

Virtual Field Assistant: Terrain analysis in the field with geologically focused GIS on a smartphone or tablet



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Session T70. Digital Technology in Real and Virtual Geoscience Experiences November 1, 2015



1985 Apple II Field Terrain Analysis









MicroFix—fielded Army system https://www.youtube.com/watch?v=OMsQkzpNLDg

Using Handhelds in the Field

Data entry Digitization Dip and strike measurement Map and image display **Compute** location ***Terrain analysis *Geologic computations**



After Mookerjee and others, 2015



Today's Field Platform?

				Dimensions	Weight		
OS	Device	Screen	Resolution	(in)	(gm)	Battery Life	GPS
Windows							
8.1	Surface Pro 3	12"	2160x1440	11.5x7.93x0.36	800	9 hours	No
Windows	Dell Venue 11						
8.1	Pro	10.8"	1920x1080	11.72x6.96x0.4	772	8-10 hours	No
Android	Nexus 7	7"	1280x800	7.81x4.72x0.41	340	9 hours	Yes
Android	Moto X	4.7"	1280X720	5.09x2.57x0.41	130	4 hours	Yes





Or These?





All Android



< Back to search results for "nexas 7"

Click to open expanded view



Nexus 7 from Google (7-Inch, 16 GB, Black) by ASUS (2013) Tablet by Asus ★★★★☆ ▼ 5,290 customer reviews | 1000+ answered questions

Price: \$165.00 & FREE Shipping. Details

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available

Want it tomorrow, June 12? Order within 14 hrs 21 mins and choose Same-Day Delivery at checkout. Details Size: 16GB



- \$275.90
- 7-inch tablet screen, 1200x1920 (323 ppi), LED-backlit IPS LCD capacitive touchscreen
- Powerful 3950 mAh battery, 10 hours, 15Wh Li-polymer Battery
- Qualcomm Snapdragon S4 Pro 8064 Quad-Core, 1.5 GHz
- Memory: 2GB, 1.2 MP Front Camera, 5 MP Rear Camera, Auto focus (rear), Large f2.4 aperture. (rear camera)
- Output:5.2V 1.35A/7W for other USB device, Input:100-240V AC, 50/60Hz universal, Support Wireless Charging

> See more product details

What do you want to pay for?

New Latitude 12 Rugged Tablet

Intelligently tough.

12" 2-in-1 meets rigorous military-standard requirements. Made with shock-absorbent materials and compression-sealed from sand, dust and liquids.

Starting at \$184900

Get \$92 back in rewards



Hardware				
10	Visually pleasing screen			
3	Lightweight and comfortable			
3	Waterproof and ruggedized			
3	Connects with other sensors			
2	Quality camera			
2	Reliable/accurate sensors			
1	Long battery life			

Software: data management					
9	Easily syncable to database, backup to the cloud				
9	The ability to access/download existing data				
4	Data is easily exportable in useful, agnostic formats				
2	Efficient workflow				
1	The ability to share data easily				
	Software: foundational				
11	Open source ("community ownership") and free				
7	Available on all platforms (e.g., Mac, PC, tablet, phone)				
6	Open Geospatial Consortium (OGC)/standards compliant				
1	Extensibility (designed for future growth)				

Software: Tools				
16	Accurate Measurements: orientations, GPS, projections			
11	Feels like a field notebook (starts with a blank page look)			
11	Maps: pre-load, interactive layers, tools (pts/lines/polys)			
10	Sketches/photographs: georeff, edit, annotate			
8	Voice recognition: offline, map symbols			
4	3D/Augmented Reality			
3	Select rock types from diagrams (e.g., a ternary diagram)			
3	Operate offline			
3	A companion Desktop app: curate/customize mobile app			
3	Connectible to various other sensors			
2	The ability to build a stratigraphic column			
2	Easily customizable/modular use of screen real estate			

Mookerjee, M., D. Vieira, M. A. Chan, Y. Gil, T. L. Pavlis, F. S. Spear, and B. Tikoff (2015), Field data management: Integrating cyberscience and geoscience, Eos, 96,doi:10.1029/2015EO036703.

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ianMICRODEM, Nov 2015

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What do you want to automate? What's on field handheld? What's on desktop at base camp?



Design Philosophy

Entirely offline

- "Cheap tablet" with no net connections
- Locations off the net
- No mouse, keyboard, stylus
- Partner with desktop/laptop GIS
- Download data
- Subset, reformat data
- Use keyboard, mouse

Incremental

Start with basics

- GPS location on base map
- 3D graphics of current location
- Geologic computations like 3 point problem Pair with other programs
- Data entry
- Dip/strike measurement

Add new capabilities over time—full core of the GIS runs in native code on handheld

Multiplatform Windows and Android working iOS and Mac OS can use same code

Android



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Screen center: N 38.9898210° W 76.4932702° z= 13.23



Point Selection

Current GPS Position Current Screen Center (finger ≠ mouse), drag map to position Confirm with button





Pick screen center Pick screen center Current screen center Current GPS position

DEM Base Maps



3D Panoramas

° 70° 75° 80° 85° 90° 95° 105° 115° 125° 135° 145°



Match photo, view, get coordinates from screen

Line of Sight/Topographic Profiles



LIDAR (LAS point cloud)



Lidar











Mesh Diagrams







Mouse at: N43.2154634° W111.229129° z=2337.56

3 Point Problem



Mouse at: N36.5738748° W115.312872° z=1923.43

Thread Start: Thread ID: 11112, Process ianMICRODEM.exe (6324)



MICRODEM

- Freeware
- Windows only, 32 and 64 bit
- Delphi DX Seattle Professional (\$1081)
- ~230 forms
- ~350,000 lines of code
- Full GIS, focus geology/geomorphometry



ianMICRODEM

- Open source
- Windows and Android working
- iOS and Mac OS possible
- Delphi DX Seattle Professional (\$1081 + \$540)
- Subset of MICRODEM useful in field
- Same base code, complete new UI
- ~70,000 lines of code
- Contact me for details

Map Drawing: Windows 10, 8 cores



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Nexus 7 (4 cores)



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Data Sets Currently Supported



DEMs: MICRODEM format, GeoTiff
Imagery: untiled Geotiff
Lidar: LAS format
Topo quads: Geotiff (from GeoPDF very slow in GDAL, huge files)
National Geologic Map Database: Geotiff (from KMZ, their "Geotiff" via ESRI)





One Datum: WGS84/NAD83

Integrate with Desktop MICRODEM (or QGIS or Arc or)

Reformat data, with GDAL Get USGS WMS imagery and save as Geotiff Convert KMZ geologic maps to Geotiff Pre and post analysis in full GIS





Next Steps

Download program and data provide feedback

- <u>http://www.usna.edu/Users/oceano/pguth/ianMD/</u>
- Windows and Android

Code for iOS, Mac OS if you want those platforms

• Open source

Code for Android phones, Google Glass

• Open source

Cell Phones/Tablets Can do Geologic GIS

Native code Little slower than desktop In the field Vest or shirt pocket Smart interface





Demos near posters, #3 12:00 noon 4:00 PM

http://www.usna.edu/Users/oceano/pguth/ianMD/

Situational Awareness



Figure 4. Photo taken by a GMIHC Crew member on two-track road on June 30, 2013.

A Fateful Fire and the Men Who Fought It

ON THE BURNING EDGE KYLE DICKMAN

"The Botshots' world is exotic and specialized and the entry Lewry effers is stronning and rare ... Bers is an original and special voice." ATTENT WORTON, New York These bettelling author of Jankeed







1/3" NED Add vegetation, land cover

GPS & compass

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