IoT based Road Trip Planner using Google Maps Platform.

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ABSTRACT

This paper exhibits a detailed analysis of the usage of data obtained from social media applications to allow personal interests and tourism to advance. Consequently, a program with such data will enable the users to avoid overlooking opportunities to explore, improving the interaction between the user and the routing systems, resulting in an optimized everyday trip from any current location to the destination. To achieve this Raspberry PI, Google Maps, and ThingSpeak platforms are utilized to obtain the current location of the user and further update these values. A Geo-tagged dataset is obtained from a social media platform based on the commonly used hashtags across the globe. This data is put together to generate a map that contains the local posts indicated by a marker, each of which points to a single data point. The user location is inturn continuously posted over ThingSpeak using which the user can obtain related details promptly.

I.   INTRODUCTION

Travelling has been redefined over the past decade as access to the knowledge related to language, culture, destinations, accommodation, and foodbecame accessible to people of all groups irrespective of their geographical differences. It is observed after a proper analysis that people, as a result of their differences, wish to travel in an approach customized to their tastes and preferences. Multiple websites and agencies make it easier for a person to visit and explore these new places. But does that effectively let the travelers fulfill their curiosity? Do these travelers go back home thinking all the money they have spent on their trip was worth it? They might be left with a feeling of missing out on something. The main reason being, their personal preferences were not catered to. The younger generations also have a slang term for this, 'FOMO' – fear of missing out. To avoid such circumstances an efficient method would be to help travelers by analyzing preferred posts on social media (Instagram) and remind them to drop by a location at the precise moment they are near the locality.The ideation starts from the destinations sorted into four categories work, home, regular routes, and traveling. This wasn't previously possible but now due to the advancements in the fields of Artificial Intelligence and the Internet of Things, it is easier than ever before to make it a reality. The user could be traveling by the most famous place/restaurant in the city and do not realize, as it is your first time in the area. This can also be a major part of route optimization in electric vehicles and can help improve the function of GPS system in general from simply providing the user with the route to understanding their needs.

Among the many possible interactions, the focus of this paper is put into 'travel'. The percentage of people who would like to self-plan their itineraries are increasing. By finding destinations that the user may want to visit and displaying the public Instagram posts of others who have been in the area previously, the application can help improve local knowledge among the tourists. Though the travel blogs written by well-known travelers might be more helpful in finding the best of places in an area, it is equally tough to sort this data based on the user interests. Also considering the fact that most travel blogs contain only the most sought after locations. Hence the inclusion of a public platform to gather authentic, local data is more necessary. The real-worldcomprehension of IoT is met with a surplus of security and privacy challenges. But by monitoring and controlling critical smart-world infrastructures, theycan be handled1. Thus resulting in its successful operation on a commercially sustainable scale 4.

Social media platform in the current generation has tons of influencers, entrepreneurs, people updating and encouraging travel. An everyday individual might be most attracted to travel while browsing through a few of these posts. So once the user finds a few intriguing posts they may like, share, or save the same in their account.

If these posts could be linked to the maps, planning a trip takes a lot less effort resulting in decreased fatigue and increased desire to explore.It is also true that most people crave adventure and would love to explore but cannot. The reason being lack of time to plan and the stress of choosing the right places. But think about all the time one spends scrolling through Instagram. India, with the third-largest figure of internet users, has started using online booking of travel plans more recurrently due to its convenience. The e-travel industry contributes to a majority of 88% growth of the Indian e-commerce industry. If each of your actions could take part in planning the trip which can be taken at any time later.Gaining access to the "remind me" option to can even allow the application to suggest an action later in the day when the user is out on the road.

II. Related Works

A lot of work and research has been going on for a while on topics related to the social media. Such data can talk about the preferences and interests of each user. The data thus obtained also sheds light on travel patterns of people in any part of the world. One such paperhas been writtenby Lei Guo, Ziru Li and Wenjun Sun which analyzes the travel patterns of people living in Cheng-du, China. In their work they have proposed a data mining method to discover tourism information from blogs while trying to explore the traveler identities and their choice of destinations individually3. But this analysis has to be given to the user in the most efficient and comprehensible means. Visualization of such information has proved to the most accountable interface for human acknowledgement.

