Map Viewer Tutorial 1 – Working With Grid and Vector Maps

The primary function of MapViewer is working with maps, both grid and vector maps. A grid map is similar to a picture, made up of cells (like pixels). Each cell records the likelihood that an obstacle exists at that part of the map. The value of a cell is a floating point number between 0 and 1 inclusive. The higher the value of a cell, the darker it gets, and the more likely that an obstacle exists at that point of the map. A value of 0 means that there is no obstacle there, a value of 1 means that there is definitely an obstacle there. An exception to this is when a cell has the value –1, which means that there is no information on that part of the map. A vector map is different to a grid map. Instead of dividing the map area into equally sized cells, a vector map is made up of a set of objects, or obstacles. Each of these obstacles is either a line or a rectangle. With map viewer, you can use lines, unfilled rectangles and filled rectangles. This tutorial will take you through the basics of working with both types of maps.

Create a new map

To begin with, click on □ to create a new map. This opens a dialog asking you what size (in cells) you want to make the map. Leave it with the defaults for now, and click ok.

You now have a blank map. On the toolbar, you'll see these two icons, ▦ and ▣. When the first is pressed, the grid map visible, when the second is pressed the vector map is visible. Both can be visible at the same time.

Drawing on the map with a pen

To draw on the map, click the pencil ✏ button. Move the mouse over the window while pressing the left button. To change the colour you're drawing, click on the colour picker button ▬. This pops up a box with a selection of colours you can use. The values from 0 to 1 are represented in grey, with 0 being white and 1 being black. Blue means the value –1. Choose a colour by clicking on it. Now draw on the window again – a different colour should be used. You can also change colours using the dropper tool, ✒, which allows you to click on any colour in the map to use it.

Currently you are drawing just one pixel at a time. To enlarge the brush, click the down arrow ▾ next to the pencil button ✏. This will give you a selection of brush sizes to use.

Drawing on the map with lines and rectangles

Now click on the Line Tool button ╲. To draw a line on the screen, click and hold down the left mouse button, drag it to another point, and leave it go. A line of pixels is drawn on the screen. The ▽ poly-line tool is similar, except that a new line begins from wherever the last one ended. To cancel drawing a poly-line, click the right mouse button. The ▢ empty rectangle and ■ filled rectangle tools can be used in the same way.
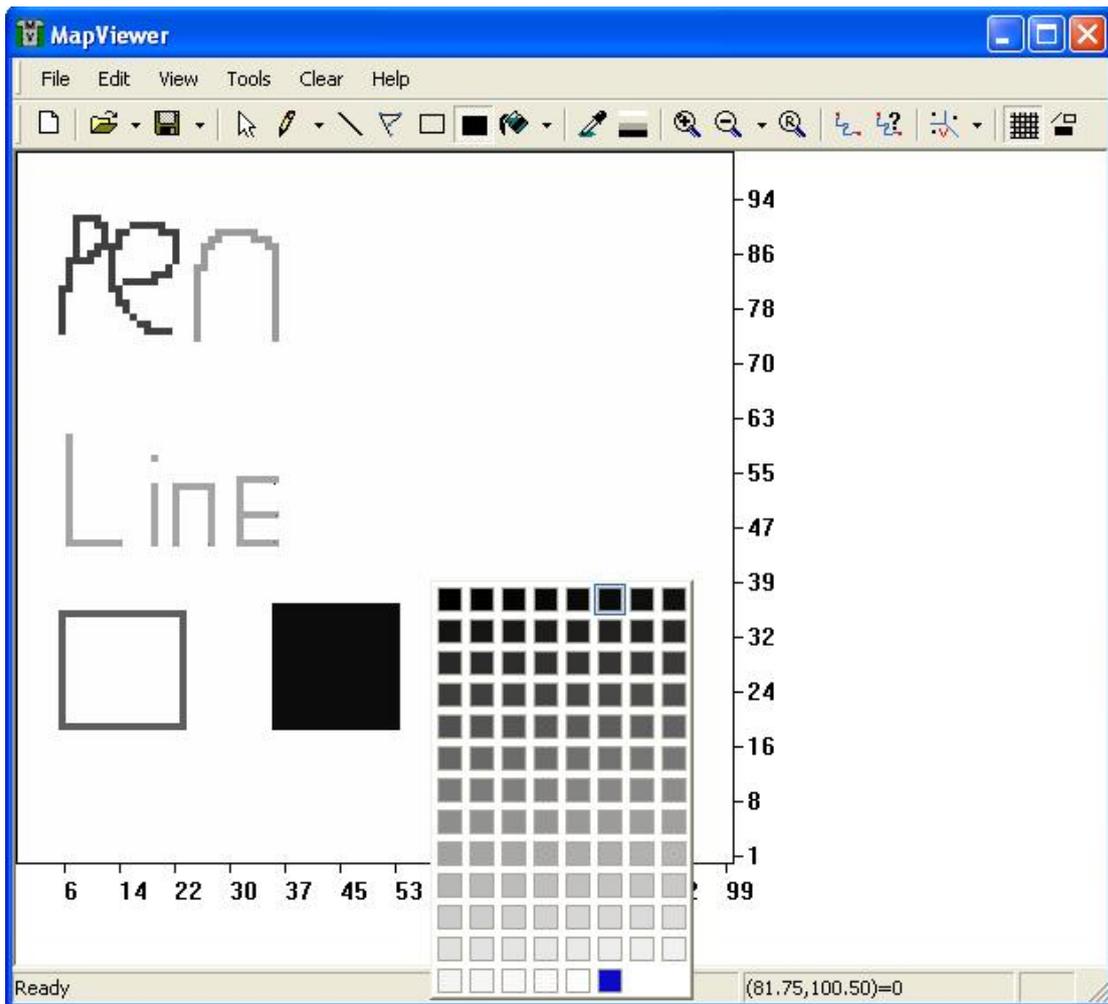
Switching from Grid Map mode to Vector Map Mode and Vice Versa

