

Benefits of Scripting for GIS Users

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This video will present some of the benefits of using scripts in both geospatial and non-geospatial analyses.

Scripts and scripting languages

- A script is a set of detailed instructions for a computer.
- Scripting languages...
 - translate your instructions into a language the computer can understand.
 - are relatively easy to program.
 - work with many software applications (ArcGIS, Microsoft Office, etc).
 - ideal for non-professional programmers (i.e. GIS users).
 - include Python, VBScript, JavaScript.

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A script is a series of instructions for a computer. A scripting language translates our instructions into a code that the computer can understand. Scripts are relatively easy to program and work with many software applications which makes them ideal for GIS users and other non-professional programmers.

Why write scripts?

Automation

- Much faster than manually performing operations.
- Reduce potential for human error in complex or repetitive tasks.
- Practical to accomplish very complex tasks.



YOU KNOW, IF IT WASNT FOR THE BORING REPETITION, THIS JOB WOULD BE THE PITS!

Image from: <http://www.cartoonstock.com/cartoonview.asp?catre-fjman92>

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Writing scripts can take large investments of your time in both learning the scripting language and in developing scripts. The pay-off of writing scripts can be well worth your time. Perhaps the biggest pay-off is in automating your procedure. The computer can run the operations in your script much faster than you could do manually and without the potential for human error (assuming the script has no programming errors). A script can make it practical to do a very complicated analyses that would be too time consuming for us to do manually.

Why write scripts?

Documentation

- Workflow documented in minute detail
- In-script comments help explain processes

```
# this is a Python comment
```

- Help page and dialog window documentation can be provided for ArcScripts



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Another important benefit of a script is that it documents your procedure in every detail. You can make it easier to follow your script by adding comment lines in your script to describe the major steps. These comments are ignored by the computer - their purpose is simply to help explain the processes that occur in your script.

Why write scripts?

Turn into ArcScripts

- Easy to use and re-use
- Easily shared with other GIS users
- Can be run by non-programmers



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Scripts allow you to share your expertise with other people. Converting the script into an ArcGIS tool is an easy way to create a user-friendly interface that makes the script sharable with non-scripters. Making your script “sharable” can also be very helpful to you if there is a chance that you may want to reuse the script again in the future.

Models vs. Scripts

Models

- Visually appealing
- Easier to build and troubleshoot
- Excellent for exploratory analysis
- No programming skills required



Scripts

- Greater functionality and control – more complex tasks possible.
- Tend to be more robust
- Can use tools from Microsoft Office and other software
- Can automate map production (Arc 10.x)

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ArcGIS and other geospatial software programs have the capability to create models for automating your procedure. These models provide many of the same benefits as scripts but with the added advantages of having a small learning curve and being faster to develop. Scripts on the other hand offer much greater functionality than models including the capability of interacting with other software programs.

GIS capabilities of scripts

- Combines capabilities of a programming language with capabilities of ArcGIS.
- Use any tool from ArcToolbox...
 - limited by license level (ArcInfo, ArcEditor, ArcView).
- Can use many utility tools not available to models...
 - create new data or manipulate existing data
 - automate map production (ArcGIS 10)

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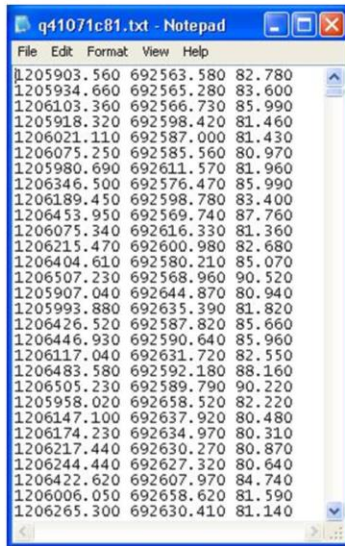
For ArcGIS users, scripts allow you to create powerful tools that use programming to enhance the capabilities of ArcGIS. Most of ArcGIS's functionality is contained within the tools of ArcToolbox (which I refer to as "ArcTools"). Scripts can access each of these ArcTools as well as many tools accessible only in the scripting environment.

