

Ministry Category : Department of Space(ISRO)
Problem Statement : Gram Panchayat Adoption Advisor
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Problem Code : #ISR2
College Code : #6080

Software Solution -

An android application will be devised to allow the citizens of the country to adopt a village and work towards its development.

- There will be a **Sign Up** option for all the volunteers.
- On a successful sign up, the volunteer will be shown upon a list of all the gram panchayats which are up for **adoption**.
- The villages will be sorted according to their GP **development indexes** and their indices towards adoption.
- There will be a floating button for the user to allow to sort the villages according to various other indexes such as health, literacy, agricultural, terrain profiles, sanitation, etc.
- A filter option can also be provided for filtering the gram panchayats according to states, districts, etc.
- When the user will open the village activity, a detailed info about the current village conditions will be shown.
- The details will include all the various rating indexes of the village, the district/state it belongs to.
- The village activity will also show the map of the village with a user friendly option to view all the roads, rivers and all the other geospatial data.
- An option for adoption will be provided. The user can adopt GP on a contribution or whole basis.
- A request will be generated to the government after recording the user's Aadhaar number.
- **Special** - A notification will be generated to the user if any natural calamity hits the village. The user can help the village by donation.

Working at backend-

1. The spatial datasets available for the gram panchayat will be interpreted and analysed using Python's Numpy, Pandas, Matplotlib, Fiona, Shapely, Geopandas libraries.
2. Primarily, **Geopandas** will be used to work with the shape files. All the geographical data such as area, length, type of object will be interpreted, cleaned and sorted.
3. **Shapely** and Geopandas will use the geometrical vector data to calculate the land use pattern, agricultural practises, and water scarcity.
4. **Open data** sets for village literacy rate, sanitation, etc will be scraped from the internet and appended to the data frame.
5. After analysing the data, the gram panchayat development index and adoption index will be calculated. according to **Data Mining and Analysis Approach**.
6. The calculated results will be stored in a **MongoDB** database.
7. The server will be built on Flask framework that is written in python
8. Server will provide an API to the android app that will help in interaction of android app with the server.
9. All the queries will be passed to the python script.
10. Manipulated data will be passed to android app in the form of JSON which will be used by the app to show the result.

Data Mining and Analysis Approach -

- **The given example spatial data set was analysed in the following manner -**

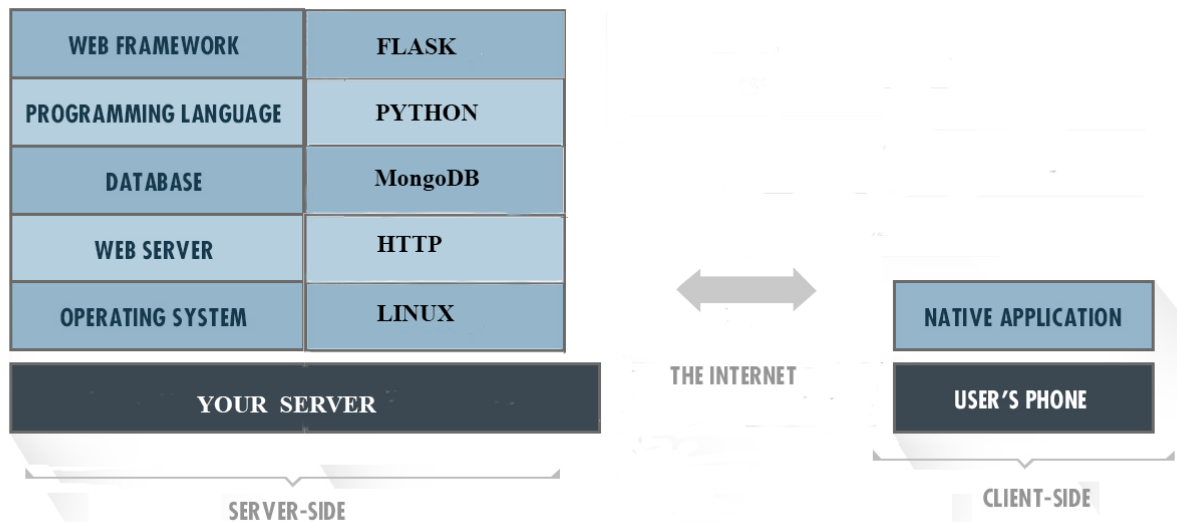
- I. **Drainage System** - Using the shape length from the dataset, total drainage area can be calculated. The rainfall intensity of that region can be scraped from the internet. Using both the factors, storm water runoff can be calculated ($Q = I * A$) to provide an index rating for drainage systems in that area.
- II. **Land Use and Land Cover (LULC)** - Time series analysis and forecasting of land use (Built ups) and land cover (Water bodies, agricultural land, wastelands) will be done. Better use of land will yield to better ratings.
- III. **Roads** - Given the dataset, lengths of National Highway, State highways, districts roads, kuchcha rural roads can be extracted. Road index for the village can be calculated using following formula $I = 1/(0.0213*NH + 0.0397*SH + 0.1408*DR + 0.798*RR)$ (referred to tnrd.gov.in).
- IV. **Slope** - More steeper slopes in the village area, more will be difficult it's development.

