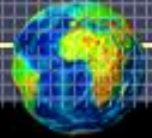


**Strategies and Technologies
for
Integrated Land Administration
and
Management of National Resources**

Bo Gustafson
DataGrid Inc.

www.datagrid-international.com

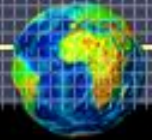


Land Administration reforms on large scale will take place

- to improve living conditions
- for economic stimulation

DataGrid is dedicated to provide “turn-key” solutions

- integrated core system
- consulting
- customization

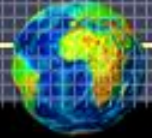


Integrated core system

Database

Data Collectors

Procedures



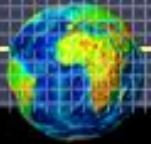
Database

- **customized** (Hard keyed organization, standard entries ...)
- **streamlined menus**
- **upgradeable** (compatible with PostgreSQL, ArcCadastre)
- **flexible structure** (Compatible with VAN DER MOLEN and LEMMEN recommendations)

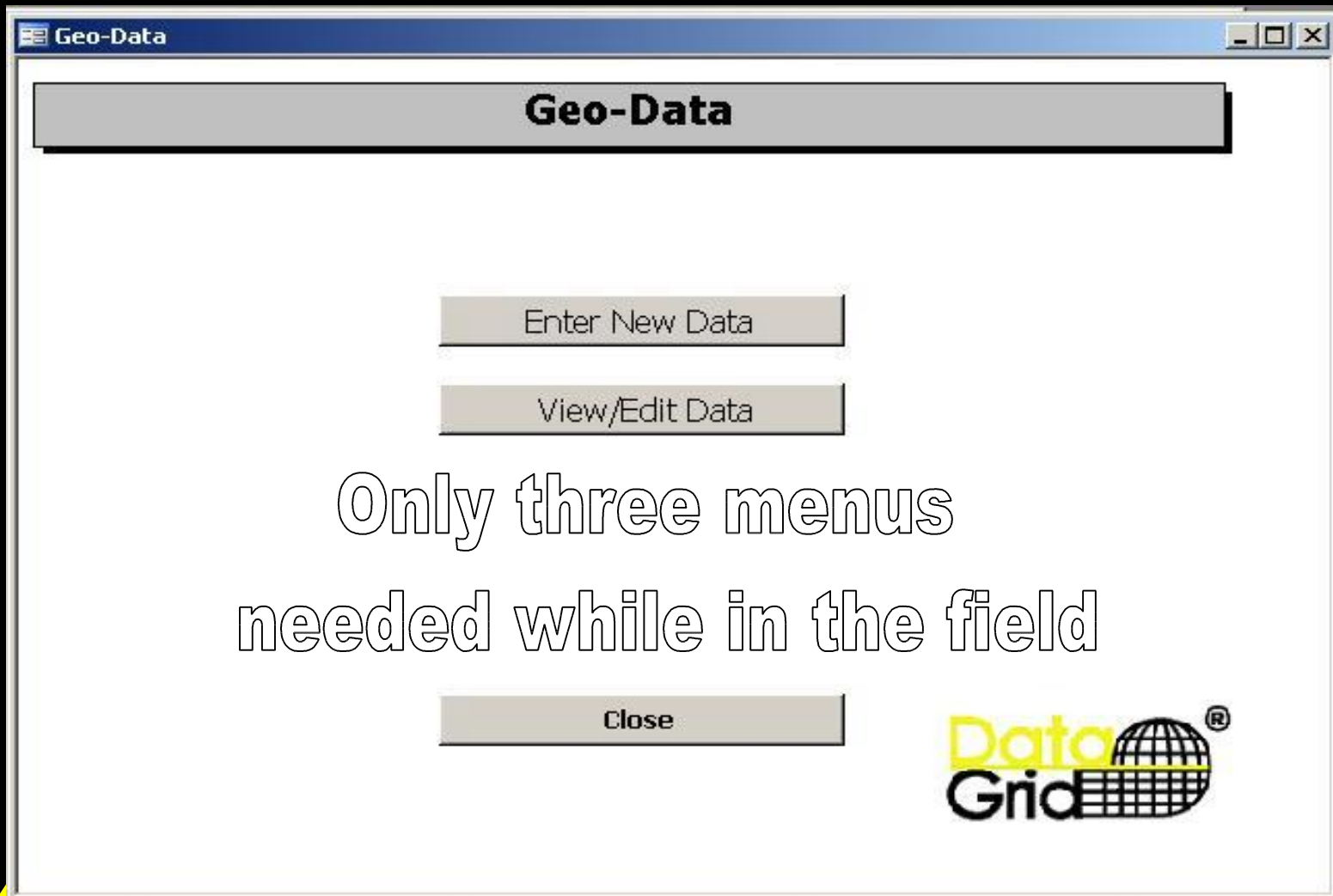
GeoData

A Geo referenced Database program

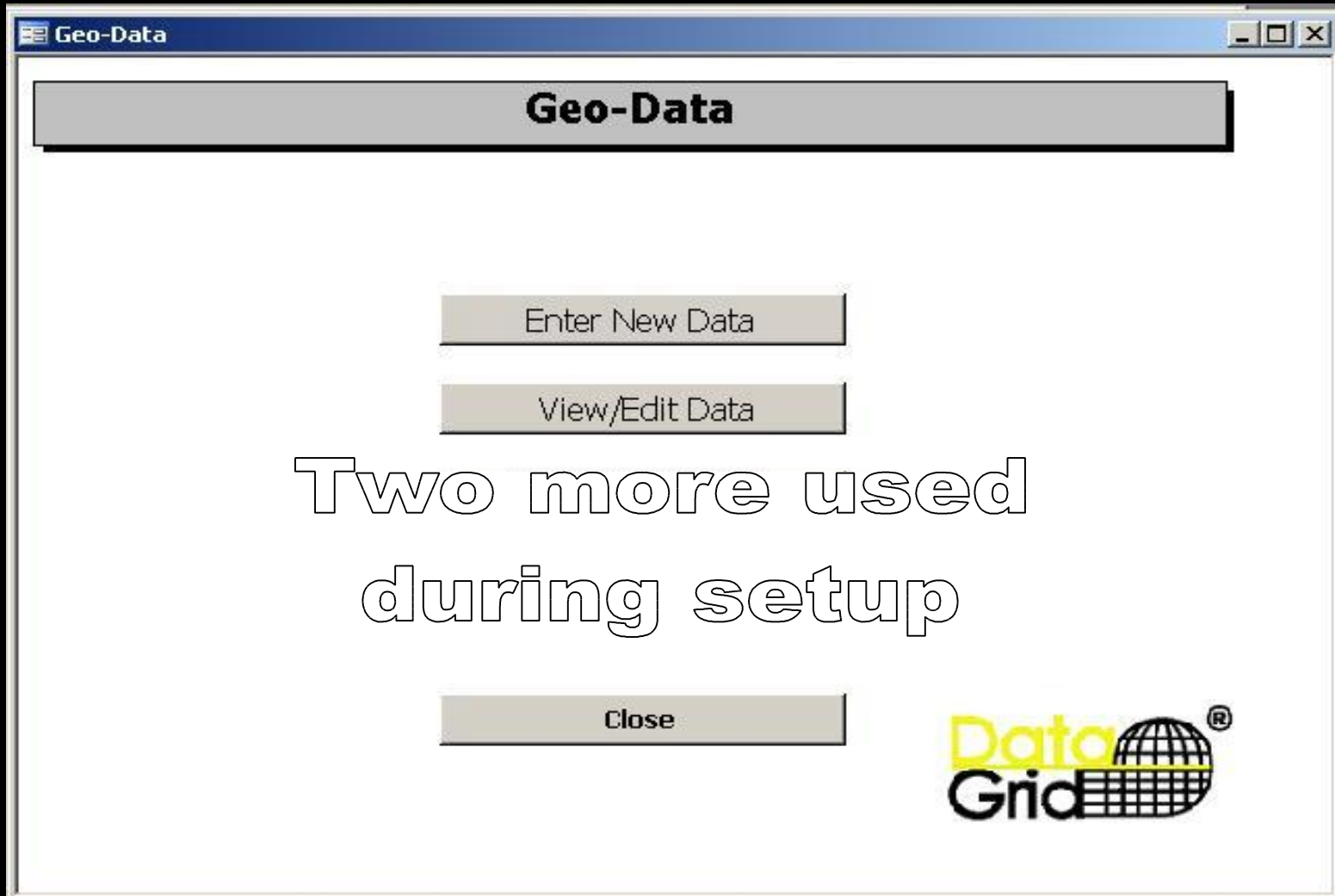
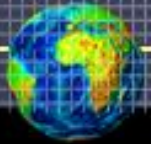
Geographic Information System(GIS)/Land Information System(LIS)

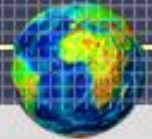


Simple Menu-driven Interface



Access though Main Menu



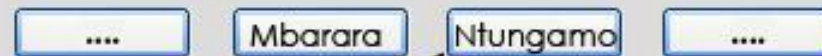


For Setup Hard-keyed organization

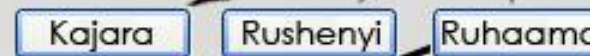