Although the actual work to improve this market using the latest technology has been minimum. The main issue with the travel market is always the choice of destination and the method of travel. The Internet of Things is aprogressing global trend in Web-based information architecture assisting in the altercation of services and goods over a complex network without demanding human-to-human or human-to-computer interaction 4. Which can be used to aide in solving the basic issue when travelling; the lack of local knowledge. This issue which seems big and complex can be solved by simply sharing information and gaining access to it at the right moment. Especially since the social media today is flooded with millions of posts every day.

This concept of sharing information about a place directly using maps is seen to be discussed by T. Kanehira, Y. Arakawa, K. Yasumoto and T. Wada6. Though their research mainly involves Google Maps' My Maps function. Instead social media data with geotags can be used to track people's movements in their daily lives. As opposed to traditional movement data, the sparseness and variability of social media data fuels the difficulty of obtaining movement patterns5.This difficulty and the complexity involved in making the data user friendly hasmade a few businesses doubt its purpose. The Python language is used for the implementation of the mentioned work. By doing so,can link this with the contents of libraries, can have an adequate Scraper linked with Google in our hand to produce the desired result 6.The result of merging of the Internet and the Global Positioning System (GPS) is a common approach called GPS tracking system7. This information helped us avoid complex tracking structures and instead use the internet to acquire the updated location. Tracking the vehicle using this method also reduces the physical requirements of the module.

III. Methodology

The process is started off by collecting user posts on Instagram with the location using an Instagram Scrapper as suggested on a Medium article by Andrea Tarquini. This location is initially a name and does not include the co-ordinates which are then obtained by sending the loc_name value as a request to the Geo-Coder.
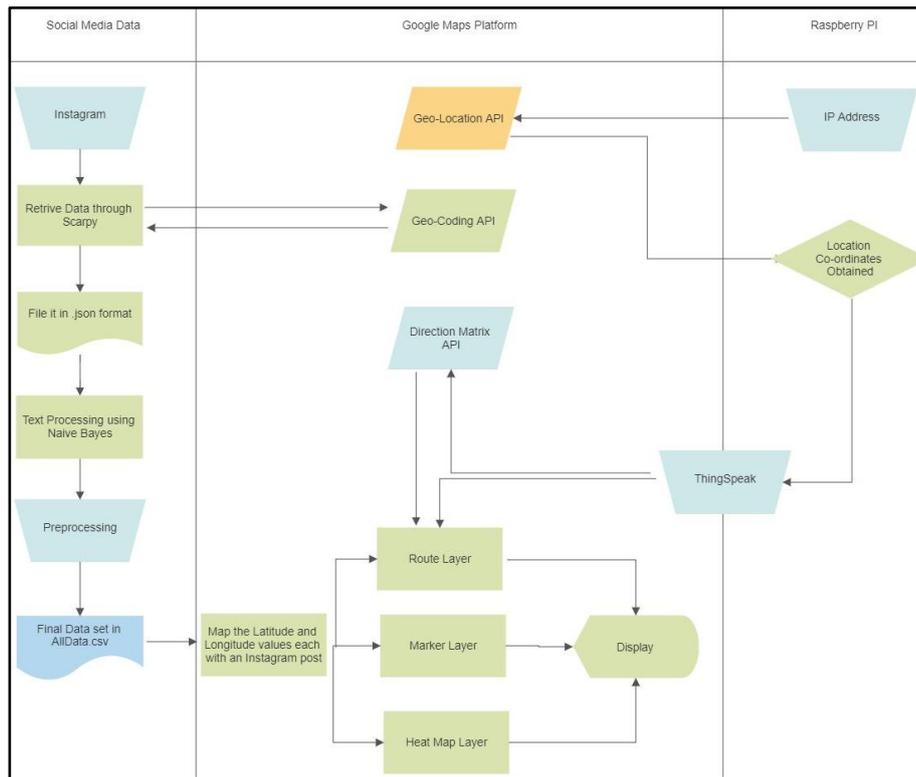
Fig. 1. The flow of the Application.

