Technology bucket: - Software- Mobile App Development

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Category :- Software

IDEA

Solar energy is a vital source of electricity and an initiative for clean and renewable energy production. Solar energy potential at a particular region can be found efficiently by detecting local sky horizon. This technique involves separation of sky pixels and identifying the terrain from the image which could potentially obstruct the sun rays.

With the help of our application “Vyomang”, users can capture or upload an image through their devices. The image is uploaded to the cloud server and masked to a sky-ground image using Machine Learning techniques such as **k-means clustering and semantic segmentation**.

At the end, along with the **binary masked image**, a detailed **statistical report** showing the variations in the energy potential across different seasons and weather conditions is produced. This helps the user to understand and develop an efficient energy policy for solar energy consumption.

Process Outline





Workflow

Step 1 - Uploading the Image:-

The image uploaded by the user is auto-tilted based on phone's orientation and compressed to a standard resolution for efficiency before sending it to the cloud server.

Step 2 – Edge Detection:-

A Sobel Gradient layout of the original image is generated to determine the edges and borders.

Step 3 – Pixel Clustering and Classification:-

Then the image is clustered using K-Means Clustering Technique (k=2) to separate sky region (high-intensity pixels) and ground region (low-intensity pixels).

Step 4 – Isolation of Sky Region-

The Semantic Segmentation is implemented for pixel-level isolation of sky region.

Step 5 – Masking of Image:-

A hybrid model is developed by integrating the above methods and masked to a dual-tone B/W image from which the angle of elevation for each lowest sky pixel is determined.

Step 6 – End Result:-

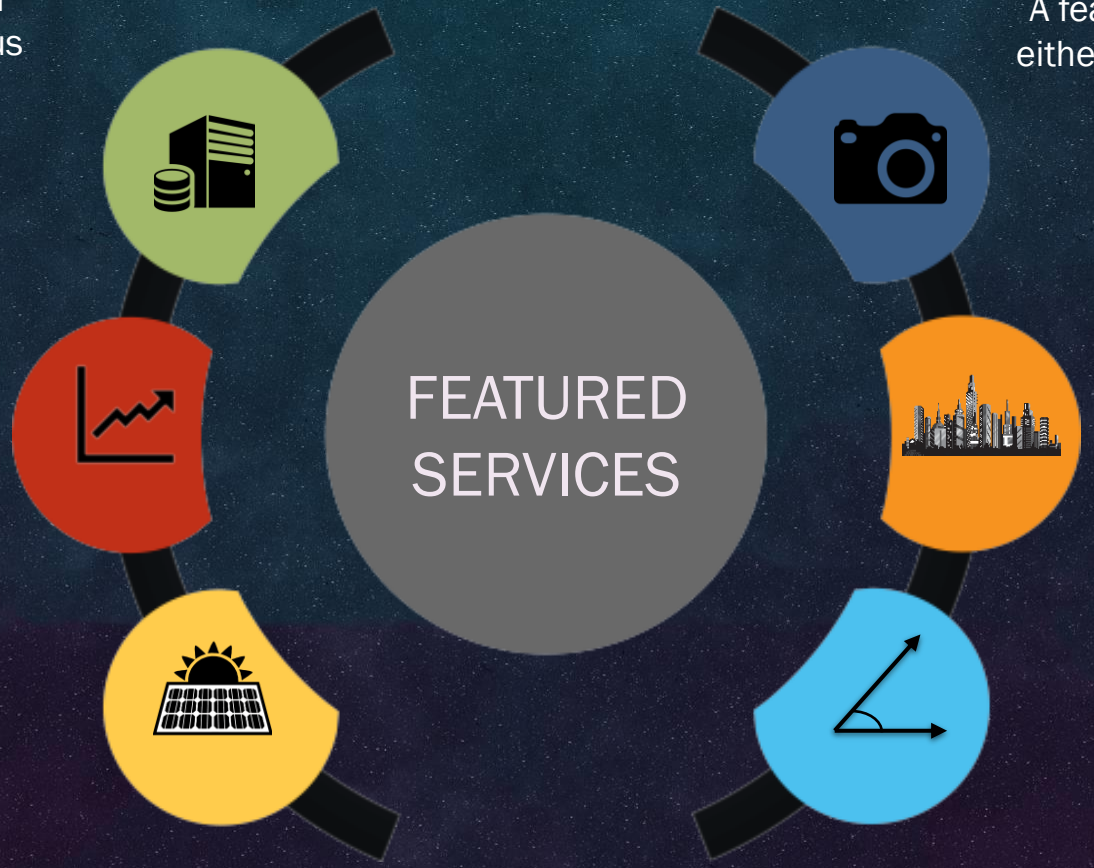
The masked image is returned to the user along with a detailed report on solar energy potential.

Note: Image processing is done on the cloud server to reduce processor strain and battery drain of the device.