Enter the administrative structure of the region of interest



Districts:



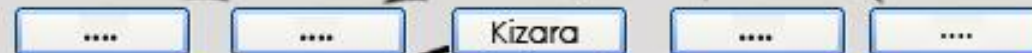
County/Municipality:



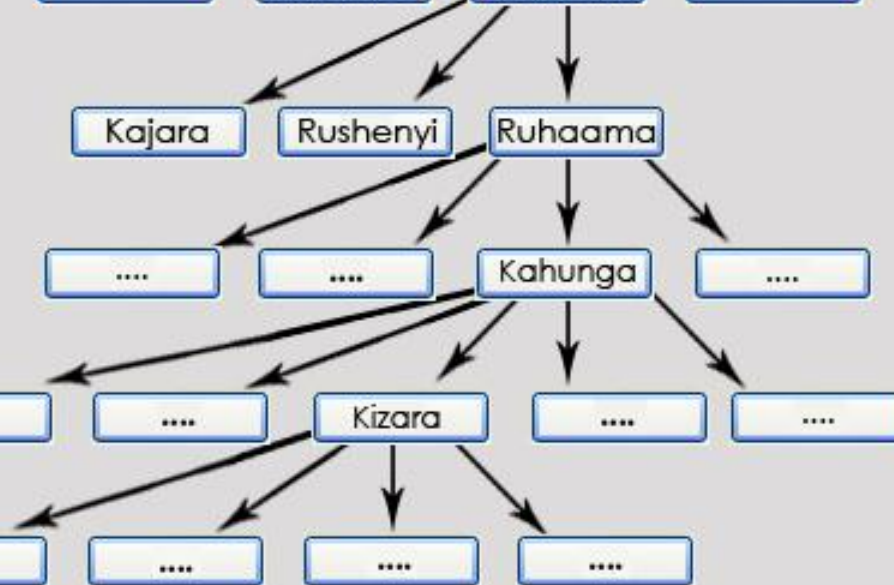
Sub-county/Town:

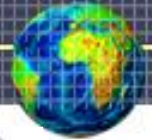


Parish/Ward:



Village:

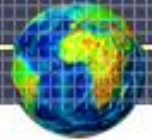




In the field

- 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

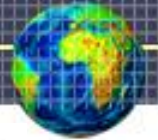
**It is not
supposed to!**



Key Advantages:

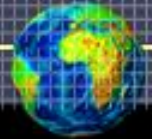


- Only authorized users can define and change structure
- Always correct administrative organization (once proofed)
- Consistency (spelling, organization,)
- Simplicity, efficiency, speed, reduces human errors
- Data can be searched and updated at any time until the record is **protected** by the authorized users with access to the setup menus.



Allows the field worker to concentrate
on his/her job

cannot interfere
with setup



Data Collectors

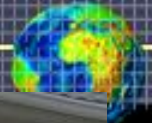
Internal: GPS

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



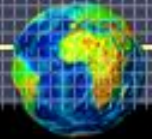
- ... no unnecessary “clutter”
- ... many automated functions
(manual override advanced mode)
- ... automated Datum translation
- ... light, rugged, practical



