

GPS-Photo Link Comparison

A Product Comparison
by Electronic Data Solutions

Linking Photos to GPS/GIS Features

Many methods are available for linking digital imagery to GIS features. Some of these are summarized below:

Hotlinking or Hyperlinking – Displays an image when clicking on a GIS feature. Photos are stored somewhere on your PC or network, and each GIS feature stores the photo file path and file name as an attribute or as a dynamic hyperlink. *Advantages:* Hotlinking is built into ESRI ArcGIS Desktop, dynamic hyperlinking can be linked to multiple photos. *Disadvantages:* Managing the correct entry of the photo file name for the correct GIS feature in the office or in the field can be cumbersome and error-prone.

Trimble TrimPix – Transfers photos instantly from selected WiFi-enabled Nikon CoolPix cameras to Windows Mobile 5.0 Trimble handhelds, such as the GeoExplorer 2005 Series, Recon, and Ranger. Photos can then be linked to features as they are created or modified in Trimble TerraSync or ESRI ArcPad software. *Advantages:* WiFi photo transfer is very fast, photos are placed in the \My Documents\My Pictures\ folder on the device so they are easy to find, linking images to features in the field is easy, and photos linked to features in TerraSync are automatically transferred to your PC when the file is downloaded with GPS Pathfinder Office. *Disadvantages:* Newer Nikon CoolPix models are not supported, WiFi photo transfer drains camera batteries quickly, storing photos on the GPS data collector uses memory up quickly, and hotlinking in desktop GIS may still require editing data to set the correct file path or file name.

ArcPad Camera Tool – Takes pictures using attached camera. *Advantages:* Mapping the feature and taking the photos is all managed in one software application. *Disadvantages:* Relies on camera device drivers that are compatible with the operating system. Works well on Windows PCs but currently the only known Windows Mobile camera is the integrated camera in the Trimble Nomad.

GPS-Photo Link Software - Links GPS data to digital images and outputs to GIS formats, as well as Google Earth, HTML, and other formats. Standard version works with nearly any digital camera and any GPS, and they do not have to be connected while collecting data. The Ricoh edition works with the Ricoh 500SE camera, an 8 MP 3x optical zoom rugged camera with built-in Bluetooth and optional WiFi which can be purchased with built-in WAAS-enabled SiRF GPS or can connect via Bluetooth to external GPS receivers and laser rangefinders for offsets. The Ricoh camera also allows entry of up to 5 attribute memos for a photo, which can be configured as drop-down lists with included software. The camera also scans barcodes and stores them as a memo. It features a GPS-lock function which allows the user to take a position, lock GPS, then move back and take a picture. An ArcMap toolbar is included for processing data. *Advantages:* batch processes photo link based on time rather than file name, doesn't require camera and data collector to be connected, enables use of nearly any camera and GPS, includes tools for easy GIS integration, Standard version works with wide variety of digital cameras, Ricoh version works with rugged waterproof shock-resistant camera with good battery life. *Disadvantages:* Cost.

		TrimPix	ArcPad Camera Tool	GPS-Photo Link	
				Standard	Ricoh
Hardware support	Windows Mobile support	Trimble Mobile 5 devices	Trimble Nomad ¹	N/A ²	N/A
	Camera Support	Selected Nikon CoolPix ³	Any Attached ⁴	Any ⁵	Ricoh 500SE
	GPS Support	Trimble MGIS ⁶	Any Supported by ArcPad	Any ⁷	Built-in or Bluetooth ⁸
Field Collection Features	Create Photo Link in Field	Yes	Yes	No	Yes ⁹
	GPS Lock ¹⁰	No	No	No	Yes
	Laser offset	Yes ¹¹	Yes	No ¹²	Yes ¹³
	Feature Collection	Yes	Yes	No ¹⁴	Yes
	Attribute Collection	Yes	Yes	No ¹⁵	Yes ¹⁶
	Real-time DGPS ¹⁷	Yes	Yes	Yes	Yes
	Post-processed GPS ¹⁸	Yes	Yes	No ¹⁹	No
	Data Quality Filters ²⁰	Yes	Yes	No	No
	Loss of DGPS Warning	Yes	Yes	Yes	Yes
	Record Barcode as attribute ²¹	No	No	No	Yes
	Link voice note ²²	No	No	No	Yes

¹ This tool in other devices is dependent on camera hardware compatibility with Windows Mobile operating system for direct camera control. If camera cannot be controlled directly by ArcPad, the photo can still be linked to a feature if the camera's software places it in \My Documents or a sub-folder (or an SD or CF card)

² No mobile software is required for GPS-Photo Link

³ P1, P2, P3, S6, and S7c, none of which are still in production by Nikon as of March 2008; newer models are not supported

⁴ See footnote 1

⁵ Must be able to set time and date on digital camera. Time and date does not need to be displayed on the photo

⁶ Includes GeoExplorer 2005 Series, Juno ST, and any Trimble MGIS receiver that can be connected to a Recon or Ranger, such as a ProXT/XH, XB, or XC

⁷ Must record GPS hour, minute, second in order to link with photo

⁸ Camera can be purchased with or without built-in GPS. Built-in GPS is 12-channel WAAS-enabled SiRF receiver, 2-5 meter accuracy. Camera can connect via Bluetooth to any Bluetooth GPS that outputs NMEA protocol. If camera is purchased with built-in GPS, it cannot connect to GPS via Bluetooth

