



Visualization Raster Based 3D Digital Elevation Model on WEB using QGIS

Sushil Chandra¹; Udai Raj²; Rajeev Sonkar³; Ujjwal Yadav⁴; Pragati Srivastava⁵; Sanghmitra⁶; Atma Prakash Maurya⁷

¹Scientist-SF, Head, CIP & DM, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, sushil.chandra@rsacup.org.in

²Scientist-SE, CIP & DM, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, udairaj.7765@gov.in

³Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, errajeevsonkar@gmail.com

⁴Ex.Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, ujjwal.yadav096@gmail.com

⁵Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, sripragati103@gmail.com

⁶Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, ksmitra585@gmail.com

⁷Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, apmaurya90@gmail.com

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Abstract: In the world of technology, Programming languages have its own importance in every field. Using programming languages one can automate the real world's problems like in Game development, Web development, Artificial Intelligence, 2D modeling, 3D modeling, GIS and as so many fields where programming languages have been played a vital role. But one who has no programming knowledge, how they can develop the things.

The objective of this paper is how to display a 3D model without having any programming knowledge using open-source, freely available software. A 3D model is developed for a particular region in QGIS software using SRTM DEM data.

Keywords: DEM, thress.js, QGIS

Study Area: In this paper, we are developing 3D model for Mirzapur district of state Uttar Pradesh of country India. Geographical extent of Uttar Pradesh is 23°52'N and 31°28'N latitudes and 77°3'E and 84°39'E longitudes.

Introduction:

3D modeling, a process of fully animating to an object. 3D models are used in video game development, website development, movies and other illustrations. We are presenting a way how to develop a 3D model without having any programming knowledge without spending money. There many open-source software are available which are free for use. In this paper, we are discussing GIS based 3D models, these models are efficient to simulate real worlds in a small scale. It depicts an object real by adding 3rd dimension z. It is easy to show height of buildings, trees, hills and mountains on map, drainage pattern of the area. These models are self-explanatory, public / private sector can plan for urban development for particular region, for designing of cellular towers and hydroelectric Dams.

We are developing a 3D model for Uttar Pradesh region using raster data in which altitude of terrain is showing. How the land surface is varying in whole region, direction of flow of rivers, topography of the region. For creating 3D-model we are using SRTM Dem data of 30 meter resolution.





Tools and Methodology:

i. Tools:

Three.js: It is library of javascript, used to render 3D model on the web and also used to develop 3D models for games and animations.

QGIS: QGIS is an open-source software of GIS. It is used to perform various GIS functionality like Data preparation, analysis, preparation of maps and many more. It is rich in free plugins which are used to perform advance task. In this paper we are using Qgis2threejs plugin of Qgis to develop a 3D model using DEM data for region of Uttar Pradesh.

Qgis2threejs: It is open-source plugin of Qgis. It is used to develop 3D model of Dem, a raster data and vector data to render on web browser. We can also use this 3d model for 3D printing.

DEM: It stands for Digital Elevation Model. It is kind of raster data, used for slope, aspects, change analysis, create a contour map, and also identify geological structure like terrains, hills, mountain. This digital model only consider earth's structure not the object present on its surface like trees, building. Dem is created to analyze elevation using Datum.

ii. Methods:

There are multiple ways of data acquisition for DEM like Ground survey, Lidar, Radar interferometry, DGPS measurement, Stereo Photogrammetry, Digitizing contour lines. In this paper, We are using SRTM DEM data for Uttar Pradesh region to know the altitude of terrain.

SRTM stands for Shuttle Radar Topography Mission. The data of SRTM for Dem is very accurate, collection of data is done using Synthetic Aperture Radar and interferometry, the measurement of earth's surface is done by two antennas. It captures 30 meter of 80% of earth's surface in 1 Acr-second. The data of STRM is freely available on USGS portal. Users can register ourself freely, after login select the region on the map, data range one can download the data very easily.

For the study, we downloaded one year data for Uttar Pradesh region of 30-meter as showing in Fig:1(A).

