Plotting bats on a map in GPS Utility

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I have used GPS Utility extensively as a tool for displaying and managing lists of waypoints and track points recorded while watching bats. The following notes explain how I used the Load Bitmap feature to display the path I took while watching bats, and where the bats were. Although there is information here which is specific to GPS Utility, the general principles could be applied in many different ways to many different programs.

1) I recorded a track on my PDA while walking around recording bats. Since I connected a Bluetooth GPS to Anapocket, my entire track was stored as an ABG file in the BatFiles directory on the PDA. This file, by the way, should be erased after downloading and copying to a final destination, because any future track would be appended to the end of the existing file, making the file larger than necessary and also potentially causing confusion, because there will be more than one track in the file.

After recording was complete, I downloaded the ABG file with the bat calls from the PDA onto the hard drive on my laptop. At this point, it would be a good idea to examine the files and make sure only those containing bat files were kept. It would be feasible to separate out files containing different species using the Disperse feature of AnalookW, so that then the different species could be plotted on different maps.

2) I converted the ABG file to a file compatible with GPS Utility. To do this, I ran the converter program in AnalookW, by clicking on Tools, Converter, GPS: PDA to GPSU. When the dialog came up, I clicked on the Source button to select the GPS.abg file to convert, made sure the Keep option was checked and made sure the Time Zone was correct. Then I clicked Run and this resulted in the production of a file named GPS_GPSU.txt.

3) I made a waypoint file of the bat locations. To do this, I opened Anahead from the Tools menu of AnalookW, and in the left pane, browsed to the files of relevance (in the middle pane) and made sure they were selected. Then I clicked on Positions, Make Waypoint File and this resulted in a file called waypoints.txt (I could have changed the name if I wanted). A few times I got a message saying “Can’t do UTM - sorry” This is a bit of a bug which I must fix one day, but basically is just telling you that the program has encountered a file which doesn’t contain a valid GPS location. What this means is that the GPS unit was not giving valid fixes at the time the file was saved. But this situation is recoverable, so I will digress at this point to explain how.

While the GPS may not have been getting valid fixes at the time the file was saved, it was getting valid fixes both before and after that time. Therefore, it is possible to interpolate between the fixes (which were obtained at known times) to figure out the bat positions,

whose times are known from information stored in the Anabat (*.??#) files (and in the filenames!). Here's how to do that.

First, I made a new folder for the files lacking GPS positions, and called it NoGPS. Then I moved the files without fixes into that folder. To do that, I scanned through those files in AnalookW with View, Header checked, and marked (using Alt-m) all the files lacking GPS fixes (visible at the right hand side of the header bar at the bottom of the screen). Then I pressed Alt e,v for the Move if Marked command on the Edit menu, selected the NoGPS folder and clicked OK to move those files into NoGPS.

Secondly, I went back to Anahead and navigated to the NoGPS folder from the left pane, making sure the files in that folder were selected in the middle pane. Then I made sure the right hand pane was large enough to see properly, and clicked on Positions, Choose file to navigate to the GPS_GPSU.txt file I had already made. This resulted in a TK entry in the right hand pane of Anahead, and it was apparent that the track listed covered the time interval over which the relevant files had been recorded. Then I clicked Positions, Track and Yes to interpolate from the track points in the track record to positions in the Anabat files. Note that had I had waypoints listed in the right hand pane, as a result of selecting a positions file containing waypoints, then I could have selected a single waypoint and clicked Positions, Waypoint. That way, all the selected files in the middle pane would have been given the same waypoint. This is often an effective way to put GPS positions into Anabat files, but on this occasion, I wanted to interpolate track positions into the files.

At this point, the files in the NoGPS folder now had positions saved into them, and I could move them back into the main folder with the other files. Back to Anahead, selected the now complete list of files, and ran Positions, Make Waypoint File again to generate a complete waypoints.txt file. No errors this time!