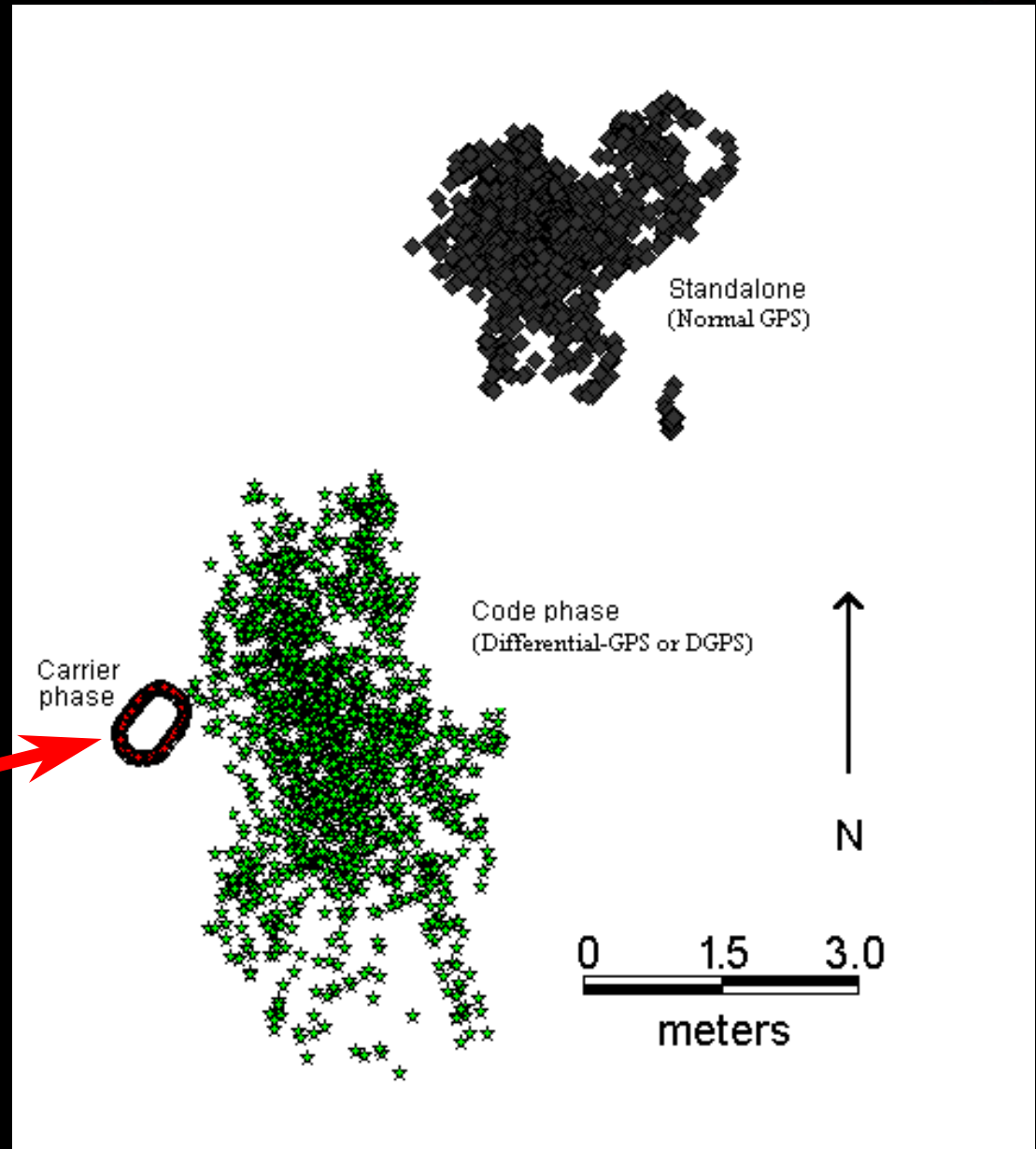
Audio signals and
LEDs tell when
satellites acquired
or lost

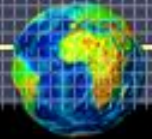


- solar power keeps internal batteries charged (last over 10 hours without sunlight)
- Data stored in internal flash memory (32 Mb standard)
- Can operate without external displays or loggers



Carrier Phase accuracy (cm to dm level)