⁹ GPS coordinates are embedded in the EXIF file header as photos are taken

¹⁰ Take coordinate of feature, lock GPS, then step back and take picture. This feature is built in to the Ricoh 500SE camera

¹¹ Offset functionality built into TerraSync or ArcPad software

¹² Dependent on capabilities of GPS unit or field software used to record GPS. Consumer GPS units typically do not work with laser offsets. If GPS is recorded with TerraSync or ArcPad software, offsets would be supported

¹³ Ricoh 500SE camera connects directly to Bluetooth laser rangefinders to record distance in EXIF file header. Compass direction can be entered as a memo, or can be created from GPS tracklog that can be recorded by camera (walk toward feature, then take picture). Direction and distance can be used to create offset features, or 'field of view' cones in ArcGIS using GPS-Photo Link Software

¹⁴ TerraSync and ArcPad support feature collection of points, lines, and areas. Consumer GPS units usually record only waypoints or GPS tracklogs

¹⁵ TerraSync and ArcPad support entry of multiple attributes using pick lists and data entry rules. Consumer GPS units usually do not support attribute entry

¹⁶ Ricoh 500SE supports entry of up to 5 attribute Memos, which can be set up with pick-lists using included List Editor software

¹⁷ Dependent on GPS receiver capabilities. All Trimble MGIS receivers are real-time capable, as are most consumer GPS receivers. The Ricoh 500SE with GPS is WAAS-enabled

¹⁸ TerraSync uses Pathfinder Office or GPS Analyst and base station data to post-process GPS and DGPS positions. Post-processing in ArcPad requires Trimble's GPSCorrect for ArcPad extension, using a Trimble Pathfinder receiver and Pathfinder Office or GPS Analyst software. Post-processing is not possible with most consumer GPS receivers, or with the Ricoh 500SE camera with built-in or external GPS

¹⁹ Unless data is collected in TerraSync or ArcPad with GPSCorrect

²⁰ Data quality filters include position mode, elevation mask, SNR mask, PDOP mask, HDOP Mask, and so on. ArcPad cannot set SNR mask, elevation mask, or HDOP mask. These can be set in GPSCorrect for ArcPad. Consumer GPS receivers generally have no quality filters. The Ricoh 500SE with built-in GPS does not have quality filters, but quality indicators are displayed on the screen

²¹ Dependent on attached peripheral devices in the case of TerraSync or ArcPad systems. The Ricoh 500SE can scan bar codes and store them in Memo 1. The Trimble Nomad can also scan barcodes and store them as attributes in TerraSync or ArcPad.

²² TerraSync can link WAV files if the data dictionary has a File Name attribute set up to store the link. The Ricoh 500SE camera can record voice notes with pictures

		TrimPix	ArcPad Camera Tool	GPS-Photo Link	
				Standard	Ricoh
Desktop Features	Output to shapefile ²³	Yes	Yes	Yes	Yes
	Output to geodatabase feature class ²⁴	No	No	Yes	Yes
	Output to Google Earth	No	No	Yes	Yes
	Output to HTML Web pages	No	No	Yes	Yes
	Output 'field of view' cones	No	No	No	Yes
	Output watermarked photos ²⁵	No	No	Yes	Yes
	Output renamed photos ²⁶	No	No	Yes	Yes
	ArcMap Toolbar to process photos	No	No	Yes	Yes
	Rotate map symbols based on direction ²⁷	No	No	No	Yes
	Link feature to multiple photos ²⁸	No	No	No	No
Cost		Free ²⁹	Included in ArcPad ³⁰	\$229	\$1,259 - \$1,449 ³¹

²³ TerraSync data is exported to shapefile through GPS Pathfinder Office, ArcPad works directly with shapefiles, and GPS-Photo Link outputs to shapefile

²⁴ GPS Pathfinder Office does not support export to geodatabase, nor does ArcPad. ArcGIS Desktop can be used to move ArcPad data in and out of a geodatabase. GPS-Photo Link exports directly to geodatabase feature classes

²⁵ Photos can be 'watermarked' with GPS position, date, time, and project. If taken by the Ricoh 500SE, watermarks can include attributes from Memo fields

²⁶ Photos can be renamed based on project, date and time. If taken by the Ricoh 500SE, file name can be based on Memo fields

²⁷ If direction is recorded as an attribute in TerraSync or ArcPad, this could be done in ArcGIS. The Ricoh 500SE camera records the direction the photo was taken by using the GPS Tracklog, or by entering the direction as an attribute Memo

²⁸ Dynamic hyperlinking in ArcMap allows multiple photos (or files of any kind) to be linked to a single feature. ArcPad and TerraSync could link multiple photos if multiple fields or attributes were defined to store the file names of each photo. GPS-Photo Link will support multiple photos in an upcoming release

²⁹ TrimPix is a free application; the cost of the system is dependent on the camera, software, and GPS system used

³⁰ Cost of system is dependent on the camera, software, and GPS system used

³¹ Cost of Ricoh 500SE camera with or without included GPS module

Conclusions

Digital photos are an integral part of data collection for many applications. Managing the large amounts of data generated by GPS receivers and digital cameras can be challenging. Various methods are available to assist with this, and all have their pros and cons. The GPS-Photo Link software automates much of the process and includes many user-friendly features. The Ricoh 500SE camera is a truly field-worthy, rugged solution that can be used in conjunction with professional Trimble Mapping systems and software, or as a standalone data collection system.