4) At this point, I had two files, one containing the bat positions as waypoints (waypoints.txt) and another containing the track I took as track points (GPS_GPSU.txt). Now I needed to combine these into a single file containing both the waypoints and the track points. First I loaded the GPS_GPSU.txt file into GPS Utility to get the track. I then saved this as a different file, called Bats.txt using File, SaveAs so that I could keep the original unchanged, in case something went wrong. Then I opened the waypoints.txt file to display the waypoints, which are the positions where I recorded bats. With both files open and the focus on waypoints.txt, I then clicked on Record, Select All to select all the waypoints, then Record, Copy Selected to copy them to the clipboard. Then I switched focus to the Bats.txt file and selected the waypoints page (e.g., by View, Waypoints, though easier through the tool which looks like an upside down, red T). Then Record, Paste copied all the waypoints from the clipboard into the Bats.txt file. Note that if you try to paste into the Track points page, you will get an incompatible data error.

Then I closed the waypoints.txt file and saved the Bats.txt file. By clicking on the Map tool (or pressing F6) I could see the bat positions superimposed over the track. Note that

there are other options you can use, such as changing the symbols used to indicate the waypoints.

5) The next part of this saga was to find an image to use as the background. In this case, I used Google Earth to display an aerial photo of the area of interest, and when I got it right, copied the screen to the clipboard using the PrtSc button. Then I imported the clipboard into a JPEG using Adobe Photoshop Elements. But there are tons of ways to do this - you could even use the built in accessory Windows Paint. I believe GPS Utility can import a variety of file formats, but haven't tried any but JPG myself.

Another way I have used this in the past has been to make a digital photo of a map, and use that. It worked surprisingly well, both with photos of maps and of aerial photos. The biggest problem is avoiding the image distortion that comes with using a camera. But it worked well, and I reduced the problem to insignificant by pinning the map onto a wall and photographing it with a tripod mounted camera from some distance away. If the photo/map you wanted was small enough, you could scan it in and get at it that way.

6) Now that I had my image, I needed to import it into GPS Utility and calibrate it so that the track in the Bats.txt file mapped properly onto the image. There are several ways to do this, but I will relate here the method I found most effective and accurate.

Firstly you need to identify three or four points to use as calibration points. These points need to be clearly visible on both the track and the image. Road junctions are especially good for this, and it is worth getting into the habit of making sure that you mark such points when you do a walking transect. The easiest way to do this is to make a short deviation from your path so it shows up as a distinctive mark on the track. Of course, if you turn at right angles down one road from another, that will give you a clear point which is easily recognisable, and the same will happen unavoidably if you walk along tracks which are easily seen in the image. But sometimes, it would be worthwhile to take notes on when you reach certain landmarks, so you can work out what part of your track corresponds to what features in the image. This would be especially true of you don't stick to roads and other readily identifiable features.

I chose three points and generated new waypoints for them using the following procedure. First I displayed the map from the Bats.txt file, by clicking the Map Tool, then enlarged it to make it easier to see. Next, I clicked the Enter/Drag Waypoints button, which is again un upside down red T, on the map window. Then I moved the point of the cursor to the point I wanted to mark for a calibration point, and clicked it, bringing up the Data Dialogue. I could then adjust the position of the mark against the underlying map by clicking on the radiating arrows near the upper left corner of the dialog. After getting the marker to just where I wanted it, I then named the new waypoint by entering something into the ID field. I called the calibration points A, B and C, but anything of six or fewer letters will work. Next, I changed the waypoint symbol so it was distinct from the symbols used to indicate bat positions. You can choose a symbol by clicking on the arrow to the right of the box to the right of the symbol box. The best options would seem to be Waypoint, Circle-X or Flag. In my case, I stayed with Waypoint, but changed the colour

by clicking on the symbol itself and clicking on OK when the "OK to add Colour to Dataset" dialog appeared. Then, clicking on symbol opened up a colour box and by releasing the mouse button on one of the colours, I was able to change the symbol colour. You could enter a comment if you wished ("Calibration Point" would be obvious!).

You can use the same procedure to add further calibration points, but note that you must select the symbol colour each time. After making the calibration waypoints, I saved the Bats.txt file again, either by File, Save Data from the map window or File, Save from the Waypoints Window.