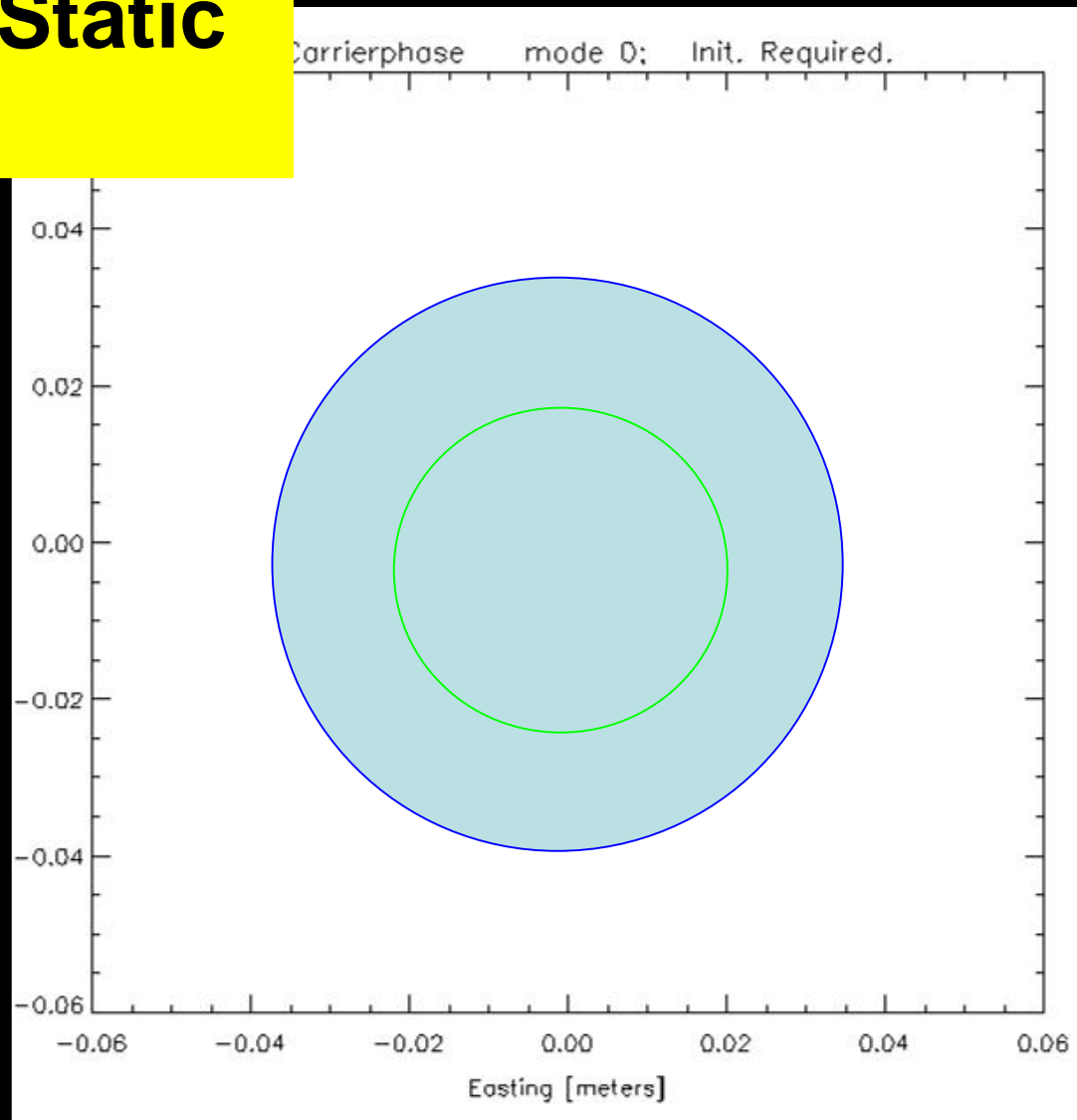


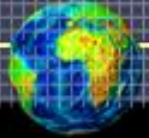
Mk1 Crane Carrier Phase DGPS corrections

**150 to 200 sec. Static
No Initialization**

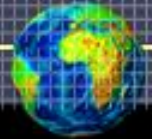
Random Error
(95%) **3 to 4 centimeters**

Systematic Error ..
sub-millimeter range
+ 3 ppm
< 10 km baseline

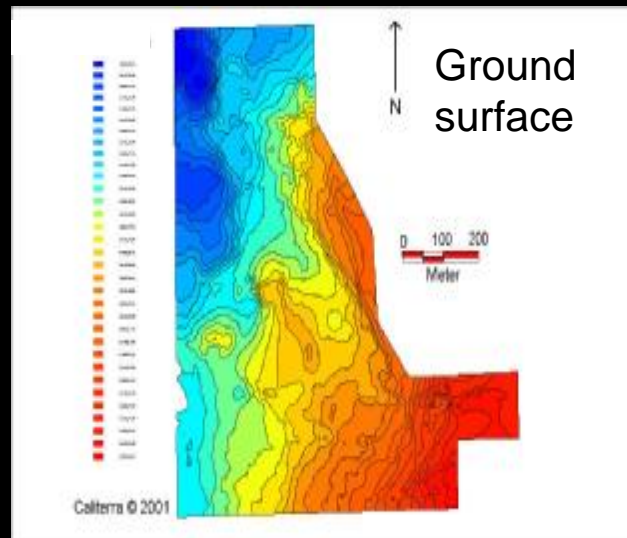




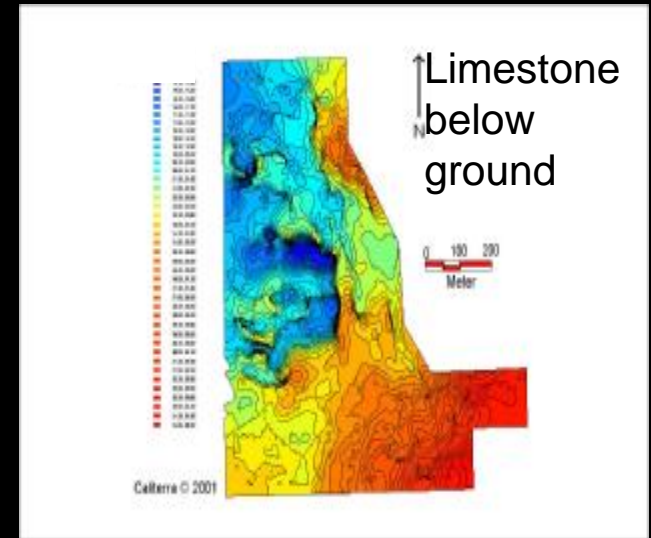
Powerful, easy to use,
GIS / LIS
Data collection



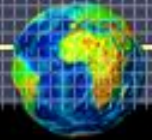
Example use of connected sensor/instrument Mk1 with a Ground Penetrating Radar (GPR)



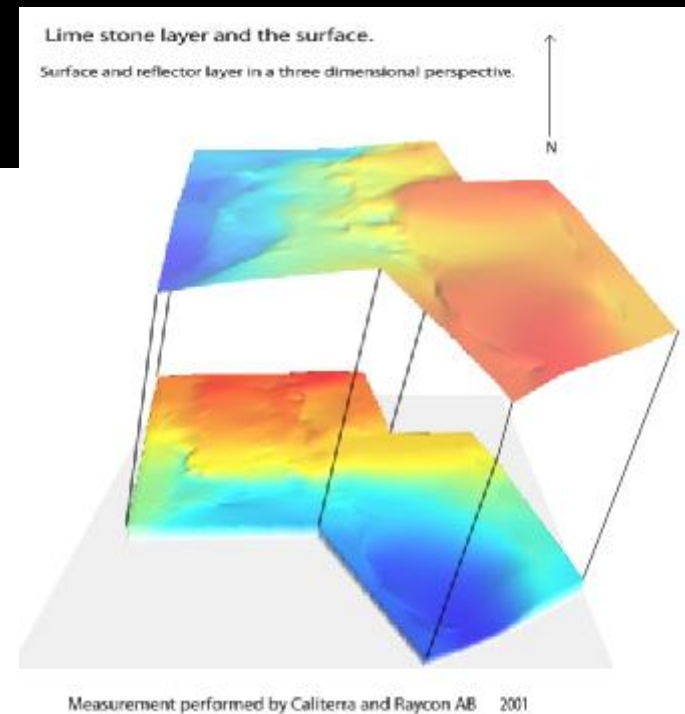
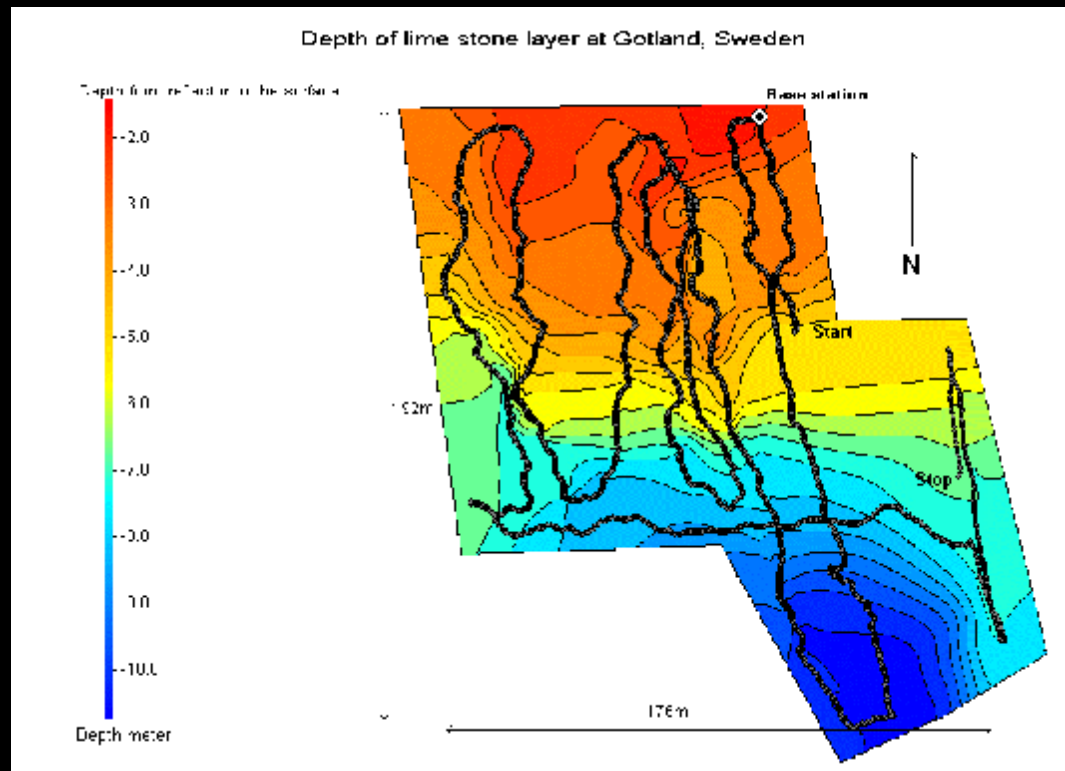
Topographic surface map