If the Vector Map button ⬚ is not already pressed, press it. You should now see the objects you have drawn overlaid on the grid map. To see the vector map more clearly, hide the grid map by clicking on the ⊞ button. You should now see a light grey background grid, and the lines and/or rectangles you drew overlaid on it.

Manipulating Vector Objects

To manipulate these objects, click the Select Tool button ⬚. Now click once on an object. If you've clicked close enough to an object, it will be selected, and a number of *handles* appear on it. For a line, the handle at either end is used to resize the line, while the handle in the middle is used to move it. For rectangles, the handles on the corners are used to resize the rectangles, while the handle in the middle is used to move it. You can select multiple objects by holding down the SHIFT button and clicking on them, or by dragging a box around multiple objects. When more than one object is selected, a box is drawn around them, and you can just move or delete them – resize is not allowed. For now, move some objects around, and delete one.
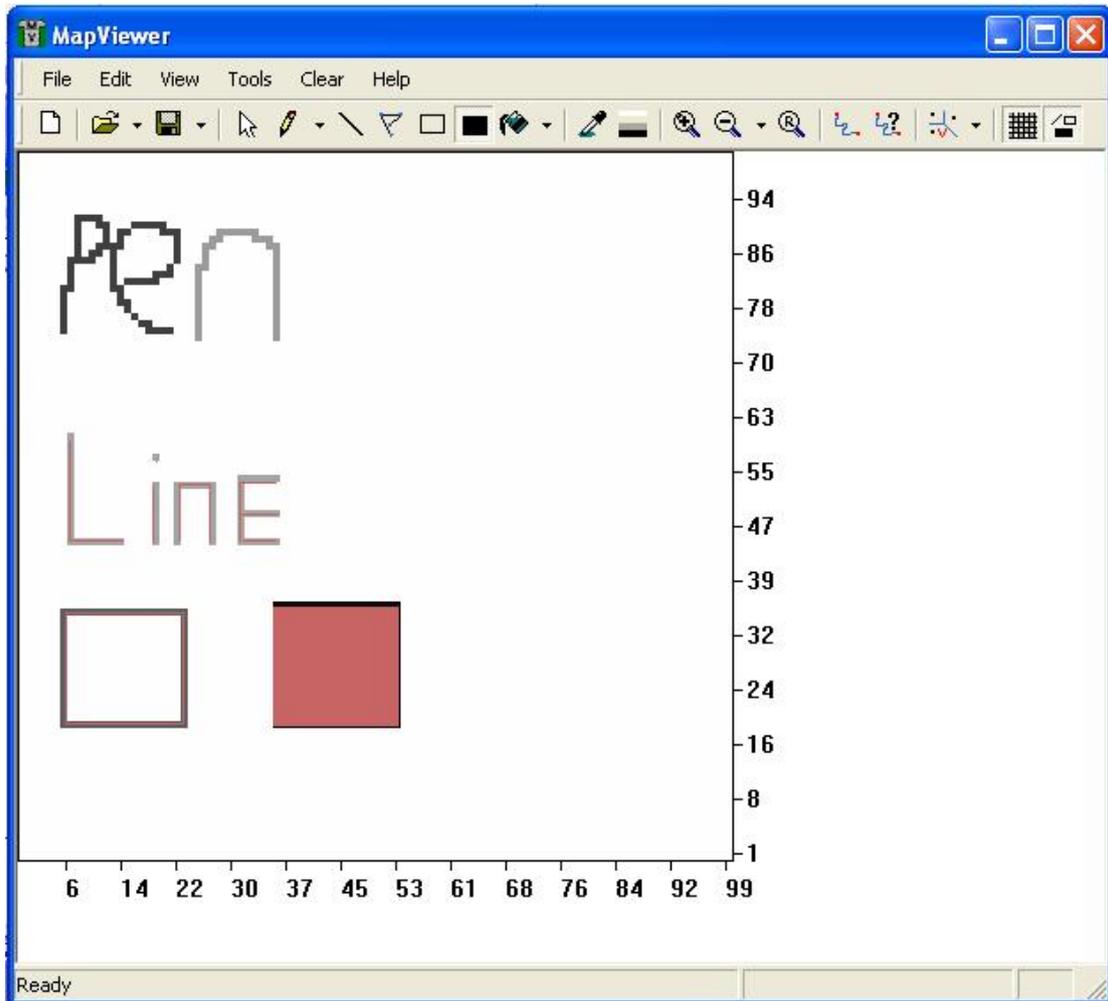
Click on the Grid Map ▦ button to show the grid map, and you will notice that the vectors you moved have had their cells in the grid updated. You can manipulate the vectors while viewing the grid map, so do it. Select a line and move it, and you'll see the grid map being updated accordingly. You can do this whether or not the vector map is visible, though of course it is much easier if it is visible. The picture above shows the window with both grid map and vector map visible – the vectors are the reddish colour shapes, while the grid is the grey scale background.

