GEO-TAGGING OF AGRICULTURAL PRODUCTS USING MOBILE APPLICATION IN REMOTE AREAS

Rushi Sheth, Keyur Brahmbhatt

•

Information Technology Department, Birla Vishvakarma Mahavidyalaya
rushisheth98@gmail.com

Abstract

Geo-Tagging is a popular term in the market nowadays. Be it a blog post or a status update on social media, things are getting geotagged. If a person adds a new post on social media giants like Instagram, Facebook, Snapchat he enjoys features like adding location to the post which is an instance of Geo-Tagging. Geo-Tagging substantially means adding crucial geographical information like longitude, latitude, altitude to the metadata of photos, video files, audio, etc. In a country like India where agriculture accounts for about quarter of GDP and employs about 50% of Indian work force, the concept of geotagging can fulfill wide range of objectives. Various laboratories in India carry out a timely test on agriculture products to ensure quality, nutrition efficiency and pesticide residues, hence sample collectors go for collecting different agriculture products. However, to verify whether the samples are collected from the same place as claimed or not is quite difficult. In this paper one such solution is proposed which can be used by laboratories to carry out sample collection by capturing picture of sample in a mobile application, fetching latitude and longitude in background to geotag each sample, hence maintaining the authenticity of the sample.

Keywords: Geo-tagging, Mobile Application, GPS, Agriculture

I. Introduction

Laboratories carry out Agricultural products testing in order to ensure the quality of products and decide whether they are suitable for consumption or not. To avoid frauds and malpractices verification of collected sample[1] is of utmost necessity. Whether the samples originated from the same place as it is claimed or not, any malpractices were performed while sample collection, all these things have to be checked before test are conducted on samples in laboratories. These samples could have been collected from farmers or local vegetable vendors. Testing of this sample is much important as it stands for how well the hygiene standards and quality of agricultural product is maintained. But what if the sample was not collected from the place as it is been claimed, it would lead to big compromise of whole procedure. The current practice followed by the sample collector is where they manually enter data of the samples in register and on the other hand they click pictures of samples in geo tagging devices. Due to this practice, they have to maintain separate data sheets for samples taken as well as their photos and manually link them while entering data on software. While, the solution suggested in this paper would change scenario of sample collection, as

---

[1] Sample- Agricultural Product

there would be no need of manual entry in register and once the entry is done digitally in mobile application, data would be automatically uploaded to the server upon sync without need of any manual entry on the server DB.

This paper suggests preparing a mobile application which would help capture photos of these Agricultural samples, fetch latitude and longitude in order to geotag these photos of samples collected. The data of sample collected would be stored in local database i.e. SQLite[2] as samples are also to be collected from rural and remote areas of the country where there is poor internet connectivity. From regions with such poor network connectivity, sample collectors would be unable to send data, hence this application would take care of that problem by making use of local database like SQLite. When the network connectivity would be available, the sample collector would be able to send data or sync data to the server with one tap on mobile screen.