+ Subterranean features

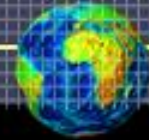


- All measurements made simultaneously
- External data automatically tied to the GPS data



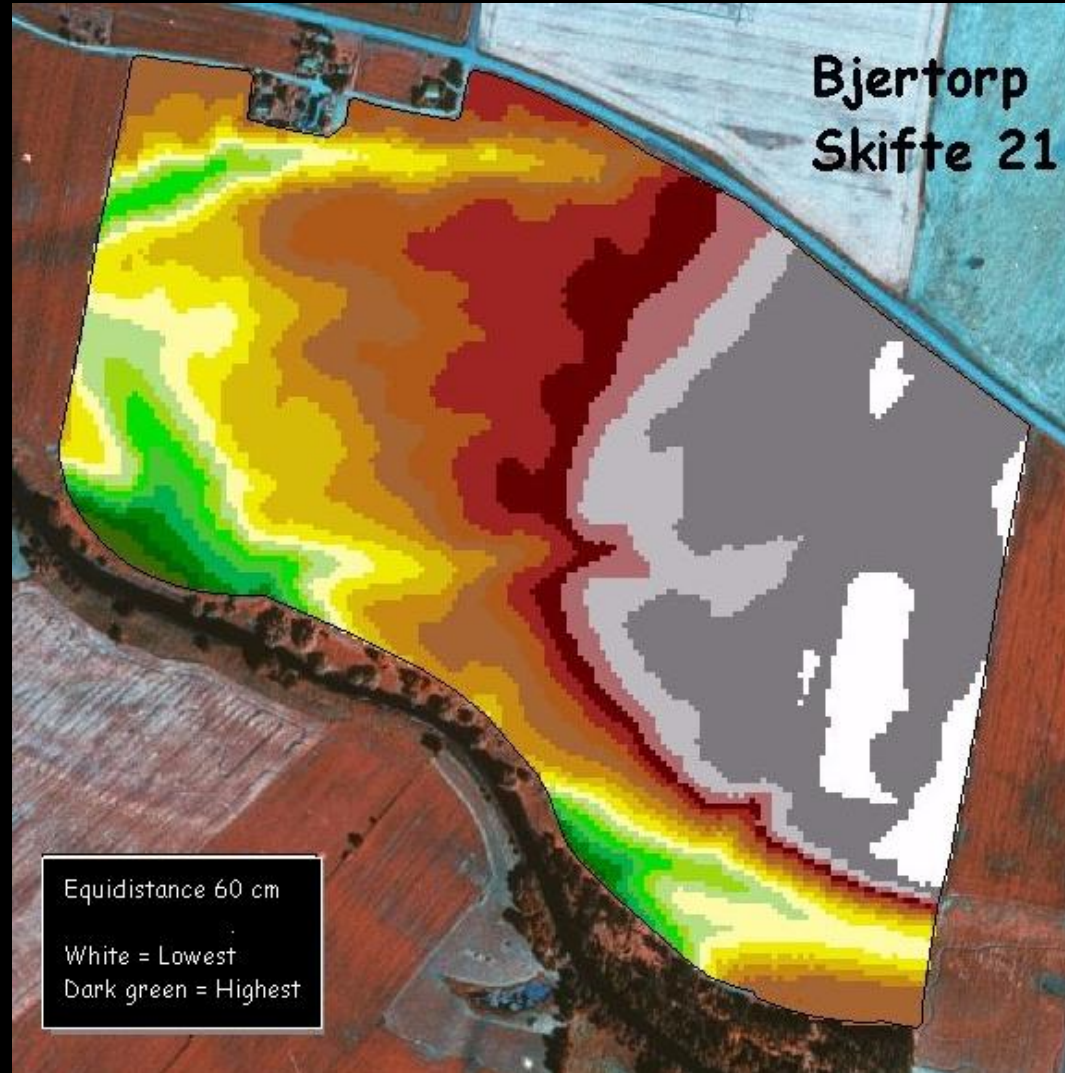
3D rendition illustrates how
volume calculations are made

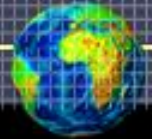
The equipment can be moved around obstacles –
no need to move in a predetermined pattern



Further Example use of connected sensor/instrument

Ground Moisture level

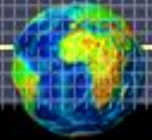




Procedures

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

TEAM	Personel	Cost	Cost / team
Information /scheduling team			\$45/day
	1 Senior communicator	\$25/day	
	1 Junior/training communicator	\$20/day	
Survey/demarcation team			\$98/day
	1 Senior surveyor	\$25/day	
	4 GPS operators	\$15/day	
	1 Base station guard	\$6/day	
	1 Driver	\$7/day	
	(2 Monument makers)	\$10/day	
Office team			\$92/day
	1 Manager	\$12/day	
	8 Operators	\$10/day	



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

Office Team
retrieve any existing records



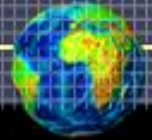
sensitize + gain an upfront understanding of any outstanding property conflicts that have not been noted by the office team and to make sure that the information on all known conflicts is up-to-date

Village Rep.



