

The Wave of the Future Part 1

Surveying with a PDA

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Introduction

Auriga (ô-rî'gu) is a freeware program for PDA's (Personal Digital Assistants) running on a Palm OS operating system. The original programming was implemented by Martin Melzer to work along side his sensor box (containing an electronic compass and clinometer) which would automatically acquire cave survey data. The hardware progress ceased in 2000 but the software development was resumed in 2002 by Luc Le Blanc a native of Montréal (Québec), Canada. In 2003 a software conduit was created by Christian Chénier which allows the bidirectional transfer of data between Auriga and many desktop cave survey programs, including Compass and Visual Topo. The conduit means the user does not need to retype the data

on their home PC after a survey; rather they simply link the PDA to the PC and the software imports and translates the information into the other program. Auriga is designed to be used as an in-cave smart survey notebook. During the surveying process, Auriga updates a line plot map, tracks statistics, can find and fix errors, and aid in drawing via a sketch to scale assistant. It is currently used in conjunction with a piece of grid paper (for the actual drawing) but all physical numerical data are inputted into Auriga. The program itself is highly customizable and is currently available in three languages (English, Spanish, and French).

Understanding Auriga

The Auriga program was designed to be as user friendly as humanly, make that mechanically, possible. From the first time you turn the program on you are greeted with a simple yet sometimes highly debated question, feet or meters? While this question is not groundbreaking by any means it does show that the program's writer was trying to



*New age surveying tools: PDA with protective case, Suunto Tandem combination compass and clinometer, Leica Disto A6 laser rangefinder, cyalume, and survey notebook. Note the survey book and PDA are mounted on a custom made clipboard for easy transportation underground.
Photo by K. M. Kissell*

make it as easy and streamlined as a veteran book keeper's own survey book. With your units selected the program opens up what is known as "the Main Form;" this is the screen you will always see when you start Auriga. It should be noted that there are many references to different "forms"

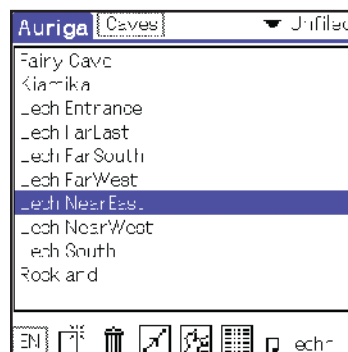


Figure 1: In "the Main Form" the user can start, edit, or delete a survey.

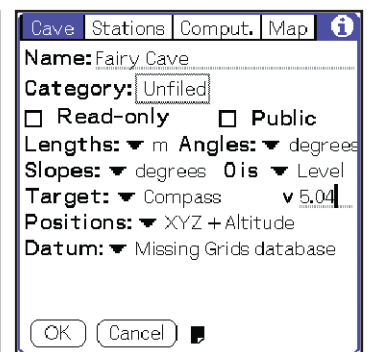


Figure 2: "The Cave Form" is used to control settings for a specific cave.

Figure 3: Instrument adjustments can be made in “the Sessions Form.”

Figure 4: “The Survey Shot Form” allows for standard input of data at and between stations.

Figure 5: Using a geographic position in “the Survey Shot Form” gives a cave a starting location and orientation.

Figure 6: The keypad self adjusts depending on what piece of information the user is entering.

and these should be thought of simply as different pages of a book, each one contains varying information required to reach the end. From “the Main Form” (Figure 1) you can change Auriga’s language, start a new or delete a survey, edit the survey data, view the map for a selected survey, view a list of all the information for each station, or add a note to a survey title. All this is accomplished by a set of icons that are along the bottom of the screen; these icons stay with you on most of the different forms (pages) and they provide the primary means of navigation while using Auriga.