Script Application Examples

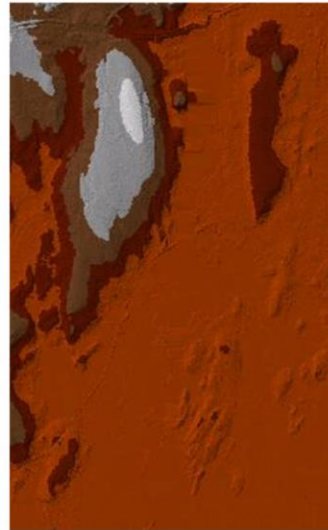
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Throughout this course, we'll see many examples when scripts can provide major advantages in geospatial analyses. In the following slides, I'll give just a few examples of what you can do with a script that uses ArcGIS's capabilities.

Example script applications: Convert LiDAR points to elevation model



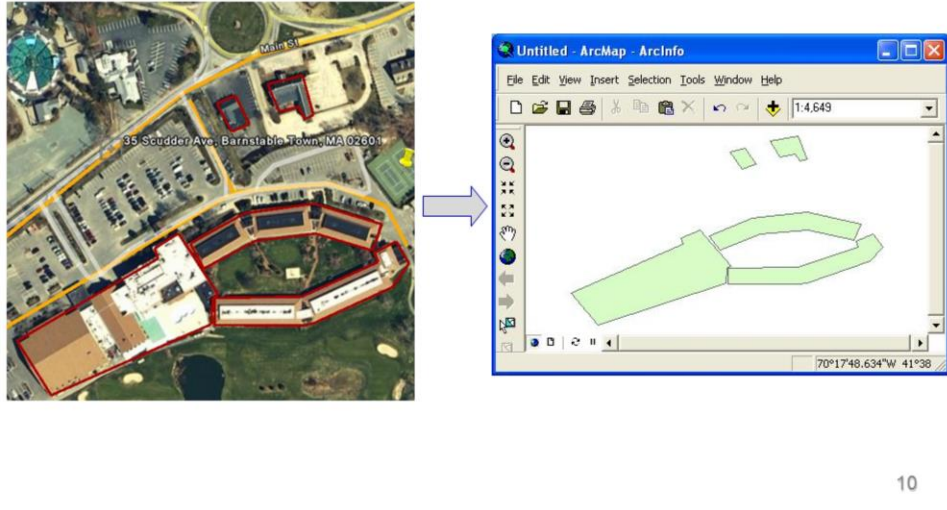
```
q41071c81.txt - Notepad
File Edit Format View Help
1205903.560 692563.580 82.780
1205934.660 692565.280 83.600
1206103.360 692566.730 85.990
1205918.320 692598.420 81.460
1206021.110 692587.000 81.430
1206075.250 692585.560 80.970
1205980.690 692611.570 81.960
1206346.500 692576.470 85.990
1206189.450 692598.780 83.400
1206453.950 692569.740 87.760
1206075.340 692616.330 81.360
1206215.470 692600.980 82.680
1206404.610 692580.210 85.070
1206507.230 692568.960 90.520
1205907.040 692644.870 80.940
1205993.880 692635.390 81.820
1206426.520 692587.820 85.660
1206446.930 692590.640 85.960
1206117.040 692631.720 82.550
1206483.580 692592.180 88.160
1206505.230 692589.790 90.220
1205958.020 692658.520 82.220
1206147.100 692637.920 80.480
1206174.230 692634.970 80.310
1206217.440 692630.270 80.870
1206244.440 692627.320 80.640
1206422.620 692607.970 84.740
1206006.050 692658.620 81.590
1206265.300 692630.410 81.140
```



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Scripts can convert data among different formats. In this case, the script uses point coordinate information in a text file to create a Digital Elevation Model. The advantage of the script in this case is that it can automatically process the hundreds or thousands of individual files that comprise certain high-resolution remote sensing datasets.

Convert KML files to shapefiles



Google Earth provides free access to an incredible image database which you can use to map out features and save as a kml file. In this example, a script was used to convert the kml file, which ArcGIS cannot use, into a shapefile which ArcGIS can use.