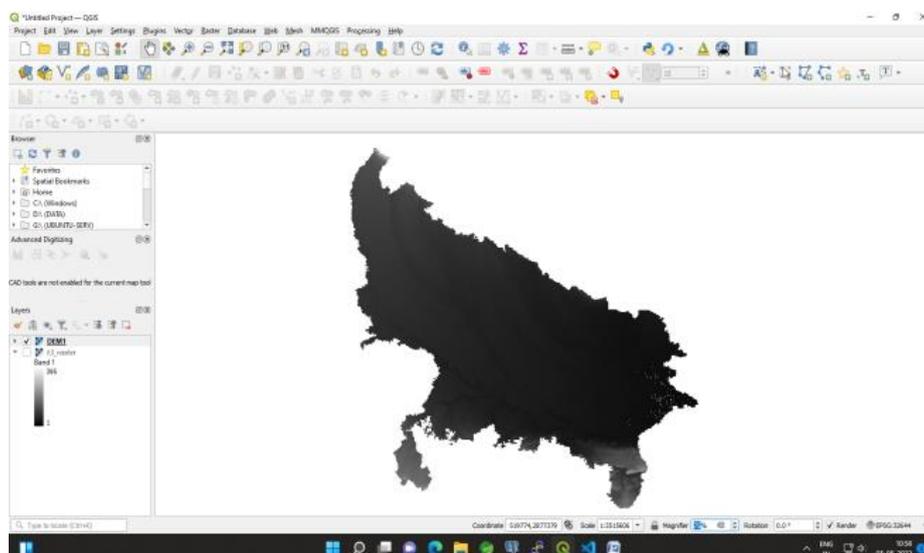


Fig:1(A)





We clipped this data for a district Mirzapur. The vector shapefile of Mirzapur as showing in Fig:1(B) used to clip DEM data of Uttar Pradesh. Fig:1(C) showing clipped DEM for Mirzapur District.

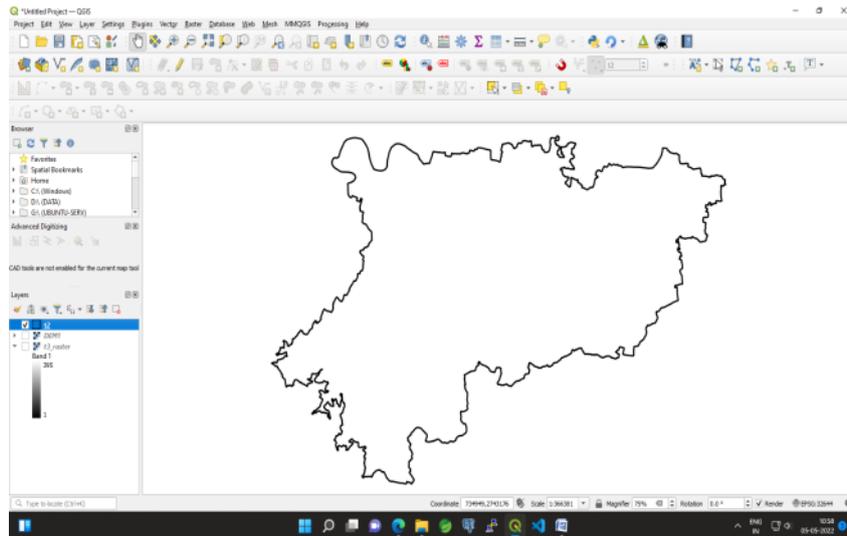


Fig:1(B)