When beginning a new survey one must simply tap the “new” icon to open the next form which is “the Cave Form” (Figure 2); here you begin the sometimes arduous task of controlling the numerous settings that give Auriga its user customization. Cave name, angle and slope units, datum, station name format, closure error, deviation, paper grid size, and target program (e.g. Compass, Walls, etc.) can all be set using the various tabs found on “the Cave Form.” While to some this may seem a bit ridiculous, it is nice to know that the program remembers nearly all the general settings on its own; basically you can skim over these each time you start a new survey and you will very rarely have to change them after the first time. Once all your general settings are up to your specifications you can tap “OK” and another option filled form opens—this one is “the Session Form” and it is used to assign specific settings to a specific session. It is at this point that you may be asking yourself, what is a session? Simply put, sessions are settings for either a particular survey, set of instruments, team, or day of survey. There can be numerous sessions listed in the same cave, i.e. a cave that takes three days to survey will have three different sessions. “The Session Form” (Figure 3) tracks the date for each session as well as settings for the instruments used during that session. The user defines what type of instrument is

used for length measurements (e.g. tape, Topofil, Disto, Rangefinder, or Toposcan) and units and number of decimals can also be defined. The Azimuth and Slope instruments (compass, clinometer, Theodolite, TNT module, Toposcan, etc.) can also be set, complete with unit and calibration settings. That means that if you know your instruments are not quite zeroed in correctly you can set it to compensate if you know how far your instruments are off. “The Session Form” comes complete with two sets of these settings, one for front shot and one for back shot. The final tab under “the Session Form” lets you decide whether or not to use, see, or store back sights, whether to use passage size on the start station or end station and even what color you want the line plot to be on the map (handy for differentiating days of survey or teams.) Upon completion, “the Session Form” offers a save feature so it can apply the settings to each shot. With saving complete you are ready to start inputting data into the program.

Get use to the next form because you will be seeing it a lot. It is known as “the Survey Shot Form” (Figure 4 and 5) and it is where you will input the start station and end station, length, azimuth, slope, left, right, up, and down for each shot. A unique feature to Auriga is the ability to create virtual shots, say at an entrance or pit and these shots can then be assigned a geographic position (UTM is the only format currently supported) and used to link two caves together—more of this will be covered below. A convenient feature of “the Survey Shot Form” is, once you start a naming sequence it figures it out and continues it. The only time this may be problematic is when connecting to another passage, i.e. where A01 connects to B01, however this is easily adjusted and the sequence starts again. Now if anyone has ever tried using a stylus to write in a centimeter square space, in gloves while your hands are shaking from

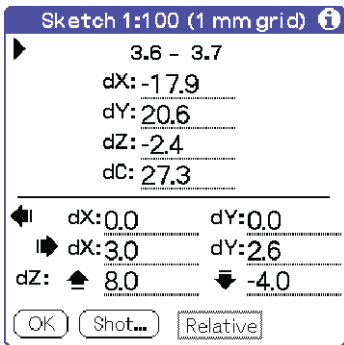


Figure 7: With “Sketch to Scale” the user simply counts boxes to place the next point on the book drawing. Here the -17.9 means 17.9 boxes to the left and the 20.6 is that many boxes up.

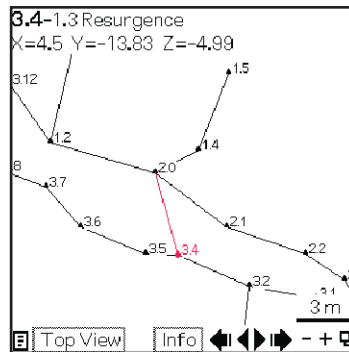


Figure 8: Many of the same features as desktop viewing software can be found in “the Map Form,” including a line plot and walls.

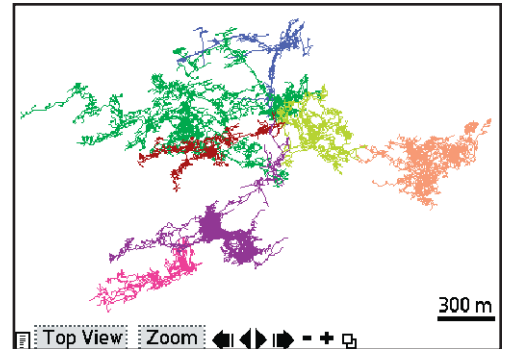


Figure 9: Caves that have been networked can appear on the same screen, making connections all the more possible.