- **Data Mined from the internet -**

- I. **Literacy rate, Health, Income** - can be extracted from data.gov.in to calculate the human development index of gram panchayat.
- II. **Sanitation** - Total individual household latrines for the village is available on <https://data.gov.in/resources/gram-panchayat-wise-rural-sanitation-coverage-guntur-district-andhra-pradesh-date>. This will provide an index of sanitation situation in the gram panchayat.
- III. **Drinking water** - State rural percentage of safe drinking water dataset can also be taken from <https://data.gov.in/catalog/households-access-safe-drinking-water>.

By combining all the above indexes with their respective **priorities**, we'll get the overall gram panchayat **development index**. The gram panchayat having the lowest development index and least contributing volunteers will be given the topmost adoption priority. As the volunteers will continue to contribute, the database will get update with the current development status so that there is an even welfare of all the gram panchayats.

Technology Stack:-



Dependencies -

Server side -

Numpy - For quick array operations.

Pandas - (GeoPandas dependency) It will be used to clean and sort the data.

Matplotlib - (GeoPandas dependency) **Basemap** and **Pyplot** will be used for plotting.

Shaply - For working with vector objects like Point, LineString, Polygon.

Geopandas - To perform various plotting and cleaning operations on **shapefiles**.

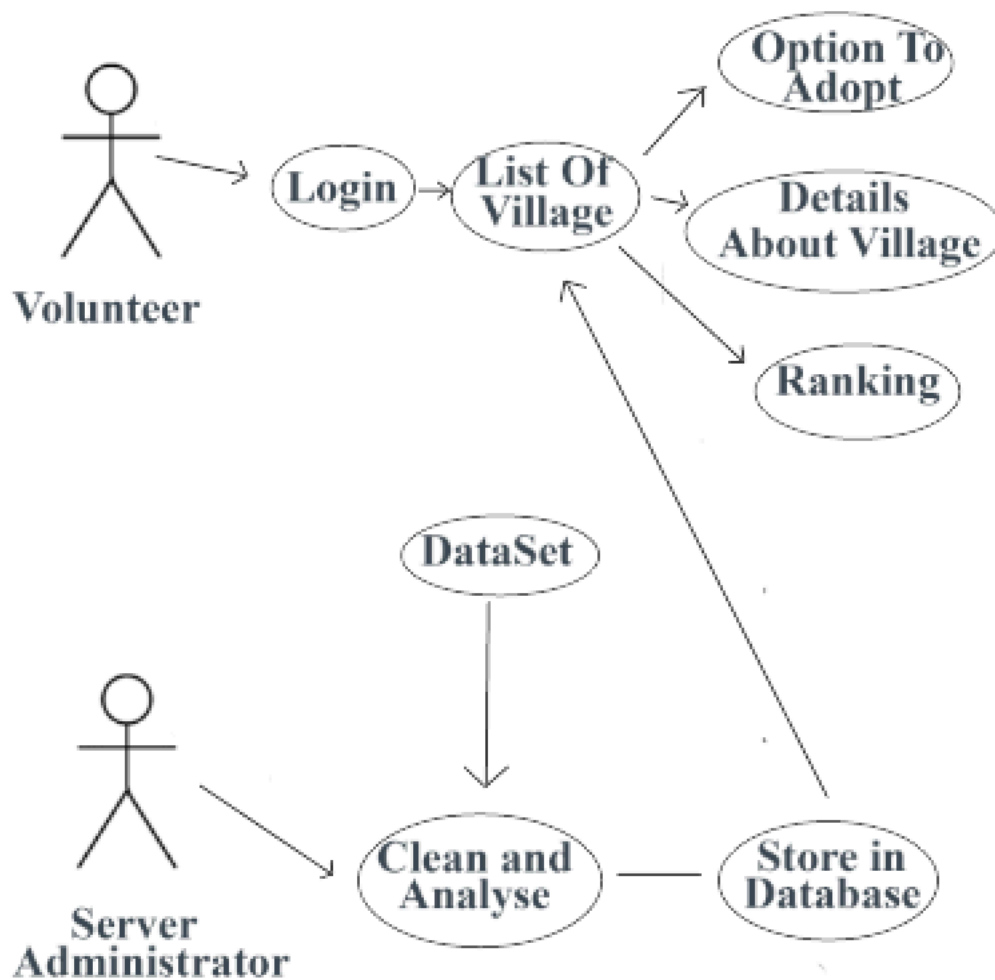
Flask - For creating and working with API.

PyMongo - For converting python object to equivalent mongoDB collections.

Client Side -

Android Framework - for creating the server side application.

Use Case -



Show stopper -

- Lack of datasets and geospatial data can cause halt the activity .