Using the Fill Tool
Click on the Fill Tool 🖌 icon. Now click anywhere on the window, and the map will be filled with the currently chosen colour.

Zooming in and out of the map
To zoom in on an area of the map, click the Zoom In tool button 🔍. Now click and hold the left mouse button on an area of the map, and drag it around the area you want to zoom in on. To zoom out, click the Zoom Out 🔍 button, which will zoom out a little. To zoom out more, click the down arrow ▾ button next to the Zoom Out button to choose the percentage to zoom out. To reset the view back to its default zoom, click the Reset Zoom button 🔍.

Saving Maps

MapViewer supports saving maps is a variety of formats. There are four pure-grid map formats,

- Grid Map,
- Carmen format,
- BeeSoft format,
- As a list of points.

Carmen and BeeSoft are two robot simulators/test suites, the Grid Map format is specific to MapViewer, while the List Of Points format is an extremely simplistic format that should make it easy for any programmer to translate their own maps to be usable with MapViewer. A map saved in any of these four formats will lose all vector information, as they only record the cell values. The first three all use the extension *.map*, while the fourth format can have any file extension.

MapViewer supports two types of vector map formats. The first, Saphira Vector Map format, is used by the Saphira robot simulator, and uses the file extension *.wld*. This can only store lines, so any rectangles you have drawn will be replaced by four lines. The second vector map format, Vector Map, is specific to MapViewer, and stores all the vector information properly, with nothing being lost (except the grid information). It uses the file extension *.mvm* (for Map Viewer Map).

The MVM format can also store grid information, and any map stored in this format can be reloaded with all grid and vector information. To save in this format, choose "*Save Vectors And GridMap*" from the Save menu.

Maps can also be saved as images. Three formats are supported:

- Windows Bitmap, .bmp
- JPEG
- PNM.

While the first two image formats are very common, the third, PNM, is not. PNM images are used with the Player/Stage robot simulator, and store grid maps differently to MapViewer – obstacles are white instead of black, and free space is black instead of white. Therefore, if you save a map in PNM format, the negative of it is saved. If an image is saved in BMP or JPEG format, they are saved as you see them – however everything on the screen is saved, so if anything else is visible (paths, Voronoi diagrams etc) these will be saved also. You can choose to save the complete map, or save the currently zoomed selection.

Loading Maps

As explained above, MapViewer supports a number of map formats. In addition to the formats above, you can load Saphira 2D Laser Maps and Vector maps created with the Saphira Mapper program.

Cropping/Expanding the Map

To crop the map, zoom in to the area you want to crop to, then click "Edit/Crop/Expand map to selection". This will clip both the grid and vector maps to the zoomed in area. Zoom Out again to see the change. To expand the area of a map, zoom out from the default zoom and click the "Edit/Crop/Expand map to selection" again. The map area is expanded, creating new free space around the map (white area).

Translating The Map

To translate the map (move it in the X or Y direction), click "Edit/Translate Map".
This opens a dialog prompting you for the distance in grid cells to translate the map.