- 8 weeks visit
- day before visit
- survey day visit

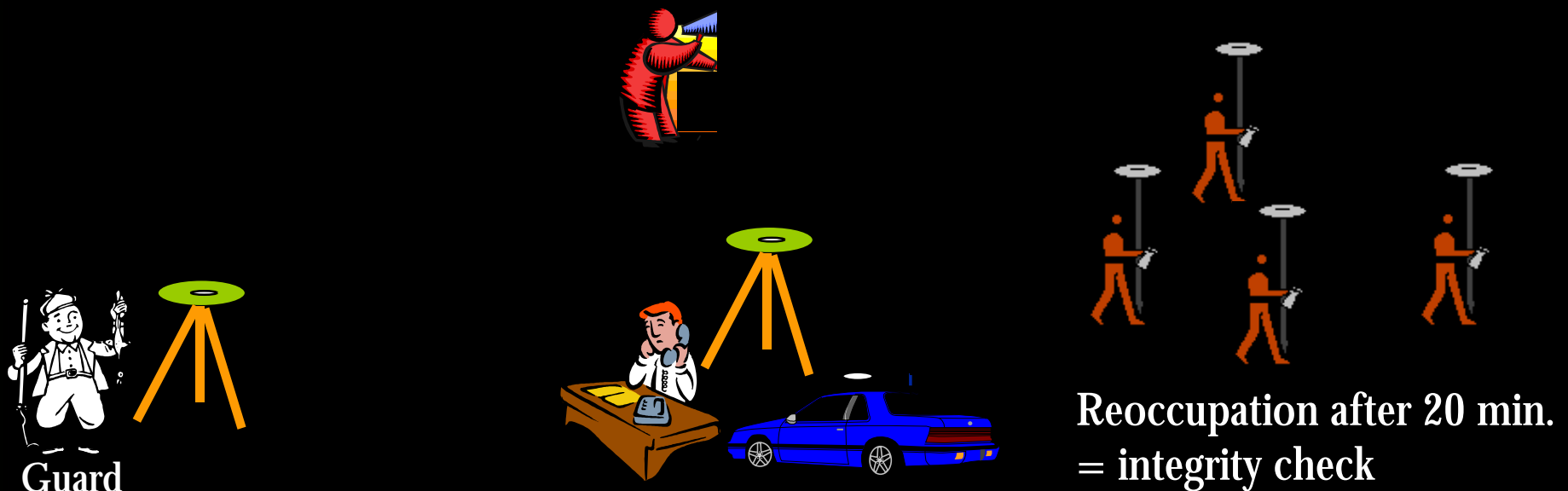


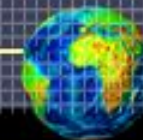


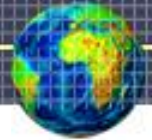
Measurement Procedures

With two Mk1 bases and any number of rovers

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







Field Operations

Can be done in the community house



1) Enter parcel ownership and statistical data



... just add computer

2) Collect demarcation data

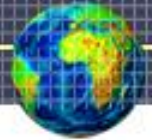


3) Process in the field to make sure GPS data is good – owner data consistency checks.

