

GeoTIFF Viewer: A PyQt5-based GUI for Viewing GeoTIFF Images

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1 Introduction

GeoTIFF Viewer is a Python-based GUI application for viewing and interacting with GeoTIFF images. It uses PyQt5 for the user interface and GDAL for geospatial image handling. The application allows users to display the image, track pixel coordinates, convert to latitude/longitude, mark specific locations, and support zoom/pan functionality.

2 Required Libraries

Before running the script, install the required libraries using:

```
pip install numpy matplotlib PyQt5 gdal
```

3 Code Explanation

3.1 Imports

The following libraries are imported:

- **sys** - For system-related functionalities.
- **numpy** - For handling numerical data.
- **gdal** - To read and manipulate GeoTIFF images.
- **matplotlib** - For displaying images in PyQt.
- **PyQt5** - For creating the GUI components.

3.2 Class Definition: GeoTIFFViewer

The class `GeoTIFFViewer` is a subclass of `QMainWindow` that initializes and manages the application.

3.3 Constructor: `__init__`

- Loads the GeoTIFF file using GDAL.
- Extracts geotransform data for coordinate conversion.
- Converts the image for display if it has multiple bands.
- Calls `initUI()` to set up the graphical interface.

3.4 User Interface (`initUI()`)

The UI consists of:

- A Matplotlib canvas to display the image.
- Labels to show X, Y, Latitude, and Longitude values.
- Input fields for Latitude and Longitude.
- A button to mark specific locations on the image.

3.5 Coordinate Conversions

The class defines two helper functions:

- `pixel_to_latlon(x, y)` - Converts pixel coordinates to geographic coordinates using the geotransform matrix.
- `latlon_to_pixel(lat, lon)` - Converts latitude/longitude to pixel coordinates using inverse geotransform.

3.6 Mouse Event Handling

- `on_mouse_move(event)` - Updates coordinate labels as the mouse moves over the image.
- `on_scroll(event)` - Implements zooming using the mouse wheel.
- `on_mouse_press(event)` - Starts panning when the left mouse button is pressed.
- `on_mouse_release(event)` - Stops panning when the mouse button is released.
- `on_mouse_drag(event)` - Moves the image when dragging the mouse.

3.7 Marking Locations

- The `mark_location()` function allows users to input latitude and longitude values.
- It converts them to pixel coordinates and plots a red cross on the image.

4 Running the Code

To run the application, execute:

```
if __name__ == "__main__":  
    app = QApplication(sys.argv)  
    window = GeoTIFFViewer(r"E:\\Computer-Vision\\Working-with-GeoTIFF-Images-Us  
    window.show()  
    sys.exit(app.exec_())
```

5 Conclusion

This GeoTIFF Viewer application provides a user-friendly way to visualize and interact with geospatial raster data. It enables zooming, panning, coordinate tracking, and marking of specific locations using latitude and longitude.