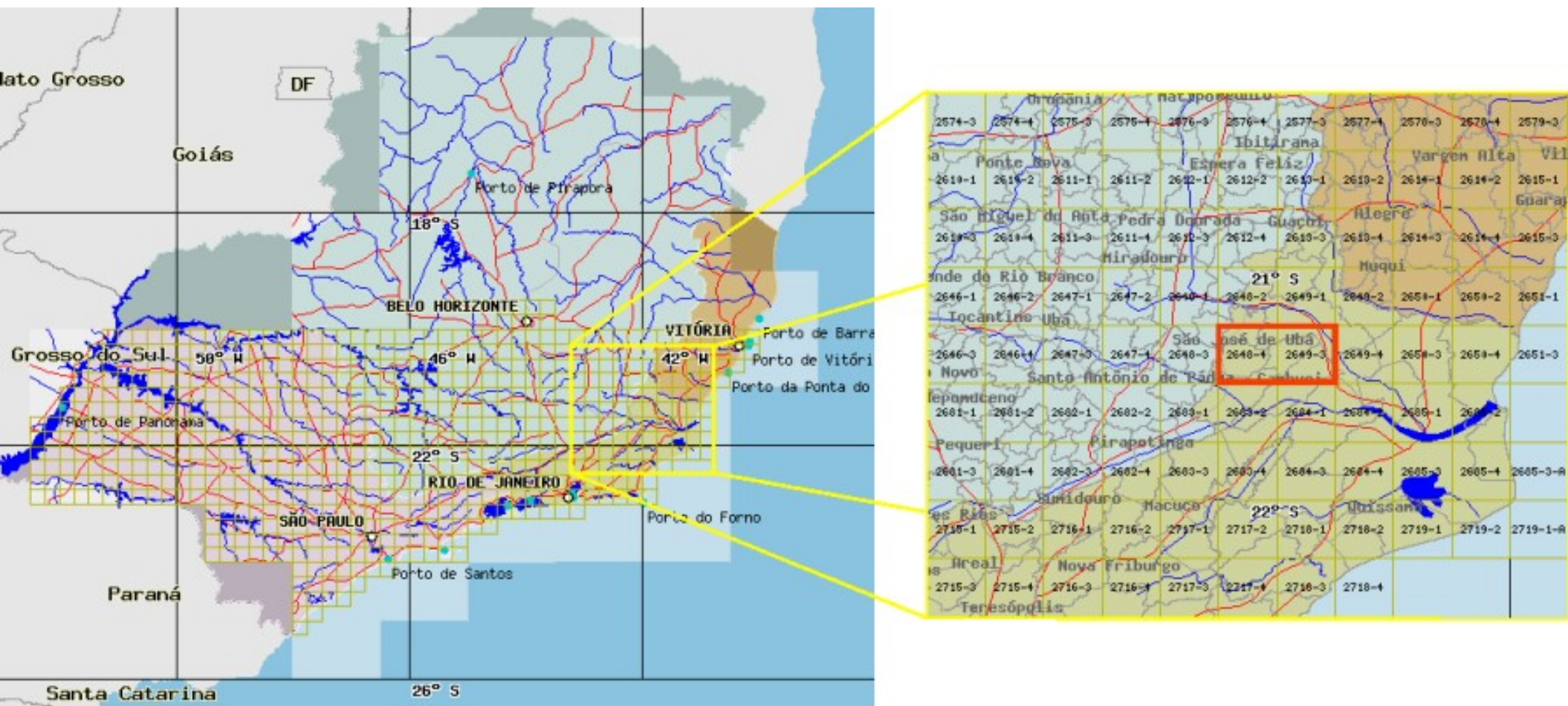
# The GDAL

- The Geospatial Data Abstraction Library is a translator library for raster geospatial data formats;
- There is a related library, which lies underneath the GDAL Project, called the OGR, and which provides a similar capability for simple features vector data;
- The latest version of GDAL is the 1.3.1 one [OGR API Tutorial], and is currently used in the development of popular applications, such as ILWIS, Google Earth, MapServer, GRASS, Quantum GIS, among others.



# Methodology

- For this work, two topographic maps were used: the 1:50000 maps named 2648-4 – Miracema and 2649-3 – São João do Paraíso. Both were made by the Brazilian Institute of Geography and Statistics (IBGE);



# Methodology

- Those maps were acquired in vectorial format, and were already digitized, structured and validated by IBGE;
- They have been through all phases that would, technically, prepare them for being loaded into a GIS (Geographical Information System);
- The entire process of preparing those maps was probably made using Bentley's Microstation CAD Suite;
- This is, until today, the most used CAD application for geographic purposes, and several cartographic databases are still delivered in Microstation's DGN (Design File) proprietary format;
- At first, a script was developed in order to import all layers contained in those DGN files, exporting them to a single shapefile.