the cold you may be thinking that writing all the data for each station would not be practical or even possible. However Auriga has the answer and that answer is a smart keypad (Figure 6). Now by smart I mean that the keypad, whose buttons are big enough to use with gloved fingers, reconfigures depending on what piece of data you are supposed to be inputting. With the start and end station and note you have a typical full character keyboard, length and azimuth gives you just a number pad with a decimal button, you get the same number pad with slope plus the addition of a minus button. Of course, along with the number pad you also get a button to reverse the direction of the azimuth and slope—this would be used in case a front shot is not possible for some reason. Finally with the left, right, up, and down walls you get the standard number pad as well as the decimal and a button labeled with an “X” which is used to represent a wall which in fact is a passage; this works the same way as the “P” in Compass. The keypad is very well thought out and once you enter it from “the Survey Shot Form” you can navigate through the different fields with convenient up and down arrows. Once all the necessary fields are filled a simple “OK” button takes you back to “the Survey Shot Form.” With the data entered, stations can be marked to help you remember certain things when viewing the map, for example, an “E” symbolizes an entrance while an “?” is used for a lead. Also of note is the ability to search for any station by its name, this can be very useful if dealing with a large complex survey where you could have hundreds if not thousands of survey stations.

As handy as not having to flip through pages of survey data can be, the most relevant feature, at least in my humble opinion, is the inclusion of a feature called “Sketch to Scale” (Figure 7). Using the grid paper setting from way back in the beginning Auriga makes the actual drawing of

the distances and angles between stations much easier. This feature basically tells you how many grid boxes to count up or down and left or right. That means you can kiss your protractor goodbye, and yes it even compensates for slope on low to high angle shots. To assist you in your sketching, Auriga also includes a constantly updating map feature, complete with grid lines that match those of your survey book. “The Map Form” (Figure 8) comes complete with zoom and pan, as well as an orientation selection, i.e. you can view a top view, an extended profile, cross-section, or any of the other four views of the map you could possibly want. Much like desktop cave viewers, you also have the option of seeing where the walls are by your choice of perpendicular lines or filled polygons; loop and closure errors also are identifiable by a dashed red line between two stations. All of these features can be extremely useful when drawing the map in the survey book. The sheer amount of data gives the drawer the ability to create an amazingly accurate map underground.

While the map feature is extremely useful it is not the only trick Auriga has up its sleeve. With the ability to network multiple caves or surveys (Figure 9) it may increase our capability to find other caves or connections between caves. Using GPS data at the entrances of various caves, Auriga can place those caves on the same grid sheet in accordance with each other and show each cave’s line plot. Thus it may be possible to look at the line plots for two networked caves and decide which survey route is most likely to lead to a connection; all of this can be accomplished underground and on the fly making route choice all the more easy. Imagine if they had this type of software and ability when they were looking for connections in Mammoth! On the topic of multiple teams, say you have two teams working in the same cave but coming at it from

different directions. Now if two teams want to work together they can easily and quickly share their data via infrared (IR) beaming ability built into any PDA—at any point you can beam any piece of data to another Auriga user. For example you could beam one shot, one session, or an entire map to another team to help tie into their existing survey. This means no more waiting until the end of the day to see if the two surveys connect. Sessions or shots can be beamed and linked to an existing survey by many means, including same station connections, i.e. two teams meeting at the same station and linking the two sessions that way. Also available on the map page is a line tool which can tell the user the distance and direction between two points, this is useful if two geographically linked surveys come close but do not connect, one could easily tell how much more passage (over a straight line distance) is needed to be surveyed in order to connect the two.

