Optimized Data Acquisition Processes and Tools for Land Administration

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www.datagrid-international.com
Land Administration reforms on large scale will take place

- to improve living conditions
- for economic stimulation

Novel Tools & Procedures among Enabling Technologies

DataGrid is dedicated to provide “turn-key” solutions

- integrated core system
- consulting
- customization
Integrated core system

Database
Data Collectors
Procedures
Database
- customized (Hard keyed organization, standard entries …)
- streamlined menus
- upgradeable (compatible with PostgreSQL, ArcCadastre …)
- flexible structure (Compatible with VAN DER MOLEN and LEMMEN recommendations)

GeoData
A Geo referenced Database program
Geographic Information System(GIS)/Land Information System(LIS)
Simple Menu-driven Interface

- Enter New Data
- View/Edit Data
- Close

Only three menus needed while in the field

Access though Main Menu
Two more used during setup
For Setup  Hard-keyed organization

Enter the administrative structure of the region of interest

- **Districts:** .... Mbarara Ntungamo ....
- **County/Municipality:** Kajara Rushenyi Ruhaama
- **Sub-county/Town:** .... .... Kahunga ....
- **Parish/Ward:** .... .... Kizara .... ....
- **Village:** .... .... .... ....
In the field

- Once the administrative structure is entered it becomes the default used in the field

- **Only** data-entry can be made in the field

- No changes to the structure can be made in the field

*It is not supposed to!*
Key Advantages:

- Only authorized users can define and change structure
- Always correct administrative organization (once proofed)
- Consistency (organization, spelling, ....)
- Simplicity, efficiency, speed, reduces human errors
- Data can be searched
- Updated at any time until the record is protected by the authorized users with access to the setup menus.
Allows the field worker to concentrate on his/her job cannot interfere with setup
Data Collectors

Internal: GPS
External: Totalstation, text, database entry, photography, ….

- field data collected digitally (Demographic, cadastral, ….)
- automated on-the-spot GPS postprocessing (dm-accuracy)
- rugged, solar power, tall pole, wireless option

… no unnecessary “clutter”
… many automated functions
  (manual override advanced mode)
… automated Datum translation
… light, rugged, practical
Audio signals and LEDs tell when satellites acquired or lost

- solar power keeps internal batteries charged (last over 10 hours without sunlight)
- Data stored in internal flash memory (32 Mb standard)
- Can operate without external displays or loggers
ACCURACY: Carrier Phase Single Frequency (cm to dm level)
Mk1 Crane Carrier Phase ..... base corrections

150 to 200 sec. Static No Initialization

Random Error .... (95%) 3 to 4 centimeters
Systematic Error .. sub-millimeter range + 3 ppm < 10 km baseline

Example: 15 000 000 boundary points
⇒ Approx. 150 000 parcels could be affected by errors > 1 m
⇒ Need for
PROCEDURES WITH STRINGENT INTEGRITY CONTROL
**L1/L2 Carrier Phase**

**Toughman OR Mk3 .....**

Random Error ....
(95%) 1 centimeter

1 to 5 sec. Static
No Initialization

Systematic Error ..
sub-millimeter range + 1 ppm
< 15 km baseline

~ 1 dm @ 100 – 1000 km baseline
Carrier Phase Accuracy saves time & costs ….

L1 carrier phase (Mk1 Crane) ….
Low inv. cost, Discipline Essential

L1/L2 carrier phase
(Toughman or Mk3) ….
Efficient.
Real Time – Mode Highly automated checks possible
Example of connected sensor/instrument

**IN THE GROUND**
- Moisture
- pH-levels
- Nitrogen

**IN THE AIR**
- CO$_2$ levels
- Radon levels
- Moisture
Ground Moisture level map
Example use of connected sensor/instrument

POSSIBILITY TO RECORD 3D / subterranean features

Mk1 with a Ground Penetrating Radar (GPR)

Topographic surface map

+ Subterranean features
Procedures

- teams approach (minimizes training needs & manpower costs)
- integrated with sensitization
- integrity control

<table>
<thead>
<tr>
<th>TEAM</th>
<th>Personel</th>
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| Information /scheduling team | 1 Senior communicator  
|                             | 1 Junior/training communicator         |
| Survey/demarcation team     | 1 Senior surveyor                      |
|                             | 4 GPS operators                        |
|                             | 1 Base station guard                   |
|                             | 1 Driver                               |
|                             | (2 Monument makers)                    |
| Office team                 | 1 Manager                              |
|                             | 8 Operators                            |
Information / Scheduling Team

- plans the sequence in which sites will be visited
- informs stakeholders of the purpose of the demarcation and of the procedures that affect them
- Community Rep.
  - 8 weeks visit
  - day before visit
  - survey day visit

Office Team
- retrieve any existing records

sensitize + gain an upfront understanding of any outstanding property conflicts that have not been noted by the office team and to make sure that the information on all known conflicts is up-to-date
Demarcation / Surveying Team

Recommended set 2 bases and 4 rovers per crew of one measurer and one processor. + guard at the remote base?
Demarcation / Surveying Team

L1/L2 Version

Recommended set 2 bases, 1 check point and 4 rovers per crew of one measurer and one processor. + guard at the remote base?

REAL TIME CHECK POINT GUARANTEES RELIABILITY + SAVES TIME
Integrated core system
Field Operations

1) Enter parcel ownership and statistical data

2) Collect demarcation data

3) Process in the field to make sure GPS data is good - owner data consistency checks.

Join 1 and 2 done onsite
Field data entry

... push button to enter data
Select admin. location of parcel
... enter data easily using menus and comment fields

Pick particulars that apply with a click of the mouse.

Identify relevant features. Can also be done onsite or edited onsite.

Record owner data. One, two, or more can also be generated automatically based on common demarcation points.

Adjacent owners.

Pick particulars that apply with a click of the mouse.
... push button to enter data
... you may push button to preview data

Identify parcel perimeter points and their order
Optionally preview demarcation data
or Generate Report

B/W pictures also possible

... data including picture automatically joined...
Main Advantages

- Affordable dm-accuracy
  (substitute L1/L2 system for higher accuracy / simpler faster yet)
- Flexible Database
- Easy to use - two and five days training
- African/C.Am. training and follow up sites
  (DG-Kampala, DG-Tegucigalpa)
- Geographic Information System(GIS)/ Land Information System(LIS) establishment and customization – National Resource and Risk Management
- Integrates with 3rd party instruments – standard feature

+ CAN BE CUSTOMIZED.
Data Grid offers

- survey grade GPS hardware L1 or L1/L2
- “turn key” custom hardware/software packages

... e-passports, Smart & Secure Tradelanes, food safety, infectious decease forecasts, ....
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