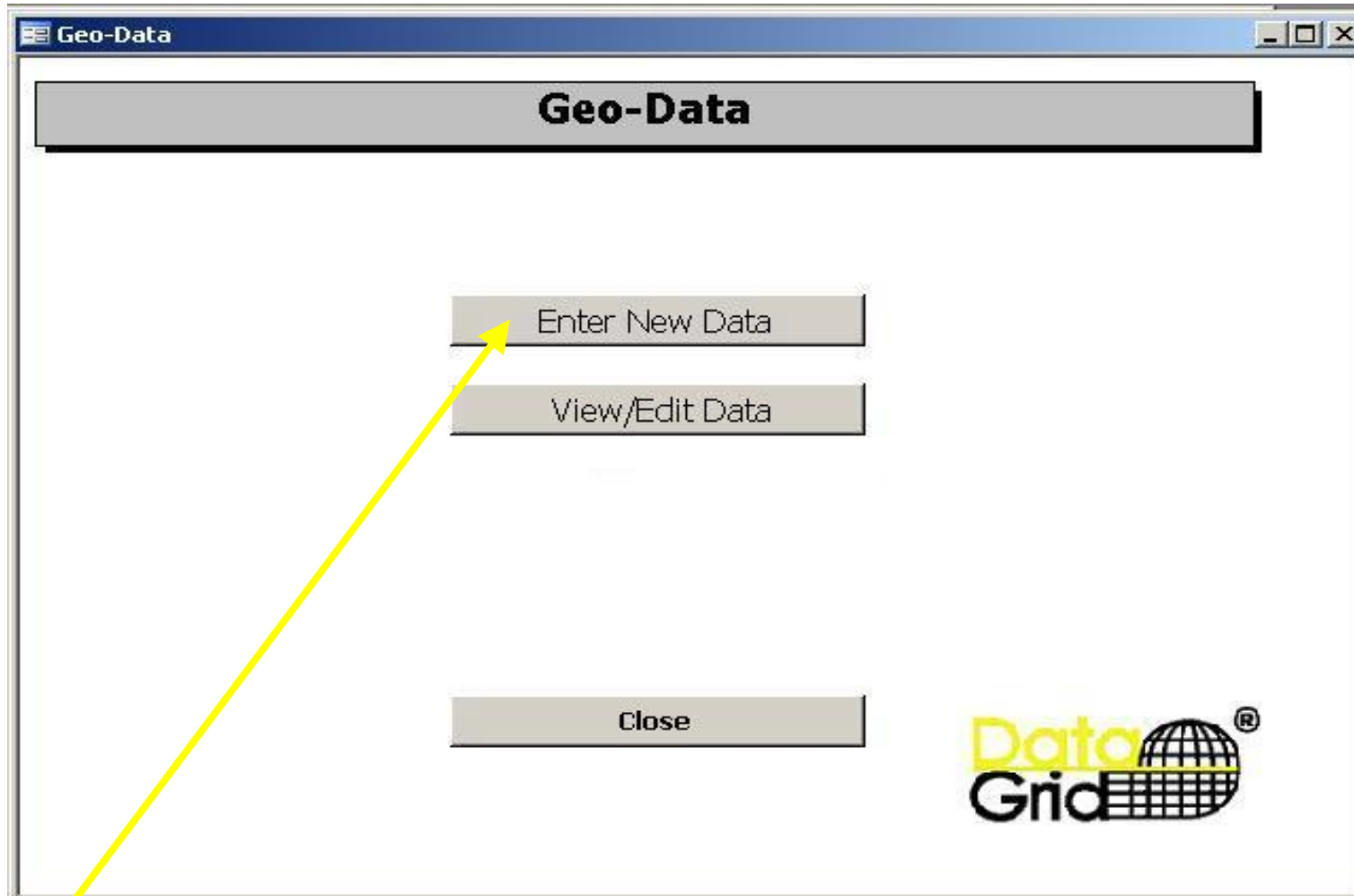


Join 1 and 2

done onsite



Field data entry



... push button to enter data



Select location of parcel

Add

Add Entry

District: Ntungamo

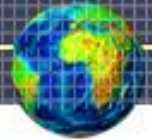
County/Municipality: Ruhaama

Sub-County/Town: Ntungamo T C

Parish/Ward: Ntungamo S/C Kahunga

Village/Zone: Ntungamo T C
Nyakyera
Ruhaama
Rukoni
Rweikiniro

Cancel



Enter Data

Parcel Data

Parcel No:

Location | **Features** | **Owners** | **Adjacent Owners** | **Parcel Particulars** | **Data Points**

Third Party rights:

Current Land Use:

Tenure type:

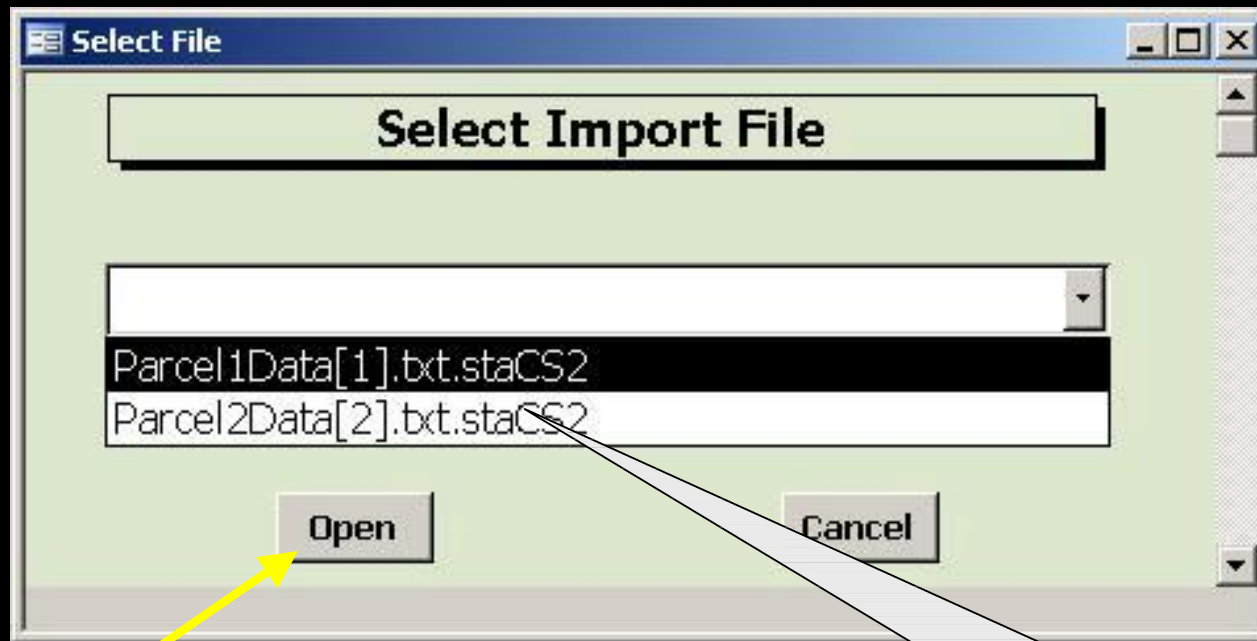
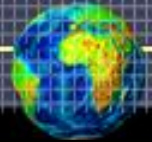
Utilities:

Water points/Easements:

Number of people living and depending on the parcel.

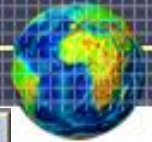
Note: A yellow arrow points to the 'Location' tab, and a speech bubble points to the 'Parcel Particulars' tab with the text: 'Pick particulars that apply with a click of the mouse.'

... enter data easily using menus and comment fields



Files generated in
GeoID by the
demarcation team

... push button to enter data



Enter Data

Parcel Data

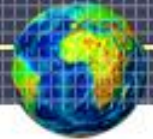
Parcel No:

Location **Features** **Owners** **Adjacent Owners** **Parcel Particulars** **Data Points**