Technology Stack

- Database
  -Google Firebase
- Server-side Language
  -Python
- Libraries
  - OpenCV, sklearn, TensorFlow
- Frameworks
  -Android API
- Operating System
  - Android

FEATURED SERVICES



The location specific solar energy potential for various climatic conditions.

A feature to upload the image either from files or capturing by camera access

The optimum angle for the solar panel to be mounted to get the maximum energy output.

Detection of horizon from the image uploaded by the user

Report on the solar irradiance throughout the day, month and year through graphical visualizations.

Masking of the image by isolating the sky and ground region.

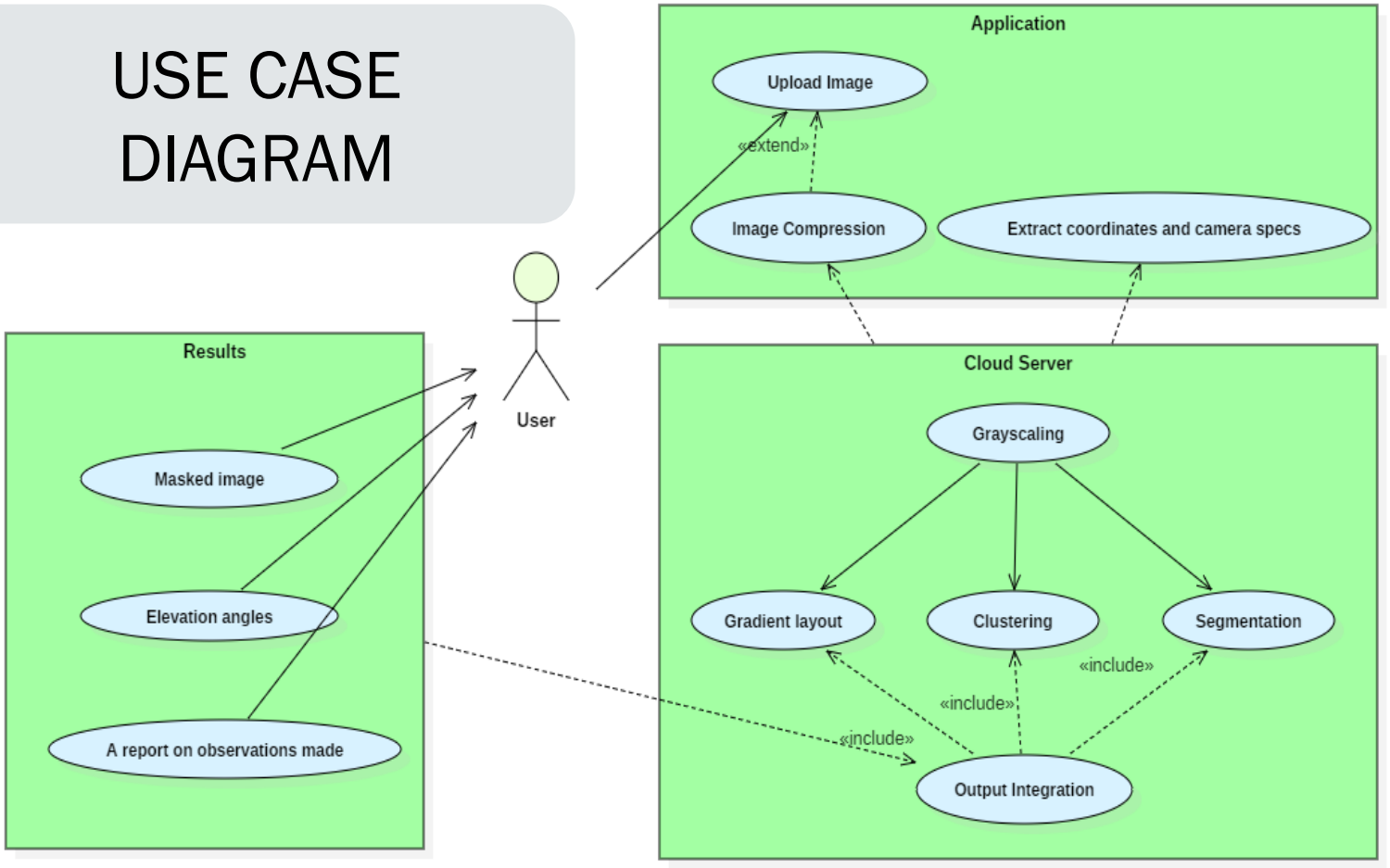
Estimated count of solar panels required based on user's energy requirements.

Continuous support to the user in case of reported queries or grievances.

Angle of elevation for each lowest sky pixel.

- To view the working prototype of Vyomang, please navigate here
- To experience our mock-up UI, please navigate here (Mobile view only)

USE CASE DIAGRAM



DEPENDENCIES

- Camera Access
- Internet Access
- Global positioning system
- File System Access
- Accelerometer sensor of the device

SHOW STOPPER

- Adverse climatic conditions may lead to improper masking.
- Inaccurate results in case of images with inadequate quality or captured during the night.