Earthquake Aftermath:

Investigating Insurance Claims
Using ArcGIS 9 and a Tablet PC

By Rhonda M. Pfaff, ESRI

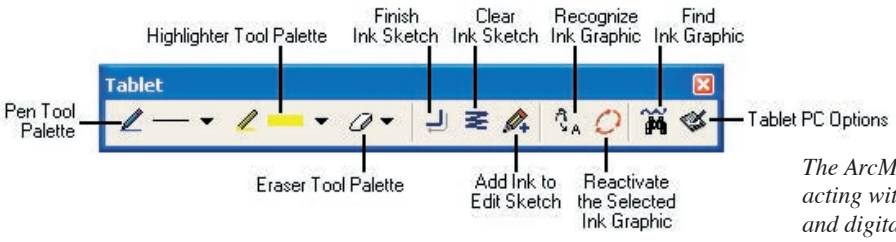
In this tutorial scenario, you are an insurance agent who has been dispatched to Paso Robles, California, to map and investigate claims that were reported after the 6.5 magnitude San Simeon earthquake that occurred in December 2003. You will use a Tablet PC running ArcGIS 9 with the ArcMap Tablet toolbar. *[Please note: Although the San Simeon earthquake did occur, the tasks in this tutorial demonstrate the functionality of ArcGIS running on a Tablet PC and do not purport to replicate the actions of the insurance adjusters who responded to this event.]*

Tablet PCs are lightweight, mobile notebook computers that can run Windows and applications, such as ArcGIS, using a digital pen and voice commands along with the traditional keyboard and mouse. Because Tablet PCs run an enhanced version of Windows XP Professional, the same GIS applications that run on desktop machines can run on a Tablet PC in both the field and the office. Some Tablet PCs are designed specifically for field use and have outdoor viewable screens and have been ruggedized to survive dropping and resist moisture and dust.

A Tablet PC with ArcGIS can bring the geodatabase and its full capabilities—networks, topologies, relationships, and attribute integrity safeguards—into the field. Through disconnected editing, data can be transferred from a master ArcSDE geodatabase to a personal or ArcSDE checkout geodatabase so it can be in the field. The updated data can be integrated with the master geodatabase upon return to the office. With the Tablet PC's support for wireless networks, users can also connect to a central server to retrieve and update information in real time from the field. With the ArcMap GPS toolbar, GPS measurements can be captured directly into the geodatabase.

The ArcMap Tablet toolbar provides tools for interacting with the ArcMap display using two of the Tablet PC's innovative features—pen-based computing and digital ink technology. With these tools, a user can write notes, highlight areas on a map, complete edit tasks, convert handwriting to text, search for ink graphics, and set ArcMap–Tablet PC options. Writing or highlighting on a map creates geographic ink that can be stored as annotation in the map document or a geodatabase. Tablet PC support is automatically provided when ArcGIS 9 Desktop is installed on a Tablet PC, but this support can also be added to a non-Tablet PC by customizing the ArcGIS 9 Desktop installation. Although most Tablet PC tools can be used on any Windows 2000 or Windows XP computer, text recognition and gesture shortcuts are only available on a Tablet PC. ArcGIS 8.2 and 8.3 users can add the Tablet tools by downloading them from the ESRI Support Web site at support.esri.com.

What You Will Need
- ArcGIS 9 (ArcView, ArcEditor, or ArcInfo license)
- A Tablet PC notebook computer
- Sample data downloaded from *ArcUser Online*
- An unzipping utility such as WinZip



The ArcMap Tablet toolbar provides tools for interacting with the ArcMap display using the Tablet pen and digital ink.

Getting Started

This tutorial requires a Tablet PC running ArcGIS 9 Desktop with an ArcView, ArcEditor, or ArcInfo license. It shows how some basic ArcGIS functions can be performed on a Tablet PC using the digital pen and Tablet toolbar tools to accomplish tasks such as handwriting notes on a map, converting these notes into text elements, entering information into a custom form, and using digital ink to create polygon features.

If you are not familiar with Tablet PCs, see the hardware manufacturer's documentation to learn how to use the digital pen to execute the pen equivalents of right and left mouse clicking as well as other features. Perform these actions when mouse clicking is required during the tutorial. Download the sample data from the *ArcUser Online* Web site (www.esri.com/arcuser) and unzip it.

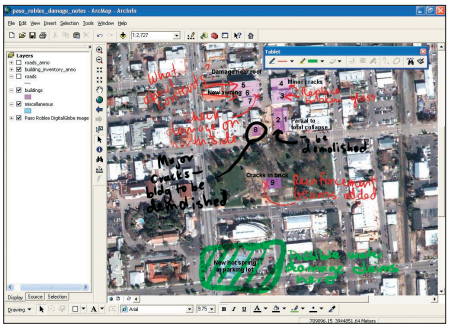
1. Start ArcMap and open tabletpc_quake_tutorial.mxd from the sample dataset. This shows a zoomed out area of Paso Robles, California. The basemap is a DigitalGlobe QuickBird satellite image that was taken after the earthquake.