II. Literature Survey

Since last decade a trend of geotagging photos, blogpost has been quite popular among social media users. But there is a lot more to the concept of geotagging which techno geeks are realizing with the time passing. Geotagging has made its way to the classrooms, where its increasing importance for student field work is quite noticeable [1]. Students are being taught history with geotagged photos. In the recent happening, officials in COVID'19 war room of India used geotagging app called 'Sahyog' which helped them identify the entry and exit points of containment zone, so that they can carry forward necessary procedures [11]. This instance clearly demonstrates the potential of Geo-tagging technique and its wide range of applications. Data analyzers have used the geotag data in order to generate heat maps and gather further inferences from it regarding user pattern and behavior [3][4][6]. Tourist behavior has also been under the observation for their response to geotag data on social media, which led researchers to identify and categorize hotspots for tourist [5]. In 2017, Ministry of Agriculture had signed a MoU with the ISRO under Rashtriya Krishi Vikas Yojna for geotagging of agricultural assets which would lead to better land management, inventory management, claim settlement and verification, soil quality check after natural calamities [8]. Prime Minister Modi himself emphasized on the need for online recording and monitoring of assets to check leakages. This MoU has somewhat shifted the focus on a point that Geotagging might play an important role in agriculture sector for asset management and the solution proposed in this paper fulfills that expectation. Under the scheme of MPRNL i.e. 'Monitoring of Pesticide Residues at National Level' 31 laboratories all over India has been assigned with a herculean task of sample analysis from different parts of India to carry out analyses of pesticide residues. A total of 1,81,656 samples were collected within a span of 10 years to undergo the analysis, out of which 2.1% were above MRL[3] as prescribed under Food Safety Standard Authority of India (FSSAI), Ministry of Health and Family welfare [10]. The volume of sample collected under MPRNL Scheme and the objective of the scheme clearly signifies need of a geo-tagging application for collection of agricultural products from remote areas. Some applications have been made in past for observation on agricultural land system i.e. ALS but they served different objective than the problem identified here [2]. In Philippines, under rural development project funded by World Bank, they are using geotagging to effectively supervise, manage and monitor numerous of infrastructure projects [9].

---

[2] SQLite – a type of Relational Database Management System
[3] MRL – Maximum Residue Limit

> "The beauty of geo-tagging is that one does not have to be an engineer to learn it. Anyone can learn the ropes"
>
> Arnel de Mesa
>
> Engineer and Deputy Program Director, Rural

III. Solution Development

The solution includes development of a geo-tagging application in cross platform framework flutter in order to complete the desired purpose. An ASMX .net Web Service or any other Rest API[4] could be developed in order to send the data to the server from local device, once the network connectivity is available. Data could be sent in JSON format and JSON serialize class can be used in order to enter data into the server database.

A. Modules of Application

There are four main modules proposed for the application to be developed, in order to geotag photos of samples collected.

- Data Entry- This module would be used for entering data of different agricultural products i.e. samples for instance, maize, wheat, cauliflower, ladyfingers collected from farmer or local vendor, by the sample collectors. The data and details of the sample inserted by the sample collector would be stored in local database (SQLite). In this module the sample collector would be able to enter detailed description of samples for instance, pesticides details, certification details etc. When there would be network availability, sample collector would able to send data to central server through sync module. Data Entry could be further divided into three sub modules:
    - Farm- For adding data of samples collected from farms.
    - Market- For adding data of samples collected from markets from local vendors.
    - Party[5] Registration- For registering new farmers and vendors. Each sample collected would be registered against a particular farmer. Here contact number of party would be used as a primary key in order to avoid duplicate entry of the farmer/vendor.
- View Entries – Sample Collectors would able to view entries of samples and parties they have registered. They would also be able to delete entries before data is sync with the server. They would also be able to see the sync status for the particular entry.

- Sync - This module would enable the sample collector to send data on the server when the network connectivity is available. The sample collector would able to send data of party i.e. farmer or vendor registered by him. He would be able to upload data of samples collected by him along with its photos. This module would also have functionality of party master

---

[4] API – used to define interactions between multiple software intermediaries

[5] Party- Farmer or Vendor

sync which would enable sample collector to sync the data of party with the central server, hence a party when registered by another user, sample collector would get the data for same.

- Registration - Sample collectors would be able to register themselves with the help of this module. Every entry in the database of the sample would be done under the User Id of the sample collector in order to avoid malpractice. Application active users would only have access to this application in order to perform geo-tagging i.e. only authorized persons would be able to do data entry of the samples in this application.

