



ESRI ArcPad 6.0

Joe Bell, LS

ESRRI ArcPad software is a mobile mapping and GIS technology that comprises the integration of four technologies: GIS, lightweight hardware, GPS, and wireless communications. ArcPad 6.0 provides database access, mapping, GIS, and GPS integration to users out in the field using handheld and mobile devices. Data collection is significantly improved with immediate data validation and availability.

What You Can Do with ArcPad 6.0

- Use your existing data. ArcPad 6.0 supports vector map and raster image display including ESRI shapefiles and

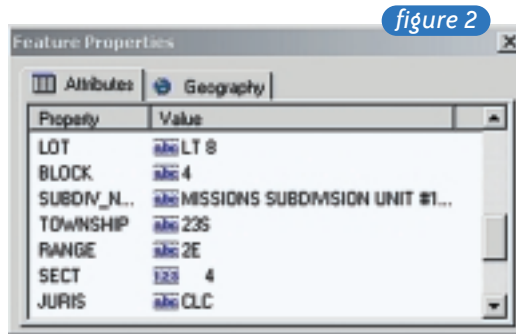


figure 2

LizardTech MrSID imaging language formats.

- Add data from the Internet via wireless communications. ArcPad 6.0 includes wireless data acquisition, and can act as a client to ArcIMS (ESRI's Internet mapping and GIS software), or to the Geography Network (www.geographynetwork.com). It uses a TCP/IP connection such as a wireless local area network, cellular phone or wireless modem.

- Move around your map. ArcPad 6.0 has a number of map navigation tools, including variable zoom, fixed zoom, zoom to specific layer or spatial bookmark and center the current GPS position.

- Query your data. You can identify features by tapping on them. You can display additional information about features through a hyperlink, and you can locate a feature within the extent of your map, label it, and zoom to it.

- Measure distances, area, and bearings on your map with three measuring tools: measure, free-hand measure and radial measure.

- Navigate with your GPS. Connect a GPS to your mobile device

and let ArcPad 6.0 guide you. A window on your mobile device shows you the current position, the kind of data being processed, current speed, current head distance to the mark, bearing to the mark, and the current PDOP. It shows you a compass with the direction to the mark displayed, a marker for the current GPS position, and a track showing you where you have been.

- Edit your data. ArcPad 6.0 allows you to create and edit spatial data using input from either a mouse pointer, pen, or GPS.

In addition, using a separate product, ArcPad Application Builder (which includes ArcPad Studio), you can completely customize ArcPad 6.0. Make lists of acceptable descriptions, set reasonable limits for input items to trap keying errors, develop new file formats and new tool bars, and customize forms for special projects.

The documentation that comes with ArcPad 6.0 is complete. It has tutorials, complete information about all of the operating systems on which ArcPad 6.0 runs, the pocket machines on which it runs, and the GPS systems that they have used with it (even the Navman). They even give you an example of the kind of customization you can achieve with ArcPad Application Builder. Nearly 400 pages in length, this is the best source book for understanding GIS and GPS that I have ever read. It is straightforward, illustrated, and provides many examples. Not only is the documentation complete, it helps you to select the right hardware for your particular task. There are instructions for how to hook up various GPS receivers (and they work). Also included is a discussion of

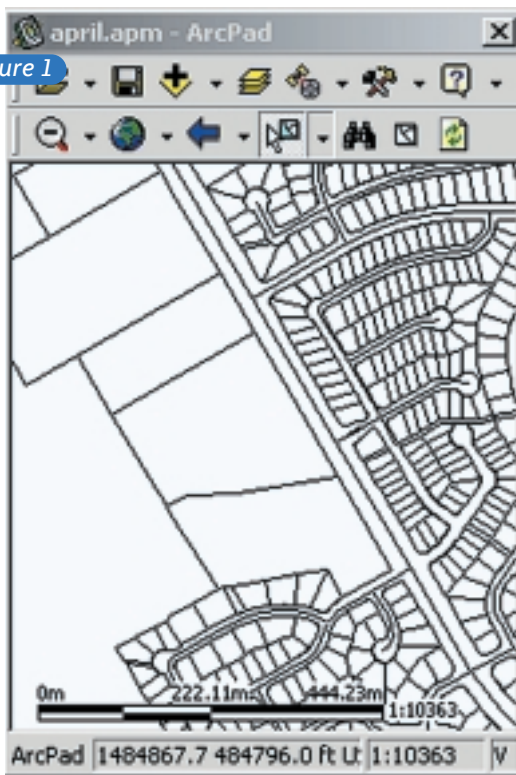


figure 1

Courtesy of The Library of Congress



the kinds of corrections that exist, what they are, and how they work. ArcPad 6.0 also works with less common equipment like depth finders for surveying the bottoms of bodies of water.

