Satellite Visual Engine

Problem Statement

The problem addressed by AUGSENSE is the need for a comprehensive tool that allows users to visualize the satellite positions, and their graphical view and to explore the points of interest on a map. Specifically, to provide a Satellite in View Display that shows the satellites within a specified location, a Graphical view for data analysis, and a Map with marked points of interest for explorations.

Solution

Coding language: Web Technology

- We have developed a web page that presents a global visualization with satellite overlays. The page includes a menu bar positioned in the left corner, offering features to manipulate the display. Users can remove the satellites or markers from views, as well as selectively display specific satellites such as GLONASS, Galileo, Navic, Geosynchronous, Star-link, and GPS. Additionally, an option is provided to show all active satellites for a comprehensive view.
- Also users can select the satellites (twice a time) and visualize the satellite orbits along with the current movement of the satellites. This interactive orbital path visualization provides an immersive experience, allowing users to observe and understand how satellites traverse their orbital paths over time. These movements are continuously updated for every 1 millisecond based on real-time simulations.
- We have added some navigation keys. The navigation features on the web page utilize keyboard inputs for movement control.
    1. W/S - > w/s keys are assigned to move the view forward/backward along the current direction.
    2. A/D - > a /d keys are used to shift the view left/right.
    3. Q/E - > q/e keys allow users to move the view up/down vertically.
- These inputs trigger corresponding functions in the web page's code, which update the positions of the view, providing the illusion of movements. We can adjust the camera's positions and perspectives based on the navigation input, allowing users to explore the satellite visualization by navigating within the virtual environment.

- Also, navigation compasses are also added so that users can able to visualize not only the present position of satellites but also their past and future positions. The web page collects satellite position data, including historical, current, and predicted positions, this data could be obtained from real-time satellite position apis. Users can interact with time controls to navigate between the present, past, and future.
- We have implemented a marking feature so that users can mark a location on the web page. The code captures the marked location's coordinates (X, Y), using mapping technique these coordinates are converted into geographical coordinates (i.e)longitude and latitude.
- The web page updates the display to show the longitude and latitude of the marked location. This feature enables users to easily visualize and obtain the longitude and latitude information of any marked location within the satellite visualization.
- In addition to that, we displayed the details of satellites so that users can gain insights into the specific characteristics and current status of the selected active satellite. It provides them with relevant information such as identification, time reference, and the currency of the satellite's position data. This additional information enhances the user experience and enables a more comprehensive understanding of the active satellites.
- We have incorporated various globe layouts, which offer users different visual perspectives. Users can choose the layout that best suits their needs or preference, enhancing their understanding and exploration of the satellite data within the chosen visual context. Each layout offers a unique visual representation of the earth's surface. Some layouts mentioned in our app are,
    1. Aerial: Aerial imagery of the Earth's surface, provides a realistic and detailed view.
    2. Aerial with labels: Similar to the aerial layout, but with additional labels and place names overlaid on the imagery, enhancing the understanding of specific locations.
    3. Bing Map Road: Shows road maps with associated features such as landmarks, highways, and points of interest.
    4. Sentinel 2: Captures high-resolution multi-spectral imagery for monitoring the earth's vegetation, land cover, and more.
    5. Blue Marble: Displays a composite image of the Earth, providing a realistic representation of the planet's surface.
    6. Earth at night: Shows a view of the Earth from space, highlighting illuminated areas representing human activity at night.

7. Natural Earth: Provides visually appealing and stylized representation of the earth's surface combining terrain, land cover, and water bodies.
8. Open Street Map: Utilizes crowd-sourced data to display a collaborative and community-driven map of the world, featuring roads, buildings, and points of interest.
9. Stamen Toner: Provides a high-contrast black-and-white map style, emphasizing road networks and administrative boundaries.
10. ArcGIS world hill shade: Shows a relief map of the Earth's surface, emphasizing the terrain and elevation variations.

- In addition to that, we incorporated different views (2D, 3D, and Columbus view) to interact with and visualize the map data. the 2D view is suitable for general navigation, the 3D view adds depth and realism and the Columbus view offers a unique and informative perspective. Users can switch between these views based on their preferences and the specific information they want to gather or visualize on the map.
- Finally, we have incorporated a search box for location input, so that users can quickly and accurately navigate to specific places of interest on the map. It improves the user experience by allowing them to visualize different locations within the satellite overlay, enhancing the overall functionality and usability of the web page.

Overall, we provided a comprehensive solution for visualizing satellite positions and exploring points of interest on a global scale. With this user friendly web page, user can manipulate the display, select specific satellite systems, and visualize satellite orbits in real-time. The navigation features allow for seamless movement within the virtual environment, while the inclusion of the navigation compass enhances the understanding of past, present and future satellite positions. The ability to mark location and obtain longitude and latitude further enhances the user experience. With various global layouts and views as well as the search box for location input, we offered a versatile and immersive satellite visualization tool.