2. Get used to working with a pen in ArcMap by tapping on the zoom and pan tools.

3. Tap the View menu, tap Bookmarks, and tap Downtown to go to the extent of the area you were sent to investigate. Check the roads layer in the table of contents to display the local roads and their names.

Adding Ink to the Map

The claims you were sent to investigate are on Park Street between 12th and 13th Streets. You will examine damage to one building in this area. Digital photographs of the exterior damage have been stored as raster attributes of the buildings layer. A new function available with ArcGIS 9, raster attributes are similar to hyperlinks except that images are stored within or alongside the geodatabase and added to a table during an edit session.



Notes added to the map using digital ink can be committed as a graphic or recognized as text.

1. One way to see the photographs is to identify features. Click the Identify tool on the Tools toolbar and click building 5, at the western corner of Park and 13th Streets.

2. Enlarge the Identify Results window and tap

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the arrow next to <Raster> in the Value for the Photos field to reveal a small photo of the building. Click the photo to see a larger image. Note the cracks and loose or fallen bricks near the building's roof. Close the photo and Identify Results windows.

3. You can take quick notes about this damage using the pen to add digital ink to the map. This ink can be committed as a graphic or recognized as text. Ink is stored in the active annotation target, which is automatically set to the default graphic layer of the map document but will be changed to the paso_robles geodatabase. Start an edit session by adding the Editor toolbar to ArcMap. Tap the Editor toolbar button on the Standard toolbar. Tap the Editor menu, then tap Start Editing.

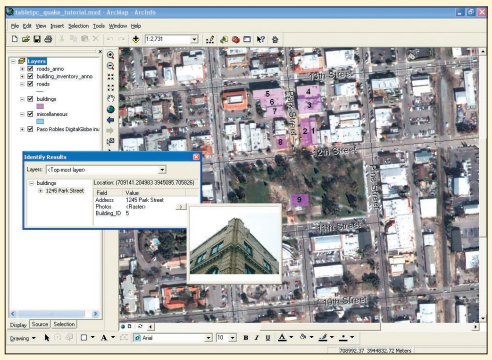
4. Add the Tablet toolbar to ArcMap by right-clicking over any blank spot on a toolbar and tapping Tablet in the list. On the Tablet toolbar, tap the Pen tool drop-down list and tap Medium Point. Make the building_inventory_anno the active annotation target so edits will be saved to a layer based on an annotation feature class.

5. Use the pen to write "damage near roof" on the map. The Pen tool recognizes the pressure sensitivity of the digital pen. The harder you press on the screen, the thicker the pen line. Tap the Finish Ink Sketch button to commit this ink sketch as a graphic.

Once the ink is saved as a graphic, it can be rotated, resized, or grouped or its color changed. Alternative methods of committing ink include pressing the Enter key or drawing a gesture. A gesture movement with the pen is a shortcut to a command. To use a gesture to commit ink as a graphic, draw a sharp down and then left motion with the pen on the screen.

Handwritten ink graphics can also be converted to text elements. With the element selected, tap the Recognize Ink Graphic button on the Tablet toolbar. The ink is automatically converted to text if there is high confidence in the recognition. If this resulting text was not correctly recognized, double-click the text element to open its Properties dialog box and type the correct text.

If recognition confidence is low, a dialog box automatically appears that allows text to be verified or corrected before the text element is created. Poorly recognized text is highlighted in yellow on the left side of the dialog box. Use a suggested word from the alternative list, edit the word using the keyboard or Tablet PC Input Panel, or make no changes. Optionally, open the Tablet Options dialog box to set the option so the Poor Recognition Confidence dialog box will open every time text is recognized, regardless of confidence level.



Use the Identify tool to view a photograph of the damage to building 5. Enlarge the photo and note the cracks and loose or fallen bricks near the building's roof.

Inputting Information Into a Custom Form

Because field GIS applications often rely on customizations to simplify tasks, developers can use ArcObjects to build mobile GIS applications for the Tablet PC. The interface for tabletpc_quake_tutorial.mxd has been customized with a Claim Investigation button that opens a form for recording basic information about the claim and the damage observed. The form input will be stored in a table in the paso_robles geodatabase. This form shows how ArcGIS customizations can be used in field mapping situations.