Points, Arcs, and Polygons

You can actually build a GIS with ArcPad 6.0. A GIS is a collection of points, arcs (lines) and polygons (closed figures). For example, if the points represent city-owned trees, they could all be kept in one shapefile. Tree types could be categorized by naming them in a regular database table that is linked to the shapefile, and by assigning different point symbols to the various tree types. You can georeference the points using a GPS receiver, using entered coordinates or by picking the spot on an existing shapefile. Lines such as canals, streets, power lines, and so forth can be located in the same way. Polygons such as parcels, school districts, city limits, can be georeferenced. You can also add to

an existing GIS. I updated a new road in the county database, which I will discuss later.

Photographs, videos, and entire documents can be added to features in the GIS using hyperlinks. Hyperlinks are addresses, which can be a storage card address, or a memory address or even a URL (an Internet WEB page address). The private surveyor can therefore access client records, financial records, maintenance records, vendors, and more from the office GIS.

Take a County to the Field

Of the many uses of ArcPad 6.0, and one use that interested me most, is the ability to carry an entire county GIS into the field. Before the City of Las Cruces put a stop to it, Dona Ana County was selling the entire parcel map GIS on a CD ROM for \$50.00. It was great to be able to look up the information on any parcel in the county when I got home. How much better it would be if I had it in my pocket all the time. Have you ever done research and needed to know what the name of the subdivision of the parcel you were surveying? Did you ever need the parcel ID or owner's name to look up a deed of an adjoiner? With this program you can actually pull a copy of the deed to your pocket PC with a cellular phone.

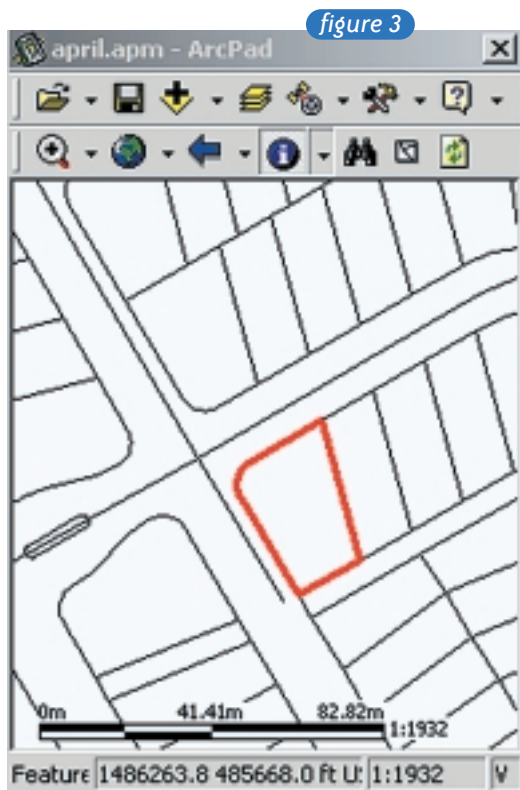
Figure 1 shows the screen on my iPAQ which depicts a very small part of the county where I live. My parcel was outlined when I used the "I" pick to pick my parcel. **Figure 2** shows part of the database file that popped up when I selected my parcel. **Figure 3** shows the lot in question: Lot 8, Block 4 of Missions



Subdivision Unit #1. Of the thousands of parcels in the county, all this information is in my pocket. Since an update is no longer possible, the fact that I can update and sell this GIS may provide me with another source of income. I have all of the tools I need to lay in new roads as they are built. I can even put in new subdivisions or update and expand the GIS to include drainage or other information, or even prepare a flood map on a disk.

Suppose your Parks and Recreation Department needs a more efficient way to manage the trees. You can create a GIS that will allow them to locate every tree, identify it by type or nearest house address, or by the last time it was checked for adequate watering, disease, etc. You can even generate work orders directly in the field and send them back by phone to the maintenance crew. The documentation actually comes with a description of such an applet (little program).

I hope to be able to create such a system for the local government and write a future article about the process. (You, too, may be able to help your city or county by demonstrating what is possible for a very few dollars.) The first project I intend to undertake is the updating of the county database. The second project will be to create my own database and GIS for all the work I have performed in the county. This is now





possible for every surveying and engineering firm in the world.

GPS Tools

The documentation on the use of GPS and the tools provided in ArcPad 6.0 are the most practical I have ever seen. What you will learn about using GPS is worth many times the price of this program. Not only can you use receivers like the Garmin receivers and other small handhelds, you can use non-handheld receivers. You can use RTK, DGPS, broadcast corrections or just navigation receivers. You can see the sky plot, signal strengths, or if you are searching, a display that shows not only the direction in which you are heading but also the direction to the object for which you are searching.