B. Plugin[6]

Various plugins are used in flutter application in order to enhance the capabilities of the application, these plugins are important part of flutter eco system. Few such plugins which can be used for above application are as follows:

- GeoLocator (Flutter Plugin) – This plugin is used to get the location data of the device through different methods defined in this particular package.
- SQLite- This plugin is used in flutter in order to maintain local database and perform dB operations like insert, update, delete. It also supports transactions and batches.
- Camera- This plugin is published by flutter developers and has features like live preview of camera widget, capturing snapshots and saving it to files, it also adds access to the image stream from dart and record video.
- path_provider – This plugin is used to locate any file, directory on the file system of local device. In order to access DB file this plugin would be useful, it would also help store image files of samples when registered.
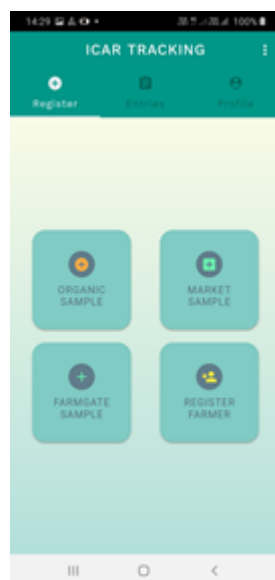
IV. Implementation and Results

I. Dashboard

Figure 23: Dashboard

Figure 1 demonstrates the Dashboard of the application which would be used by the sample collector in order to make different type of entries. He would be able to navigate to different entry forms to enter relevant data regarding samples collected.

---

[6] Plugin- Used to perform Functions like native apps in flutter
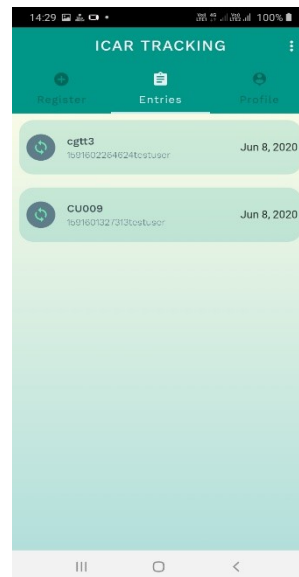
II. Entries

Figure 24: View Entries

Figure 2 reflects how entries can be viewed in the application once sample data is added. The sync icon on the left of each entry denotes that the data pertaining to this particular sample has already been synced with the server. The date on the right reflects on which date the sample was registered for testing.
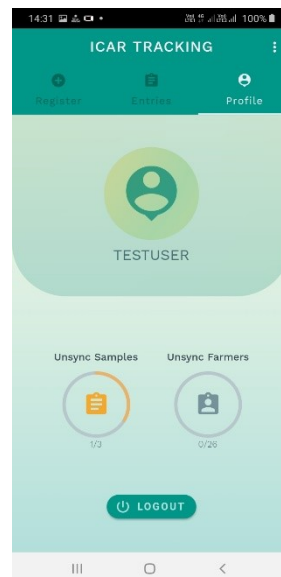
III. Profile

Figure 25: Profile

Figure 3 shows profile screen where sample collector would be able to know about number of unsync samples and unsync farmers. With the help of this data he would know whether the data was uploaded or the sync failed to perform in background.

IV. Party Registration Form

Figure 26: Party Registration Form

Fig. 4 demonstrates party register form and how data would be entered by the sample collectors where contact details for each party is kept unique in order to avoid duplication of data and maintain consistency.

V. Future Scope and Limitation

This solution has wide **scope** in future which can cover numerous of objectives in agriculture and other field.

- On the basis of geographical data, Farmer can be suggested what nutrients are needed by his crop based on the topography of the land. Amount of water required by the soil for the nourishment of the crops. Hence, farmer module can be included in future to this application for their guidance.

- This solution can also help in geo fencing of field in future in order to identify agricultural land in one's possession. This would help in different government schemes as accurate data of the land and area of land would be known to the Government.

- Recently MoU[7] was sign between Ministry of Agriculture and Nation Remote Sensing Center of ISRO[8] under Rashtriya Krishi Vikas Yojana for geo-tagging of agricultural assets. Government would use the same for land management and verification of claims in case of crop damage etc. This would help promote transparency in data regarding agricultural assets [8].

- Inventory management of Agricultural Goods would become easy by using the above solution with slight modifications. Bulk data could be easily sorted rather than keeping manual records in registers.