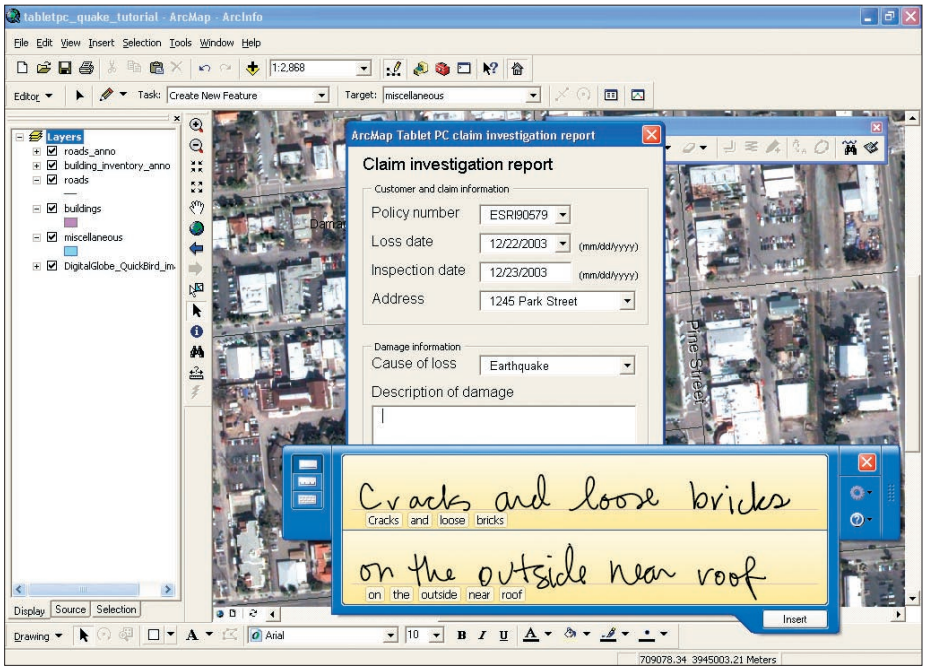
1. The Claim Investigation button on the Standard toolbar has a house icon. Tap on it to open the claim investigation report form. The values in the drop-down lists contain information on claims that have been filed. You loaded this information before leaving your office. However, new values can be added to these lists.

2. Input information about the damage to building 5 by entering the information as indicated in Table 1. Although the loss date is the date of the earthquake, another date could be entered for customers who experienced losses from later events such as theft or fire.

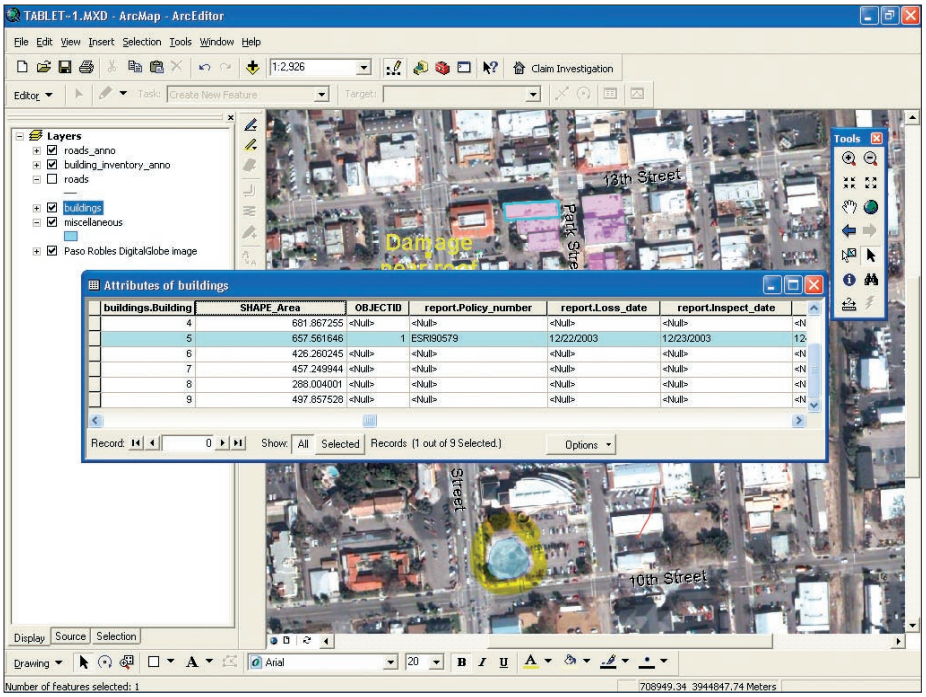
3. Tap inside the text box below Description of damage and use the Input Panel or keyboard to

Tap on drop-down for	Tap on
Policy number	ESRI90579
Loss date	12/22/2003
Inspection date	(Keep default value)
Address	1245 Park Street
Cause of loss	Earthquake