My county GIS is in SPC 3002 (New Mexico Central) and in U.S. Feet. The Navman and the Garmin both work in latitude and longitude (although you can display UTM in meters). ArcPad 6.0 automatically converts the input of the GPS receiver (or whatever else you put into the shapefile) to the coordinates of your map. I first tried this out in a park and could not get a consistent fix because of all of the trees. I was afraid that either my map was not good, that there was something wrong with my Navman, or that ArcPad 6.0 was not correctly converting to the existing coordinate reference, so I took it out on the roads I know well. It worked so well that there was no crisscross of the southbound and northbound travel. I decided to add a new part of Northrise Drive. I updated the GIS in ArcGIS (shown in **Figure 4**). The other road is called Sonoma Ranch Road. When it is extended, I will add that as well. There are many things that have not been added to this parcel GIS for the County of Dona Ana—canals, drains, trees, manholes, traffic lights, stop signs, fire hydrants, water meters,

gas meters, telephone risers, cable risers, and who knows what else that might be marketable.

I noticed that the accuracy of the navigation position in motion is much better than ± 60 feet. I measured the distance from my car to the property corner with a tape as 40 feet. I measured the GPS track to the property corner on the map as 34.4 feet—better than six feet with no correction, and ten times better than expected. I hope that by the time I write another review of ESRI software, I will have discovered whether it is an improvement in the broadcast ephemeris or some special way in which ArcPad 6.0 handles the GPS output. At the very least I can say that on this day, ArcPad 6.0 worked extremely well on the iPAQ 3635 with the Navman sleeve. When a correction signal becomes available in New Mexico, it will be interesting to see just what kind of accuracy can be reliably maintained. The GPS tools are good, allowing you to skip measurements with a PDOP of greater than whatever limits you set. You can even set the expected accuracy

figure 5



of each point by being able to control the averaging of readings on that point. I wish that I had known just how much I was not getting out of my little handheld GPS. If you have a handheld GPS, that is reason enough to buy this program. The fun you will have will justify the cost.

Income Potential

There are many first-rate features of this program that cannot be covered in a brief article such as this. **Figure 5** shows a combination raster and vector image. This is part of San Diego, California and is part of the applet that is used to manage the city trees.

As a surveyor, you have spent a good part of your life learning the varied skills of measurement and map making. If you are letting GIS contracts slip through your fingers, not only are you depriving yourself of substantial income, you are denying the public the benefit of your experience and training. If you do not take on this part of mapping, then non-surveyors unfamiliar with the art of measurement and the wrinkles in the Public Lands System will do it.

You can download a working copy of ArcPad 6.0 from www.esri.com but it will only run for 20 minutes at a time until you buy it. What is even better is downloading it for the documentation. Anyone who does not download and read this documentation is passing up a great opportunity. I think you will agree that this is a candidate for the best software package of the year. ESRI, I am really impressed. ♣

JOE BELL is the owner of SCJ GPS/GIS Consultants in Las Cruces, New Mexico, and the Software Reviewer for the magazine.





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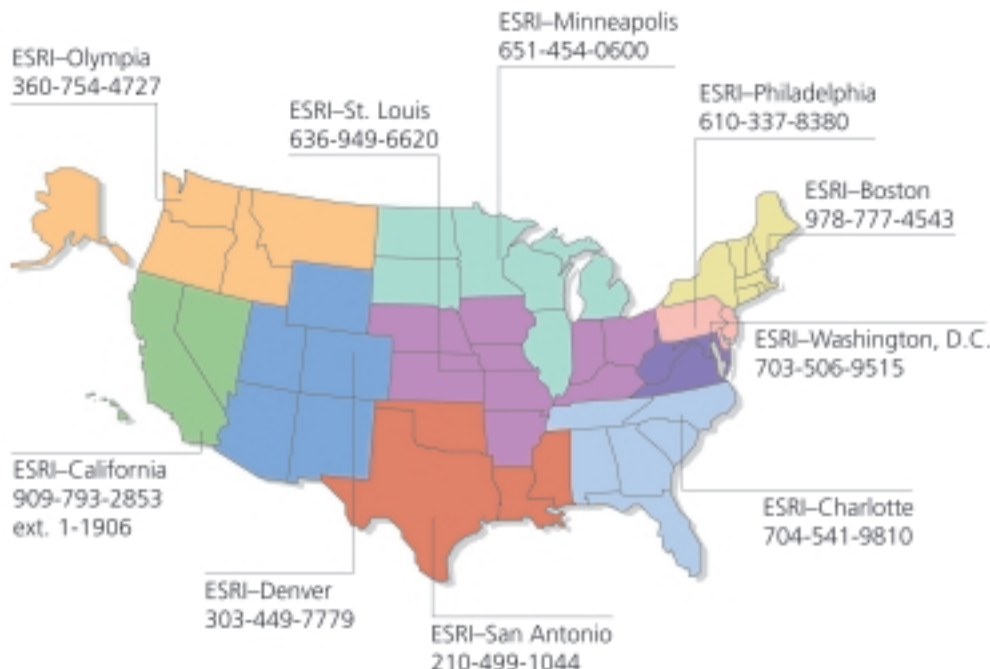
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