Practicality

I have been a PDA user for sometime now but I have to say when I heard about this program it did make me cringe. The thought of taking a small portable electronic device into the deep dark recesses of a cave, especially for a survey trip, seemed completely impractical and, dare I say, stupid! Upon doing a little research and finding out what worked and what didn't I came to the conclusion that while not impossible it would certainly take some thinking. The main concern is protection of the PDA while traveling underground; this includes keeping it dry and dust free. For the club this is handled by the purchase of an OtterBox 2600 PDA case (Figure 10). While this case can be a bit pricey it has proven to be well worth the money and shows no signs (other than mud stains) of being destroyed any time soon. Also, as any electric caver knows, all of our electronics require batteries to keep them useful; this is something a typical paper survey book does not require. This problem is also easily erected due to the large number of PDA's Auriga will run on, including the old Palm III which run off two AAA batteries. Even for those of us who own PDA's with rechargeable batteries all is not



Kate Ferguson inputting data into Auriga. All data can be inputted by tapping on the screen; there is no need actually to write out the information. Photo by K. M. Kissell

lost. Inexpensive rechargers that run off two or four AA batteries can easily be found online and are usually capable of recharging a PDA at least once if not two or three times. When a PDA's battery will last for eight hours at a time, a recharger gives you the ability to stay under for more than a day of straight surveying. Finally the last major issue is that of reliability. While not much can happen to a standard survey book, electronics are sometimes filled with glitches that could cause power loss or worse, data corruption or loss. Most current PDA's have built in flash memory, which means that even with a complete power loss, data are never lost. Auriga also supports the use of memory cards. At any time the user can save the entire survey to a secure memory card making it nearly impossible for data corruption or damage.



Figure 10: The OtterBox 2600 is a formidable opponent for dust, dirt, water, and grime.

Tomorrow and Beyond

Auriga is by no means a perfect program. After 35 beta versions the first non-test phase version (1.0) was just released last September and already the program has improved by leaps and bounds. Since September, Bluetooth support for the new Leica Disto A6 has been implemented and you can now transmit data straight from the laser rangefinder to the PDA with the push of a button. Gone are the days when you actually had to talk to your survey team!

Another added feature is that of a “Pit Sounder,” (Figure 11) an automated program that calculates vertical distances by using a mathematical formula along with the speed and acceleration of a falling rock. This highly accurate program can take the guess work out of knowing how much rope to lower into a pit.

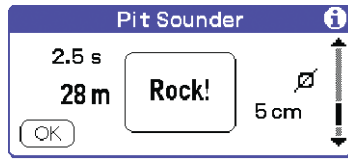


Figure 11: By telling Auriga the size of a rock, the program can accurately tell you the depth of a pit, cliff, or stainwell.

This article is by no means a complete representation of the entire Auriga program and it would take many more pages to list all the possible features and settings of this very well written and comprehensive in-cave survey program. With any luck the future incarnations of Auriga will bring with it the ability to draw the actual map right on the screen of the PDA and hopefully the ability to overlay Topo

maps on top of the line plots while underground. It is no doubt that Auriga will continue to improve over time. As we approach the all-digital age, the real test will come when Auriga has to face off against the old timers and their trusty paper survey books. Only time will tell who will win the battle of the survey books.

Notes and References

For more information regarding Auriga go to: <http://www.speleo.qc.ca/auriga/>

Information on Otter Boxes can be found at: <http://www.otterbox.com/>

Already have Auriga but need some help? Please see Brandon Kowallis’s website for video walkthroughs at: <http://www.brandonkowallis.com/Video.htm>

POETRY

a poem by lisa nichols

if you should decide to go caving
it's important to keep down the raving
for you'll scare all the bats
and they'll drop their top hats
and the guano from which there's no
saving!



Christy Taylor in Pine Hill Cave, Kentucky. Photo by Aaron Taylor.

The Crawlspace

An invisible force grabs my wrists,
Pulling me deeper into silent darkness.
I've lost all bodily control,
My limbs move by unconscious momentum;
The quest has begun.

I traverse the elongated passage,
My ribs are punctured, my breath is gone,
The serrated rock etches wounds in my skin,
But the quest has begun.

My mind is flaccid and pensive,
I conceive no conniptions, no paranoia,
I am only probing the unknown,
The quest has begun.

My body is desperate for quenched thirst,
But the soil, once glistened, is now encompassing my clothes,
My soul is elated as I reach a magical room,
The virgin passage is mine,
But the quest is not over.

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