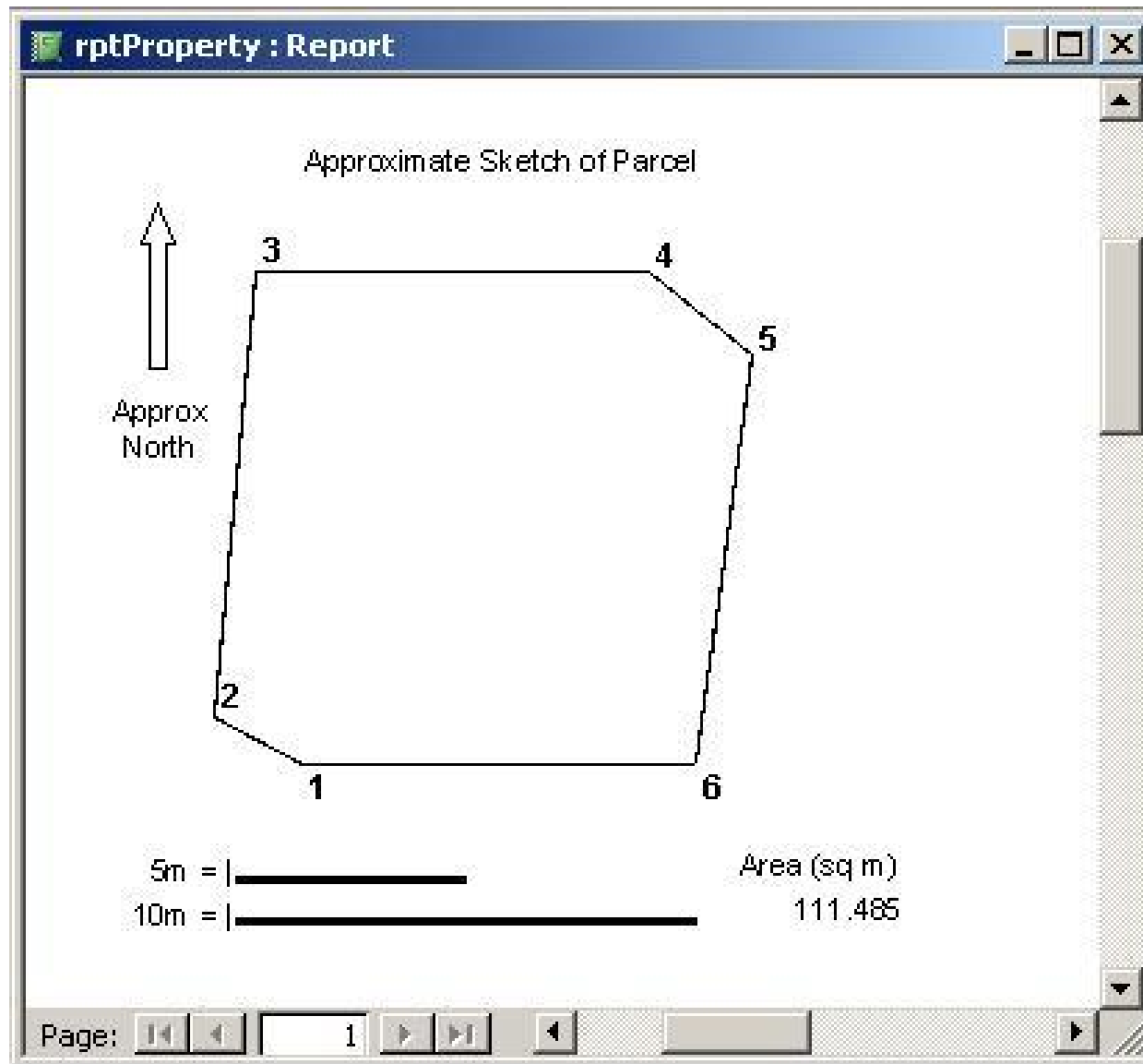
	Northing	Easting	Hemis	Mark		Perimeter Point	Point Order
▶	38451.597317	453049.292013	N			<input checked="" type="checkbox"/>	<input type="text" value="1"/>
	38452.597317	453047.392013	N			<input checked="" type="checkbox"/>	<input type="text" value="2"/>
	38462.297317	453048.200000				<input checked="" type="checkbox"/>	<input type="text" value="3"/>
	38462.297317					<input checked="" type="checkbox"/>	<input type="text" value="4"/>
	38460.400000					<input checked="" type="checkbox"/>	<input type="text" value="5"/>
						<input checked="" type="checkbox"/>	<input type="text" value="6"/>

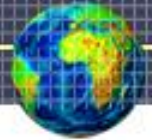
Identify parcel perimeter points and their order

... you may push button to preview data



Preview demarcation data





... or Generate Final Report

GEO-DATA
SYSTEMATIC DATA COLLECTION FORM

Measured and booked by Worker 1 Date 9/8/2004

PIN	District Ntungamo	County / Municipality Kajara	Sub-county / Town Bwongyera	Parish / Ward parish	Village / Zone ward	Parcel No. 1
-----	----------------------	---------------------------------	--------------------------------	-------------------------	------------------------	-----------------

Buildings

Commercial

Rocks

Hard

Hardwood trees

Mahogany

Muvie

Any other features

UTM COORDINATES OF PERMANENT STRUCTURES

Norhtings	Eastings
36951.597317	453186.292013
37266.597317	453047.392013
38462.297317	453186.292013
38462.297317	454081.792013
38402.497317	454311.992013
36951.597317	454081.792013

Approximate Sketch of Parcel

Area (sq m)
111.485

TURNING POINT COORDINATES

Point	Norhtings	Eastings
1	38451.597317	453049.292013
2	38452.597317	453047.392013
3	38462.297317	453048.292013
4	38462.297317	453056.792013
5	38460.497317	453058.992013
6	38451.597317	453057.792013

Total Area (sq. meters)		111.485
Point to Point	Segment Length (meters)	
6 - 1	8.5	
1 - 2	2.147091	
2 - 3	9.741663	
3 - 4	8.5	
4 - 5	2.842534	
5 - 6	8.980534	

PARTICULARS OF OWNERS

Owner / Spouse / Address	SEX	DATE OF BIRTH	Full Names of adjacent owners
John Smith	M	9/7/1980	Joe Williams
Jane Smith	F	3/15/1981	David Jones
One Main Street OurTown			

Comments

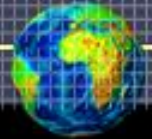
Parcel crosses two zones

PARTICULARS OF THE PARCEL

Third party rights	Current use of the land	Tenure type	Number of people living and depending on the parcel	Utilities	Water points / Easements
Animal pasture Communal well/spring	Commercial/Industrial Mixed farming	Leasehold	5	Telephone Running water	Bore hole Well

B/W pictures also possible

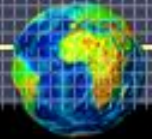
... data including picture automatically joined



Main Advantages

- Affordable dm-accuracy
(substitute L1/L2 system for higher accuracy)
- Easy to use - two and five days training
- African/C.Am. training and follow up sites
(RCMRD-Nairobi, DG-Kampala, DG-Tegucigalpa)
- Field visits
- 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.



DataGrid

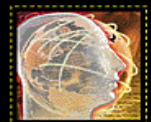
offers

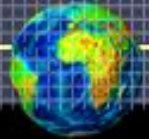
- survey grade GPS hardware L1 or L1/L2
- GIS / LIS / Natl. Res. & Risks Managm.
- "turn key" custom hardware/software packages

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



Help us help you...

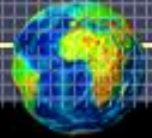




DataGrid Support Providers & Applications Centers

www.datagrid-international.com





Integrated core system

www.datagrid-international.com

Database

- **customized** (Hard-keyed organization, standard entries ...)
- **streamlined menus**
- **upgradeable** (compatible with ArcCadastre)
- **flexible structure** (Compatible with VAN DER MOLEN and LEMMEN recommendations)

Data Collectors

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

Procedures

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