Assignment 3 notes

Mercator Projection

map width = map height = 256 \* 2 level pixels

The **ground resolution** indicates the distance on the ground that’s represented by a single pixel in the map. For example, at a ground resolution of 10 meters/pixel, each pixel represents a ground distance of 10 meters. The ground resolution varies depending on the level of detail and the latitude at which it’s measured. Using an earth radius of 6378137 meters, the ground resolution (in meters per pixel) can be calculated as:

ground resolution = cos(latitude \* pi/180) \* earth circumference / map width

= (cos(latitude \* pi/180) \* 2 \* pi \* 6378137 meters) / (256 \* 2 level pixels)

The **map scale** indicates the ratio between map distance and ground distance, when measured in the same units. For instance, at a map scale of 1 : 100,000, each inch on the map represents a ground distance of 100,000 inches. Like the ground resolution, the map scale varies with the level of detail and the latitude of measurement. It can be calculated from the ground resolution as follows, given the screen resolution in dots per inch, typically 96 dpi:

map scale = 1 : ground resolution \* screen dpi / 0.0254 meters/inch

= 1 : (cos(latitude \* pi/180) \* 2 \* pi \* 6378137 \* screen dpi) / (256 \* 2 level \* 0.0254)

Calculate Width/Height

Width = 256 \* 2^level = Height

Given latitude and longitude in degrees, and the level of detail, the pixel XY coordinates can be calculated as follows:

sinLatitude = sin(latitude \* pi/180)

pixelX = ((longitude + 180) / 360) \* 256 \* 2 level

pixelY = (0.5 – log((1 + sinLatitude) / (1 – sinLatitude)) / (4 \* pi)) \* 256 \* 2 level