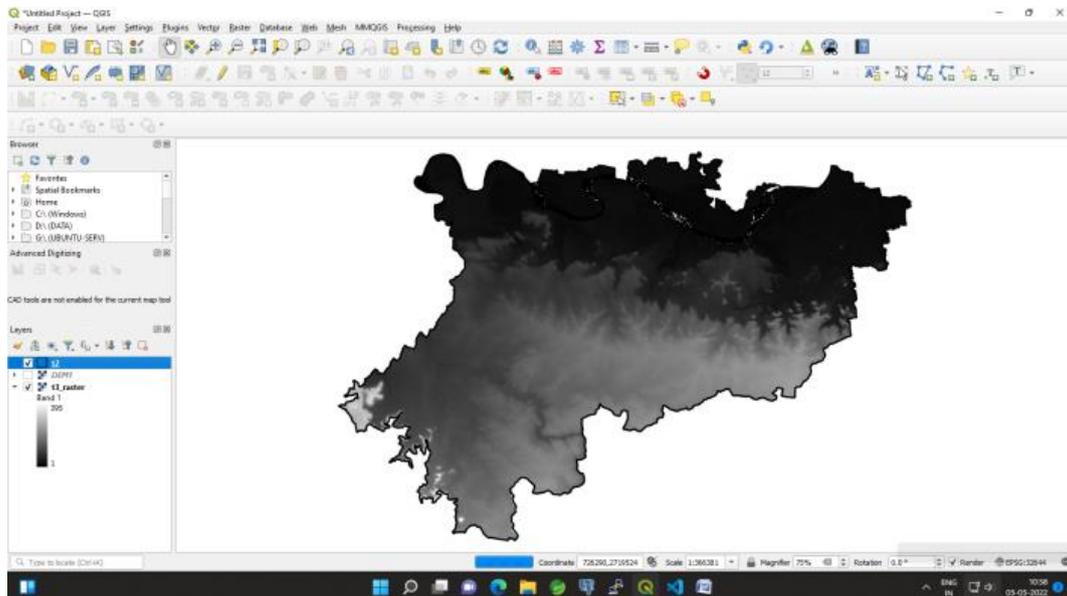


Fig:1(C)



After collecting data, we generated 3d model for 30m resolution data for Mirzapur District. Using Qgis2three.js plugin we generate 3D model as showing in Fig:2(A) This model showing Terrain part in this region and whitish part showing flow of rivers in Mirzapur district.

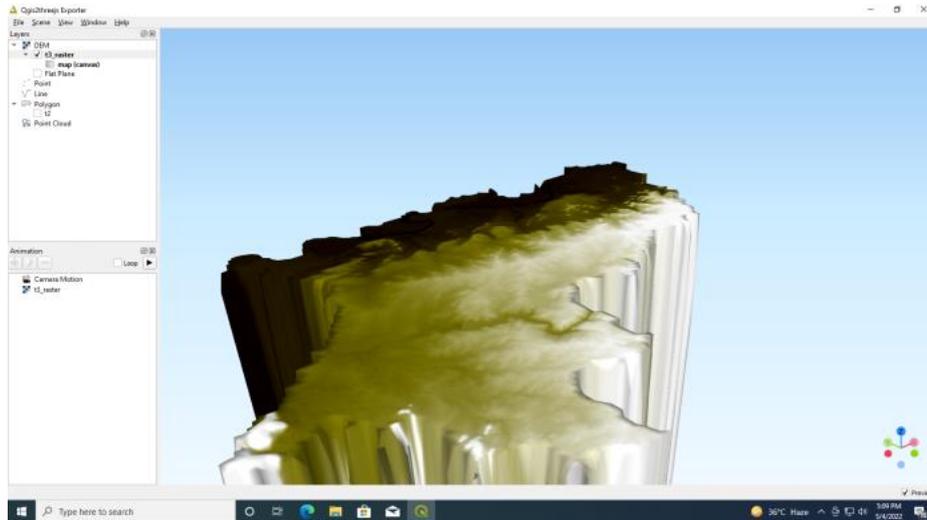


Fig:2(A)

We can also save this model as 2D image in .jpg or .png format. We saved this as .png image as showing in Fig:2(B)

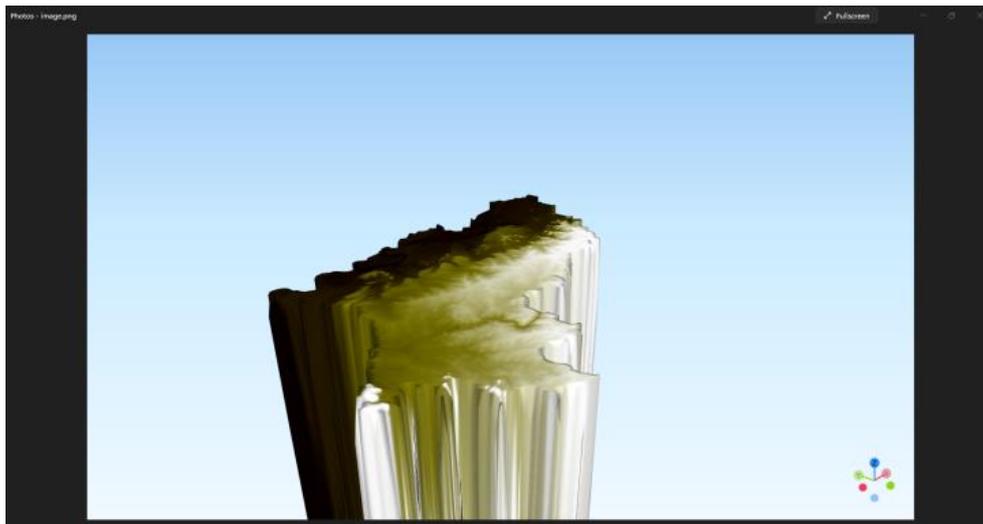


Fig:2(B)



Also saved as 3D object in .gltf format showing in Fig:2(C).

