

Participatory use of GIS

Jeroen Verplanke

ITC 2004

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Using GPS and PDA in Practice



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About PDA the Personal Digital Assistant

- The Compaq-iPAQ pocket PC
- 64 Mb RAM memory
- 16Mb – 256Mb optional Flash memory
- 400 Mhz processor
- running MS-Windows-CE v.3.09
- backlight-features so that in bright sun the screen is still readable.



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About Pocket PC (PDA)

- Easy installation of software
- Easy synchronization of files



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About ArcPad™

- Convert GPS readings 'on-the-fly' to the coordinate system in use.
- Any image, GT-Sheet, or shapefile can be displayed in Arc-Pad.
- The user can save the GPS-Track log (as points), or prepare new shape files.
- The software also allows to prepare forms



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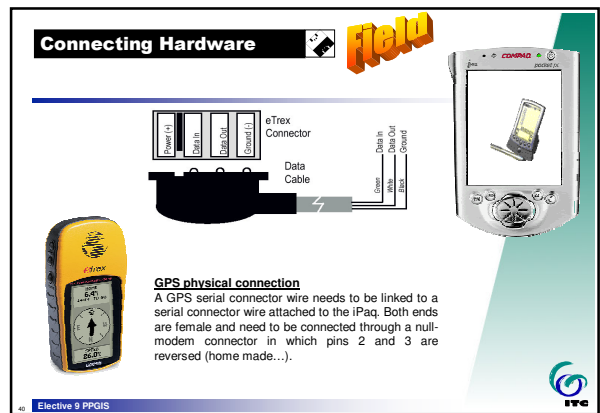
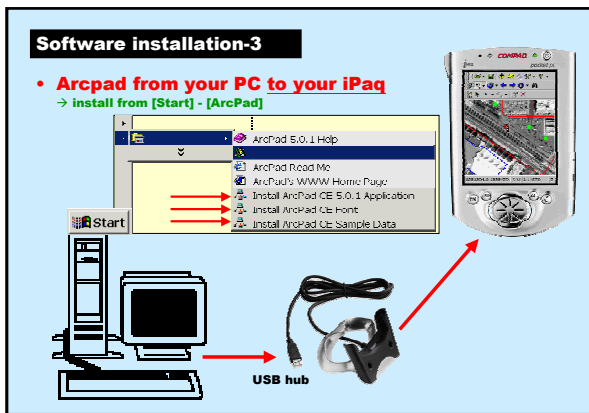
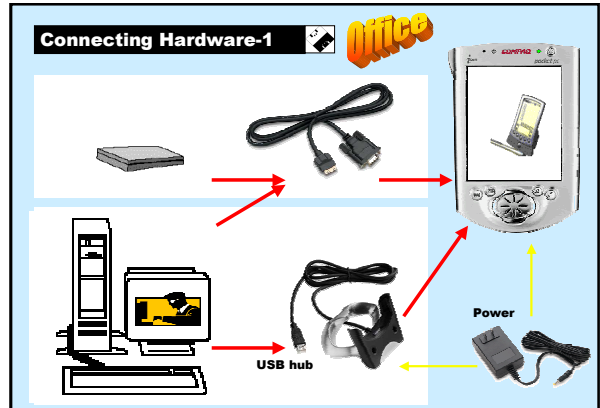
About ArcPad™

By using MrSID data compression Images can be compressed by a factor 25!!!
Example: compressed from 25 to 1 MB.



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Hardware settings: ArcPad

Arc-Pad settings

- GPS: NMEA protocol, WGS84 Datum
- GPS Port: port com1, Baud 4800, Parity none, Data bits 8, Stop bits 1, Break 0.

Hardware settings: GPS

GPS settings

- 'units' settings: position format: hddd.ddddd°, map datum: WGS 84, and units: metric
- 'interface' settings: i/o format: NMEA out, and baud rate: 4800.

GPS-iPaq Warnings

- Not for GIS amateurs
- Requires user to know facts on projection systems 'properly'
- Requires proper preparation:
 - of geo-referencing images
 - of compressing images
 - of converting shapefiles
 - of preparing symbologies
 - of preparing forms
- Requires proper GPS-ArcPad software settings

Example-1 ... Pakistan

Example-2 ... India

IRS-Image (23m Multi-spectral fused with 6m Pan)

Jan. 2000

Sep. 2002

Sep. 2002

Digitized "in the field"

Example-3 ... Iran

Aster-Image, Topsheet, GPS data... All fit !!!

Aster-Image (15m Multi-spectral)

Jul. 2001

Digitized "in the field" and "on the road"

Projection settings-1

To convert 'on-the-fly' coordinates sent by the GPS to Arc-Pad, at least one Arc-View shapefile must be loaded as Arc-Pad layer for which a projection file (*.prj) exists in the same directory as from where the shapefile was loaded.

