

Project Overview

This Missile Simulation project is a realistic visualization tool that allows users to simulate the launch and explosion of missiles on a real-world map. It calculates damage radii based on the missile's yield and displays them with styled animations and overlays.

Technologies used: - **React.js** - **Leaflet.js** - **Framer Motion** - **Tailwind CSS** - **Vite**

Features

- Set **launch** and **target** positions on a map.
 - Select missile type with range and yield parameters.
 - View animated missile trajectory.
 - Hear launch and explosion sounds.
 - See realistic explosion effects and shockwaves.
 - View detailed blast radius report on explosion.
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Installation Guide

1. Clone the repository

```
https://github.com/your-username/missile-simulator.git  
cd missile-simulator
```

2. Install dependencies

```
npm install
```

3. Start the development server

```
npm run dev
```

Project Structure

```
missile-simulator/  
├── public/  
│   └── assets/           # Images and sound files
```

```

├─ src/
│   ├── assets/           # CSS and media files
│   ├── components/       # MissileMap, ExplosionInfo, missileData.js
│   ├── pages/            # SimulationPage.jsx
│   ├── utils/            # geoUtils.js, greatCircle.js, blastRadii.js
│   └─ App.jsx
├─ index.html
├─ package.json
└─ vite.config.js

```

Dependencies

```

"dependencies": {
  "cesium": "^1.130.1",
  "framer-motion": "^12.19.1",
  "leaflet": "^1.9.4",
  "leaflet-providers": "^2.0.0",
  "react": "^19.1.0",
  "react-dom": "^19.1.0",
  "react-leaflet": "^5.0.0",
  "react-router-dom": "^7.6.2"
},
"devDependencies": {
  "@vitejs/plugin-react": "^4.5.2",
  "tailwindcss": "^4.1.10",
  "vite": "^7.0.0"
}

```

Routes

/

Redirects to the simulation page.

/simulate

Shows the full simulation UI where user can launch missile and view map.

Utility Files

blastRadii.js

Calculates radius of effects like fireball, radiation, blast, etc.

```
export function calculateBlastRadii(yieldMT) {  
  return {  
    fireball: 0.28 * Math.pow(yieldMT, 0.4) * 1000,  
    radiation: 1.05 * Math.pow(yieldMT, 0.5) * 1000,  
    heavyBlast: 1.2 * Math.pow(yieldMT, 1 / 3) * 1000,  
    moderateBlast: 2.5 * Math.pow(yieldMT, 1 / 3) * 1000,  
    thermal: 4.5 * Math.pow(yieldMT, 0.4) * 1000,  
  };  
}
```

Leaflet Map

- Uses `MapContainer`, `Marker`, `Polyline`, `Circle` from **react-leaflet**.
- Missile icon is rotated using inline CSS transform.
- Explosion overlays include multiple damage zones.

Audio Effects

Add your sound files (MP3): - `launch.mp3` - `explode.mp3`

Use the `Audio` object to play them during launch and explosion events.

Additional Notes

- Shockwave animation is achieved using `Circle` + state-driven radius updates.
- Info component appears **only after explosion**.
- Each missile can be customized via `missileData.js`.

Acknowledgments

Thanks to: - Leaflet.js for mapping - OpenStreetMap for tiles - React community for amazing libraries

Designed and developed by Vishnu Yadav