# Methodology

- Shapefiles, however, pose several limitations related to geometry;
- One of them was the fact that different kinds of geometry cannot be stored in the same file;
- Later, the original DGN files and the shapefiles obtained from the conversion tasks were compared thoroughly in order to understand what features were lost (if there were any) in the conversion process;



# Results

- DGNs and shapefiles are, in nature, deeply different from each other;
- As a consequence, in order to preserve all the information that can be found in the original files, graphic attributes had to be transformed into fields of the database that takes part of the file structure itself;
- The OGR library has converted seven attributes during script execution: type, level, graphic group, color index, weight, text and style;
- Then, a feature count was performed for each geometry type and for each layer, with the main objective of knowing if there was any kind of spatial information loss;

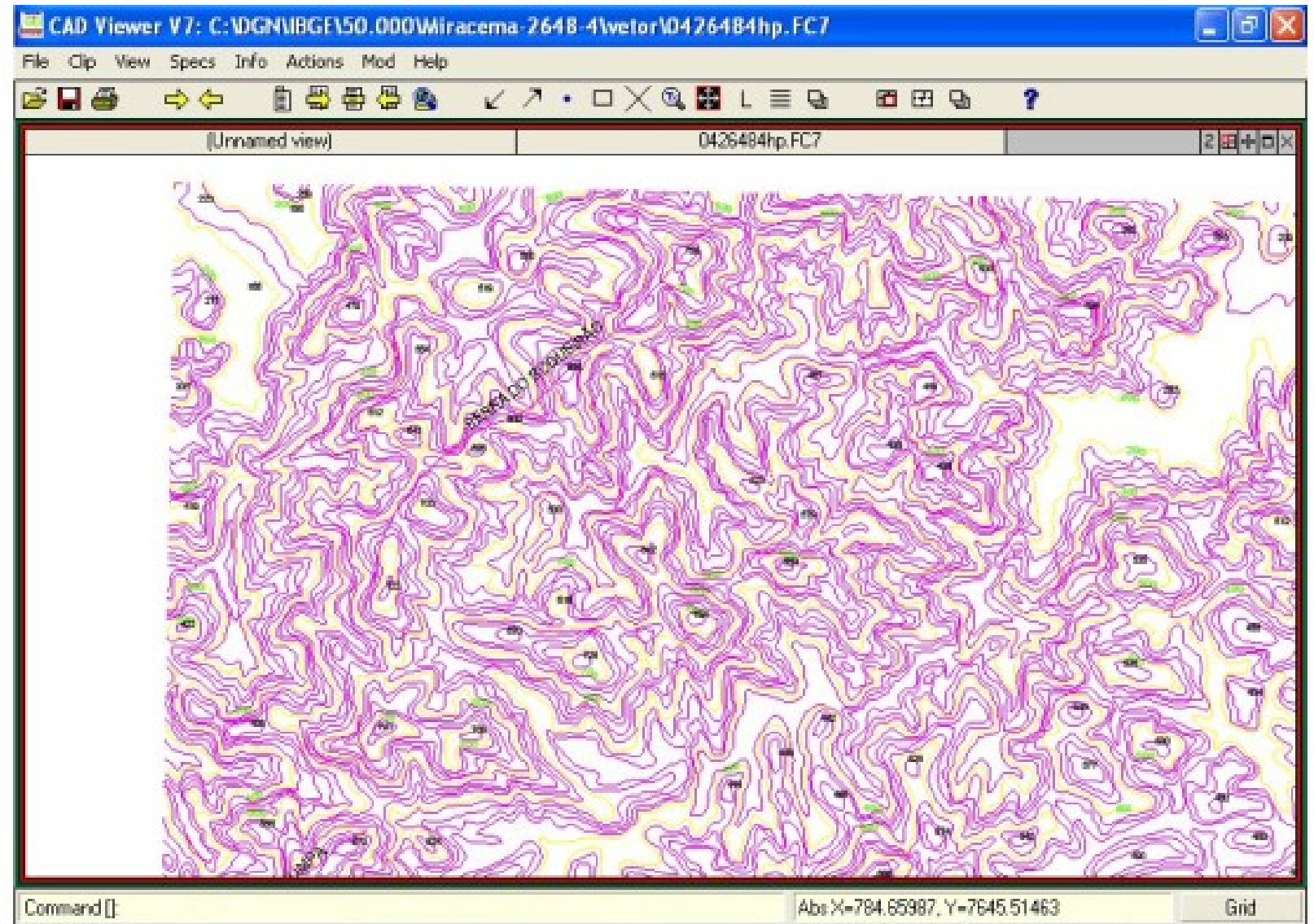


# Results

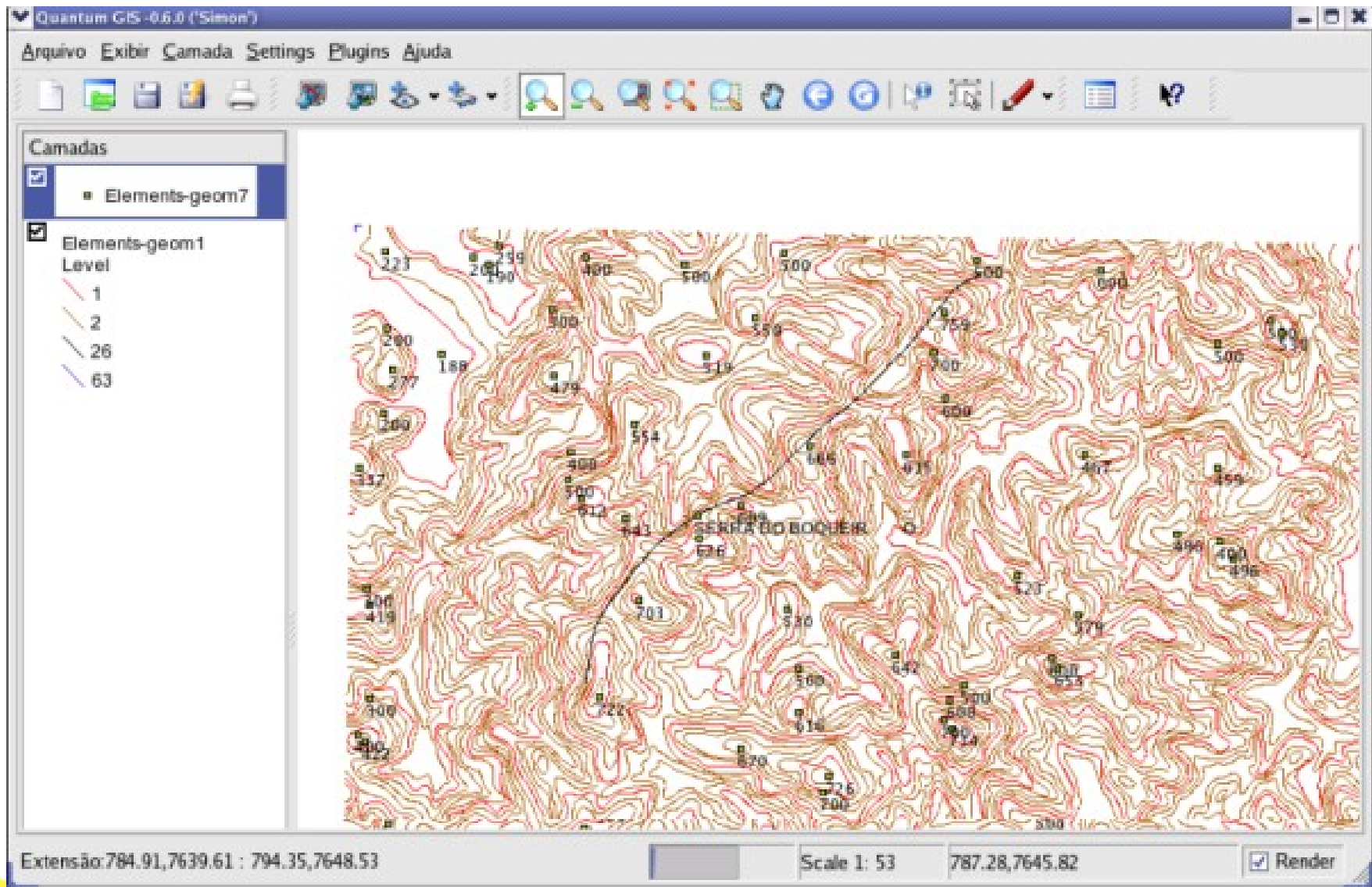
- This step has proven that all relevant data (i.e. geometry features and their attributes) were not lost;



# Results



# Results



# Conclusions

- The main purpose of this task was to provide an inexpensive way of turning those databases accessible for the main public;
- All steps were done with the aid of free software: GDAL's OGR libraries were used for reading and writing data, and other free applications, such as QuantumGIS, were used for viewing and analyzing the final result;
- The results, albeit conclusive, still need further refinements;
- Further projects on the same line of research might include the creation of a CGI script to turn this task worldwide accessible and the conversion of DGN files directly to a database management system.





**OpenGEO**

# Contato

Luiz Coelho

luizcoelhof@open3dgis.org  
(21) 2518-6233



**OpenGEO**

[www.opengeo.com.br](http://www.opengeo.com.br)