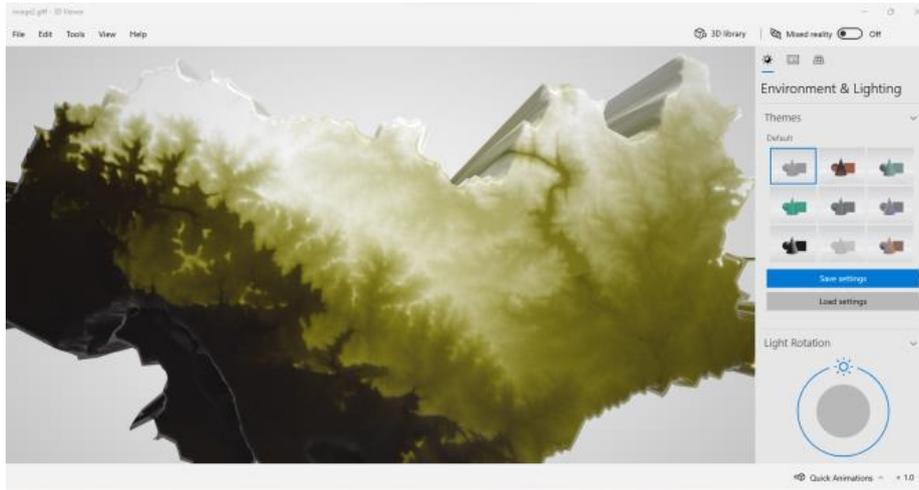


Fig:2(C)

And also Export these models for web. For this save this as .html format. It creates a web project in the desired directory. Then open HTML file for rendering 3D model in web as showing in Fig:3

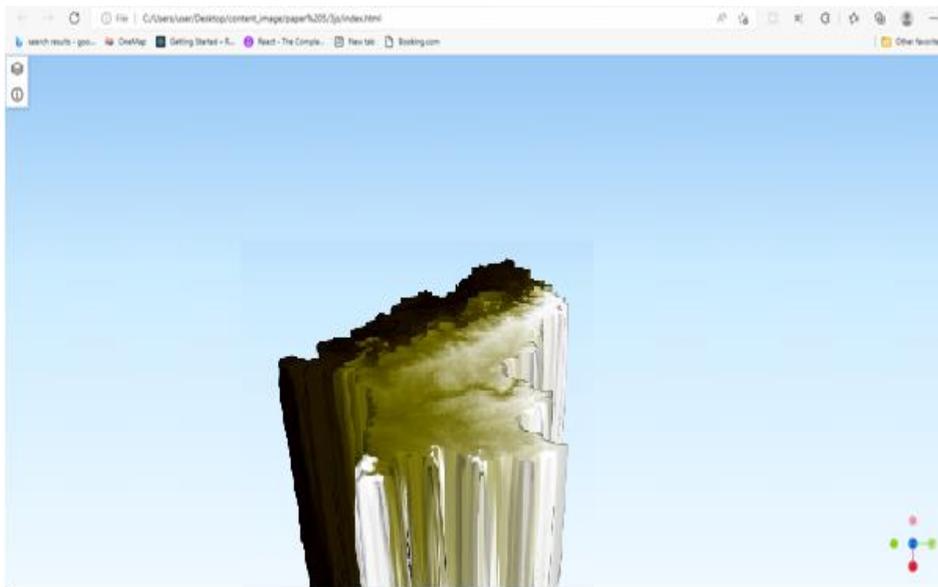


Fig:3





Conclusion:

The Qgis plugin qgis2threejs is used for displaying raster SRTM Digital Elevation Model on Web Successful. This is initial level work but in future we will do volumetric analysis on web.

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