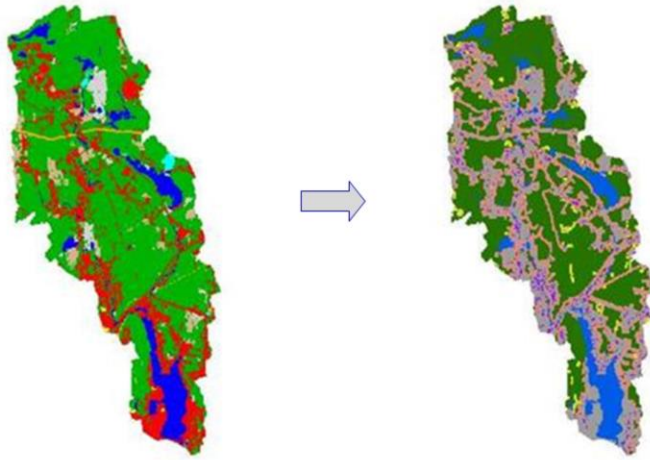
Identify line intersections



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The script in this example identifies the intersections of a line network (e.g. a road centerline dataset)

Forest fragmentation analysis



- Raster analysis can be done without using Spatial Analyst

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Many of the tools in ArcGIS are included in specialized extension packages which can be very costly and will likely be unavailable if you work at smaller organizations. Scripts can offer a work-around to some of the limitations of the less expensive ArcGIS license levels. In this example, the script performs a raster-based operation without the use of Spatial or 3D analyst.

Generate Excel spreadsheets for geoprocessing output



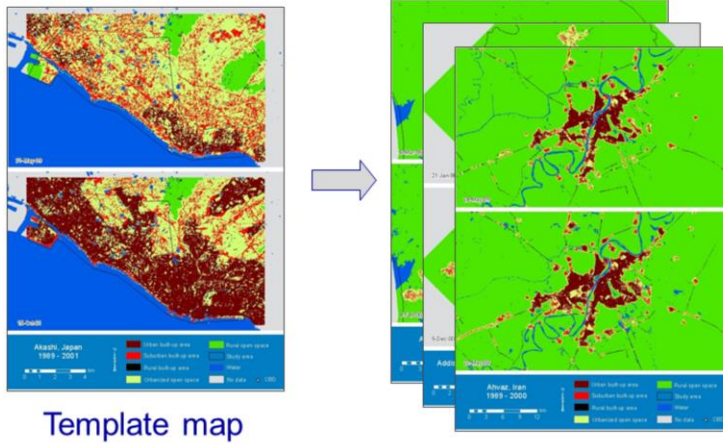
Microsoft Excel - Boston.xls

	A	B	C	D	E	F	
1	Boston (2000) Density vs Distance to Center (town hall)						
2							
3	FID	Area	Population	Distance	Pop_density (/ha)	Expected Pop_density (Exp.)	Nat Pop
4							
5	10196	8716275655	4982	46.37217076	4.778264281	8.143533065	154
6	10379	843.8552483	5620	50.34878173	6.659992003	6.929224911	14
7	10380	1389.268323	7386	47.03887508	5.31646788	7.92607665	161
8	15282	434.679571	4250	16.70423408	19.0073781	27.16634966	2.3
9	15283	22.9726895	2490	5.3737808	107.9542749	43.03941073	4.6
10	15284	30.18956695	2123	4.041495265	70.30833565	45.43194267	4.2
11	15285	25.95400021	2409	4.32135606	92.81806197	44.91858173	4.5
12	15286	25.91859344	2368	5.750582862	91.38768419	42.38574189	4.1
13	15287	42.94892683	3255	4.71167131	75.7876911	44.213198	4.3
14	15556	171.545967	6901	44.87781819	3.869732839	8.653080222	131
15	15557	57.54614406	4433	7.44623059	45.44519972	39.56527953	3.8
16	15563	263.3562259	4879	9.037818987	18.52623051	37.08907459	2.1
17	15564	145.779567	6789	6.743886312	46.5703255	40.7100738	3.8
18	15565	141.4292747	8348	5.973099628	59.02175413	42.16510767	4.4
19	15566	59.62929308	2825	7.462846145	66.8924298	39.53493689	4.18
20	15567	60.32656186	4980	6.5427878	80.54817579	41.042259	4.2

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A spreadsheet often provides the input data for a geospatial analysis or it may be the desired format of the output of a geospatial analysis. A script can work with both GIS software as well as Microsoft Excel. In this example, the script performs an analysis using ArcGIS and creates a spreadsheet in Excel to present the results.

Automate production of a map set



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The results of geospatial analyses are often presented as series of maps. The script in this example was used to generate hundreds of maps based on a template created in ArcGIS. In addition to the initial map creation, a major advantage of the script in this case is that little time is lost when recreating the maps if a change is needed to the map template.