

GEOG3600. Geographical Information Systems

Lab 4. Data Collection and Integration

Objectives

Before we can use GIS for any analysis and decision support, the geographical data in GIS must be properly prepared. Unless GIS data is in the same coordinate system, it will not display or overlay correctly. If the data become part of a permanent GIS database, you must make sure they are in the same coordinate system as the rest of the database. You may also need to obtain new data for your project based on the requirements of the analysis. In some cases you need to create the data by digitising or scanning from a paper map or remotely sensed data.

This lab allows students to practise the techniques of data capture by entering x, y coordinates and manual digitisation. Methods and techniques are also practised for setting geo-referencing system to the data sets and transforming the geo-reference from one system to another.

Create XY Data

1. We set up some observatory stations in Hong Kong Island so as to capture air pollution data. From the B20000 paper map, we obtained the stations' coordinate as below:

X	Y	Place
205000	2467000	Hong Kong University
206300	2467760	HK-Macau Ferry Terminal
203257	2466460	Mount Davis
204000	2466950	Kennedy Town
205500	2466000	Victoria Peak Garden

You may create a new map layer based on the x, y coordinates. Do the following tasks:

- i) Enter the table into a digital format using Microsoft Excel, and save the table as a Dbase IV (.dbf) file.
- ii) Close Microsoft Excel, start ArcCatalog, right-click the table and select 'Create Feature Class' → 'from XY Table'.
- iii) Select x, y field and save the shapefile (named *pollution.shp*) in appropriate location.

Define the coordinate system

2. Open *pollution.shp* in ArcMap. Open another map layer in your personal geodatabase (say *t11heightarc*). Can they be overlaid properly?

The answer is probably “no”. The problem is that your existing geographic data and newly created XY data are in different coordinate system. The B20000 and B5000 series are in Hong Kong Grid 1980 coordinate system, but the XY data you input is in Universal Transverse Mercator Grid coordinate system. Introduction to both systems can be found on the right-hand side of any HM20C (1:20000) series map.

We therefore need to define the coordinate system for different dataset before we can use them together.

3. Close ArcMap and open ArcCatalog.

To define the coordinate system for shapefiles or personal geodatabase, right-click the shapefile/feature class concerned, select Properties → Fields, then select the field name ‘shape’, choose the ‘Spatial Reference’ in the Field Properties box, and click the ‘...’ button.

For feature class under your personal geodatabase, select ‘Hong Kong 1980 Grid.prj’ under ‘National Grids’, which under ‘Project Coordinate System’.

For *pollution.shp*, select ‘WGS 1984 UTM Zone 50N.prj’ under UTM, which under ‘Projected Coordinate System’.

You can see there are two categories of coordinate system, what are they and what are the differences between them?

4. Open ArcMap, add *pollution.shp* and another map layer in your personal geodatabase (say *t11heightarc*). Set the coordinate system of the data frame to be ‘Hong_Kong_1980_Grid’ (you should know how to do this now), and write down the coordinate of each station under this coordinate:

X	Y	Place
		Hong Kong University
		HK-Macau Ferry Terminal
		Mount Davis
		Kennedy Town
		Victoria Peak Garden

Digitising Road Network

5. We need to add the road network to our personal geodatabase, however, we do not have the digital copy of this layer so that we need to digitise the roads from a satellite image.

The workflow of this task should be:

- i) Create a new feature class in the personal geodatabase.
 - ii) Open the satellite image and the new feature class.
 - iii) Register the satellite image.
 - iv) Digitise the roads.
6. Open ArcCatalog, right-click our personal geodatabase and select 'New...Feature Class...'. Give the feature class a name and set other parameters as default except its shape (it should be a LINE layer) and its spatial reference.

Add this road layer as well as the satellite image in ArcMap by clicking the 'Add Data' icon.

7. You may find the satellite image cannot be overlaid with existing layers. That is the reason why we need to register it to other layers. We will do this by adding links between the control points on the image and the corresponding points on other layers (in this exercise, the *t1hydro_arc* layer). This is known as georeferencing. ArcMap requires a minimum of three links to transform the image – rotating, scaling and warping it as needed to fully register it too the *t1hydro_arc* layer.

Make the Georeferencing toolbar visible, add control points on satellite image and *t1hydro_arc* layer (set most control points along the coastline). You may use the magnifier under the Window menu to help you.

8. Make the editor toolbar visible and start your digitising.
9. Save the edits, and quit ArcMap after you finish.