I should at this point explain that the calibration points need to be chosen so they best allow corrections to be made to align the map and image. Ideally, the calibration points should be as far apart as feasible, and must not lie on a line, so an equilateral triangle is a good configuration. A good option would be to choose points near the top of the map, and at each of the lower corners, but NOT three points which line up. The third point needs to be as far away from the line between the first two points as feasible.

7) The next task is to import and calibrate the image. Before loading the image, I chose the calibration strategy from the Options Map Setting dialog. In the Map Calibration box, I turned off Hints (which I found annoying!) and selected the 3 pt option. It is important to do this before loading the image, because I found it harder to change the options once I had loaded the image. If you find you can't get back to where you need to be, simply close the file and start again. Provided you saved it after making the calibration waypoints, and not after that, all will be well, and reloading the Bats.txt file will make it easy to start over.

While the Map window had the focus, I clicked on File, Load Bitmap to match the image to the Bats.txt file. Note that the image is not saved into the Bats.txt file, but instructions are saved on how to match the two together. After choosing the image, I was confronted by the image with my track and waypoints overlaid onto it, but in the wrong places. It is this matching up of the image with the track which is what the calibration waypoints are for. At this point, the box at the top of the map showed "Enter Calibration Point 1". To do that, I moved the cursor to where the first calibration point belonged on the image, and left clicked on that point. This opened a dialog box which allowed me to choose the waypoint which corresponded to that point. If it is the nearest waypoint, the right calibration waypoint will be selected, but if not, you can select the right calibration waypoint by clicking on Browse. I repeated this for the other two calibration waypoints, and after entering the third, the map and image were well matched up and I saved the Bats.txt file again.

If you want to start over, click on the Calibrate Bitmap tool, select the correct image and click Delete. This will not delete the image, but will remove the image and its calibration information. You can then start over by clicking once more on the Calibrate Bitmap tool, and selecting the image to load. I found a few anomalies in this process, such as the colours of the calibration waypoints changing, or the image hiding the map. The latter

was cured simply by closing the map window and re-opening it, but it might be best to save, then close the whole file after deleting the calibration information, then re-open it. You might find that you want to move one of the calibration points relative to the image, because it ended up in the wrong place. This can happen because the cursor might hide some of the relevant image detail while you are moving it. Adjusting the calibration is easy enough. In the Map window, I clicked on the "Rectangular Area" tool. This allowed me to select an area of the map for various purposes. I then selected a broad rectangular area around the point I wanted to move, and then I expanded the map up to that area by clicking on the Zoom In tool (a magnifying glass with a +). Having expanded the map up to where I could clearly see the detail I needed, I clicked on the Identify/Measure/Drag map tool which is a hand in the upper left corner of the Map window. Then I was able to RIGHT click on the calibration waypoint of interest, and drag it to where it should be. This resulted in a dialog box asking me if it was OK to move the calibration point, to which I answered Yes.

8) At this point, I had the right alignment of map and image. I could have changed symbols or various other things without messing with the calibration of the image. Now it was time to save the whole image with the overlaid waypoints and track points. This is easiest to accomplish simply by clicking on File, Save Bitmap as and choosing whatever file format you like. Alternatively, you can choose to make an image file of only that part of the image currently visible in the Map window, by clicking on File, Save Window as. Either way, you get a graphics file which can then be imported into numerous graphics editors for various purposes.

The included JPG file was modified in PowerPoint to put labels on it. I find PowerPoint very easy to use for this sort of purpose. You insert a picture from file into a slide, modify it as needed, select the whole image with its enhancements and save it as a picture. I find it much simpler and more intuitive than using some of the more complex programs like Photoshop Elements.

Finally, I should point out two things. Firstly, I have included a file with an image in grey tones, but colour images work just as well. Secondly, don't expect too much accuracy from the GPS track. Deviations from reality of some tens of metres are not at all unusual, and in some cases, I find I can get really bad errors if I am standing still and the satellite signals are poor. Even so, the technique has obvious advantages, and for many purposes, the accuracy is easily enough. It would be possible to calibrate the image in GPS Utility using known co-ordinates from other sources, then overlay the track map, but in practice, it is usually better to match the track itself up with the image, because gross GPS errors tend to change gradually in time.