Example "Enschede" :

```

PROJCS["ED_1950_UTM_Zone_32N",GEOGCS["GCS_European_1950",DATUM["D_European_1950"],SPHEROID["International_1924",6378388.297],PRIME["Greenwich",0],UNIT["Degree",0.0174532925199433]],PROJECTION["Transverse_Mercator"],PARAMETER["False_Easting",500000],PARAMETER["False_Northing",0],PARAMETER["Central_Meridian",9],PARAMETER["Scale_Factor",0.9996],PARAMETER["Latitude_Of_Origin",0],UNIT["Meter",1]]
  
```

Projection Information

Projection = ED_1950_UTM_Zone_32N
 Projection Type = Transverse_Mercator
 Projection Units = Meter
 Projection Units Factor = 1
 Datum Name = D_European_1950
 Spheroid Name = International_1924
 Semi-major Axis = 6378388
 Inverse Flattening = 297
 False Easting = 500000
 False Northing = 0
 Scale Factor = 0.9996
 Origin Longitude = 9
 Origin Latitude = 0
 Standard Parallel 1 = 0
 Standard Parallel 2 = 0
 Azimuth = 0
 Prime Meridian = 0
 Geographic Units = Degree
 Geographic Units Factor = 0.0174532925199433
 Method = Geocentric_Translation
 dX = -67
 dY = -98
 dZ = -121
 Fx = 0
 Fy = 0
 Fz = 0
 Sc = 0

Projection settings-2

Then, when applicable, the correct datum shift must be selected within ArcPad.

Example "Enschede" :

Name	ID	TrackID	Method	Spheroid	A	IP	DX	DY	DZ	FX	FY	FZ	SC
D_Eur...	6230	1588	Prostor_Ve...	Internatio...	6378388	297	-116	-56	-118	0.527	0.464	-0.444	0.32
D_Eur...	6230	1612	Prostor_Ve...	Internatio...	6378388	297	-116	-56	-118	0.893	0.921	-0.917	-3.52
D_Eur...	6230	1613	Prostor_Ve...	Internatio...	6378388	297	-90	-101	-123	0.333	0.077	-0.094	1.994
D_Eur...	6230	8033	Geocentric...	Internatio...	6378388	297	-87	-98	-121	0	0	0	0
D_Eur...	6230	8034	Geocentric...	Internatio...	6378388	297	-87	-96	-120	0	0	0	0
D_Eur...	6230	8035	Geocentric...	Internatio...	6378388	297	-103	-108	-141	0	0	0	0
D_Eur...	6230	8036	Geocentric...	Internatio...	6378388	297	-104	-101	-140	0	0	0	0
D_Eur...	6230	8037	Geocentric...	Internatio...	6378388	297	-130	-117	-151	0	0	0	0
D_Eur...	6230	8038	Geocentric...	Internatio...	6378388	297	-96	-96	-120	0	0	0	0
D_Eur...	6230	8039	Geocentric...	Internatio...	6378388	297	-87	-96	-120	0	0	0	0
D_Eur...	6230	8040	Geocentric...	Internatio...	6378388	297	-84	-95	-120	0	0	0	0
D_Eur...	6230	8041	Geocentric...	Internatio...	6378388	297	-117	-132	-164	0	0	0	0
D_Eur...	6230	8042	Geocentric...	Internatio...	6378388	297	-97	-103	-130	0	0	0	0
D_Eur...	6230	8043	Geocentric...	Internatio...	6378388	297	-97	-88	-135	0	0	0	0
D_Eur...	6230	8044	Geocentric...	Internatio...	6378388	297	-107	-88	-149	0	0	0	0
D_Eur...	6230	8045	Geocentric...	Internatio...	6378388	297	-84	-107	-140	0	0	0	0
D_Eur...	6230	8148	Geocentric...	Internatio...	6378388	297	-112	-77	-145	0	0	0	0
D_Eur...	6230	8184	Geocentric...	Internatio...	6378388	297	-84	-97	-117	0	0	0	0
D_Eur...	6230	8237	Prostor_Ve...	Internatio...	6378388	297	-89	-93	-123	0	0	-0.156	3.2
D_Eur...	6230	8372	Geocentric...	Internatio...	6378388	297	-86	-92	-127	0	0	0	0
D_Eur...	6230	108111	Geocentric...	Internatio...	6378388	297	-86	-108	-120	0	0	0	0
D_Eur...	6230	108121	Geocentric...	Internatio...	6378388	297	-89	-134	-111	0.53	0.14	-0.57	-3.4

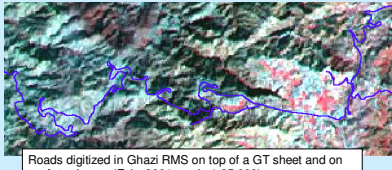
Mapping in the Field-1

Performance in Hills

Often, main roads are poorly mapped on GT-sheets, while (15m resolution) images of mountainous areas hardly show the roads.


Digitizing roads by GPS in hills proved very useful and accurate enough to fill this shortcoming.

Digitizing administrative boundaries in hills on foot using a GPS is not considered practical.



Roads digitized in Ghazi RMS on top of a GT sheet and on an Aster image (Febr.2001; scale 1:25,000).

Mapping in the Field-2



ArcPad can provide accuracy warnings !!!


Ideal tool for the 3 handed fieldworker



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Hardware alternative

- "Jacket GPS" (Navman 3000)
 - Comparable accuracy
 - Less options (black box)
 - Weaker acquisition of signals



Fully integrated solution

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Some conclusions

- Much of the quality and usefulness of the data recorded with this combination of PDA and GPS depends on the skills and knowledge of the operator.

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- Although the tools are pretty straightforward to use, even for inexperienced users, it requires specific knowledge to prepare the right configuration in order for it to become straightforward.

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- GPS and ArcPad™ settings will be different for each country or region and therefore need to be carefully observed and should correspond to the geo-reference and projection settings of the background data (maps and satellite images).

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