- Soil Health assessment could be carried out easily with this kind of application in future at times of natural calamities.

The only **limitation** of the proposed solution is that the mobile would require a SIM card in order to get the GPS location i.e. latitude and longitude, for performing geo-tagging.

---

[7] MoU-Memorandum of Understanding

[8] ISR0 – Indian Space Research Organization

VI. Conclusion

In a nutshell, the proposed solution of geotagging agricultural products using mobile application clearly seems to be a better alternative than the current practice followed by sample collectors of manual entry in registers. Geotagging of samples would also help in avoiding mal practices and would maintain the authenticity of the sample collected. As the data after digital entry would get sync to central server on one tap at screen, lots of time and manual work could be saved. Analytics of sample data would be easily available as the data would get sync on the central server. In a country like India, where, Agriculture accounts for 17-18% of GDP employing about more than 50% of Indian work force, this solution seems quite viable [7]. On the other hand, this solution is not limited to this particular problem, but as mentioned above it might be handful in tackling other agricultural issues.

References

[1]   Welsh, Katharine & France, Derek & Whalley, Brian & Park, Julian. (2012). Geotagging Photographs in Student Fieldwork. Journal of Geography in Higher Education - J GEOGR HIGHER EDUC. 36. 1-12. 10.1080/03098265.2011.647307.

[2]   Yu, Q., Shi, Y., Tang, H., Yang, P., Xie, A., Liu, B., & Wu, W. (2017). eFarm: A Tool for Better Observing Agricultural Land Systems. Sensors (Basel, Switzerland), 17(3), 453. https://doi.org/10.3390/s17030453

[3]   Flatow, David & Naaman, Mor & Xie, Ke & Volkovich, Yana & Kanza, Yaron. (2014). On the Accuracy of Hyper-local Geotagging of Social Media Content. WSDM 2015 - Proceedings of the 8th ACM International Conference on Web Search and Data Mining. 10.1145/2684822.2685296.

[4]   Huang, Binxuan & Carley, Kathleen. (2019). A Large-Scale Empirical Study of Geotagging Behavior on Twitter.

[5]   Maeda, Takashi & Yoshida, Mitsuo & Toriumi, Fujio & Ohashi, Hirotada. (2016). Decision Tree Analysis of Tourists' Preferences Regarding Tourist Attractions Using Geotag Data from Social Media:. 61-64. 10.1145/2962735.2962745.

[6]   Luo, Jiebo & Joshi, Dhiraj & yu, Jie & Gallagher, Andrew. (2011). Geotagging in multimedia and computer vision—a survey. Multimedia Tools Appl.. 51. 187-211. 10.1007/s11042-010-0623-y.

[7]   Wikipedia contributors. (2020, August 19). Agriculture in India. In Wikipedia, The Free Encyclopedia.   Retrieved   17:32,   August   20,   2020,   from https://en.wikipedia.org/w/index.php?title=Agriculture_in_India&oldid=973864269

[8]   T. (2017, April 7). Geo-tagging of agriculture assets: Radha Mohan Singh. The Times of India. https://timesofindia.indiatimes.com/centre/geo-tagging-of-agriculture-assets-radha-mohan-singh/articleshow/58061522.cms

[9]   Philippines: Geo-tagging for Efficient, Cost-Effective Project Management. (2013, February 19).   World   Bank.   https://www.worldbank.org/en/news/feature/2013/02/19/geo-tagging-for-efficient-cost-effective-project-management

[10]   Ministry of agriculture, cooperation and farmer welfare. (2018). Monitoring of Pesticide Residues at National Level. http://agricoop.nic.in/sites/default/files/MPRNL%20Guidelines_0.pdf

[11]   Singh, I. (2020, April 27). Survey of India's geotagging app to help steer lockdown for 1.3 billion people. Geoawesomeness. https://www.geoawesomeness.com/survey-of-india-map-app-covid-19-coronavirus-sahyog.