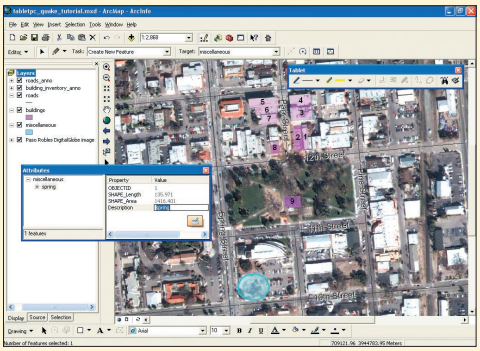
Table 1: Values for claim investigation report



Use the Claims Investigation form to record the information for building 5. Use the Input Panel to write notes on the damage observed.



The report table can be joined to the buildings layer so the report information collected using the form is appended to the buildings attribute table.



The Tablet PC's pen not only replaces the mouse for editing tasks but can also be used to create new polygon or polyline features. A polygon will be created to show the location of a hot spring that appeared after the earthquake. ArcMap can automatically complete the geometry if the segments don't close.

enter "Cracks and loose bricks on the outside near roof." To use the Input Panel, make sure the cursor is in the text box and access the Input Panel. See Help for the Tablet PC you are using if necessary. You can input ink words by writing them on the Writing Pad or by typing them using the pen and on-screen keyboard. With either method, ink notes are inserted as typed text in the form. Tap the Save button, and the form closes.

4. Tap the Source tab on the table of contents. Right-click the report table, then tap Open. The information you entered on the form appears as a new row in the table. Close the table window and tap the Display tab. Optionally, you could join the report table to the buildings layer so the report information is appended to the buildings attribute table. To join attributes from the report table, right-click the buildings layer, and choose Joins and Relates > Join. Choose Address as the field in the layer on which the join will be based, choose report as the table to join to the layer, and choose Address as the field in the table so the buildings attribute table will contain the fields from the report table.

Creating Features With Ink

The Tablet PC's pen not only replaces the mouse when using editing tools but can also be used to create new polygon or polyline features. When creating a polygon feature with digital ink, ArcMap can automatically complete the geometry if the segments don't close.

In this section, you will create a polygon locating a hot spring that opened up in a parking lot after the earthquake. The spring's location may be of interest if it causes water damage that leads customers to file claims. The spring is near the bottom of the map's extent at the northeastern corner of 10th and Spring Streets.

1. If you did not keep the edit session open, start another edit session. In the Editor toolbar, set the edit task to Create New Feature and the target layer to miscellaneous.

2. Tap the Pen tool on the Tablet toolbar. In one stroke, trace the spring's outline over the basemap.

3. Tap the Add Ink to Edit Sketch button on the Tablet toolbar. The ink is converted to a feature.

4. Tap the Attributes button on the Editor toolbar. In the Value column for the Description field, use the keyboard or Input Panel to enter "spring." Close the Attributes dialog box. Now add highlighter ink to the map so it will be easier to find these edits. Highlighter ink is semitransparent so the features underneath remain visible.

1. Tap the Highlighter tool drop-down arrow and tap a Medium pen.

2. Draw a circle around the feature you just added, then commit the ink as a graphic by tapping the Finish Ink Sketch button.

3. Tap the Editor menu, then tap Stop Editing, and save the edits.

Conclusion

The tasks in this tutorial introduce Tablet PC use and demonstrate that all the functionality of ArcGIS and ArcObjects-based customization is available on this platform. With its portable design and pen and voice technology, the Tablet PC offers increased mobility and productivity as compared with a traditional notebook computer and has overcome the computing power and screen size limitations of handheld devices. Tablet PC technology provides a powerful, versatile platform for field mapping and analysis. Mapping and collecting information on insurance claims are just two of many potential uses for ArcGIS on Tablet PCs. Users in utilities, telecommunications, government, agriculture, retail, real estate, health care, and other industries can also benefit from the enhanced functionality of a Tablet PC running ArcGIS software.

For more information on running ArcGIS on a Tablet PC and links to any bundled hardware and software offers, visit www.esri.com/mobile.

Acknowledgments and Data Credits

Thanks to the individuals and organizations that provided images. Photographs included in the tutorial data were taken by the author (buildings 7 and 9), Michael Casey (buildings 2, 5, and 6), J. Alan Glennon (building 1), and Janise E. Rodgers (buildings 3, 4, and 8). The basemap in the tutorial is a QuickBird satellite image courtesy of DigitalGlobe. Special acknowledgment goes to Ken Johnson, fire chief of the city of Paso Robles; J. Alan Glennon of the University of California, Santa Barbara; and Jonathan Bailey, John Calkins, and Brad McCallum of ESRI for support in preparing this article.

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