The dataset thus created is text processed using machine learning to separate the posts based on their authenticity using the fundamentals discussed on Towards Data Science - A Medium publication by Javaid Nabi. Which is further made into a marker layer, plotted accordingly on the map which is then displayed using JavaScript API. All this while the Raspberry PI sends in the obtained current location using Geo-Location API to the ThingSpeak server. These co-ordinates are obtained by the user using Read API and are updated onto the displayed map regularly. Thereby tracking the user and following the route from A to B obtained using the Direction Matrix API.

Google Maps Platform:

It is a technology provided by Google based on AJAX, which powers many map-based services8. Among the first steps to be taken as a part of developing such a platform, geolocation of the user must first be obtained and further updated every 5 seconds to the application. In this case, the Google Map Platform's Geolocation API - World Wide Web Consortium's (W3C) comes in handy. Though an actual GPS module might perform sufficiently well and provide an accurate result of the location, the address of the location might be better known when integrated with Google9. Also, the Places API is used to obtain the previously existing database without too much of a hassle.

While the Geocoding API returns the latitude and longitude of the loc_name, found through the details of the Instagram post, to create a marker layer to plot the locations on the Map for direct access. Geolocation is generally traced either based on the cell towers in the area or the Wi-Fi Nodes, though an approximate location can be found using the IP address, the MAC Address provides a more accurate result varying to the original only by a few meters10. The requests are sent to the Google server which returns the latitude, longitude of the user, and if required the street, district, city. The heat map layer and Marker layer is generated and layered with the Map retrieved. Then zoomed in to only accommodate the current location and destination for the user to easily access the places nearby.

Original GPS co-ordinates do not match the road track in the Google Map due to slight mishaps in the satellite reading of the location using only the IP, hence must be provided with more adequate information. The impression of these slight abnormalities of GPS is previously observed by other developers who have provided a solution, an algorithm to correct the track11.

Social Media – Instagram:

Solo travel, corporate trip, or family vacation each of us want to know what is popular in the locality. This is best heard from a local person or from people who have previously visited the area. Hence, the use of data from social media is made necessary. Scrapping the Instagram data via the Scrappy Tool by using python packages such as Scrappy and Pandas. Thus converting the ".json" format file obtained from the webpage directly to an extractable, usable data frame. This data frame is further sorted by including only the data that is required in terms of other hashtags, likes, locations, and the post itself. The frequency of people visiting these areas can talk a lot about the popularity of the place thus generating a heat map deems useful.

The technique is distributed into three fragments: the web scraper draws the desired links from the web, and then the data is extracted to get the data from the source links and finally stowing that data into a '.csv' file 6. Based on the geolocation obtained from google maps API related hashtags were considered to analyze the model and data from Instagram is scrapped. In which the details of the post including the location ID, caption, location name, display URL are observed. Among the data collected there exist a couple of spaces, '0', as not all users include the location details which have been removed before further analysis.

In the case of restaurants, it might a dish ever so famous or a drink only available or native to that location. This would normally require tons of market research and years of work to obtain but with similar data already available on social media. Integrating and expanding the current database is a lot more resourceful. Though the sorting of useful data from all the scraped data can be challenging.Consider a post is previously liked or saved by the user in his browsing history and this post of the 'ice cream you always craved for' pops up at the precise moment you are near the location and you just have some time to spare. It is a lot easier to clear the things you have wanted to do off your bucket list. This allows any person from any part of the world to spend a good time during their travel at any place. Everyone wants to have the best of things one can find in the least possible time.

Raspberry PI:

It is used to find the current location of the user by sending a request to the Geolocation API whose response contains the latitude, longitude, and other information. This data corresponds to the IP address of the device when connected to local Wi-Fi. A 4G Dongle or a GPS Module can improve the accuracy of the location obtained significantly. Geo-location API request also takes multiple data points, more of which will improve its accuracy. This data is pushed through Write API to cloud (Thing Speak). This is to make sure the application can be accessed on all devices and can be used for further development with Deep Learning and the Internet of things.

Thing Speak:

The data sent over by the Raspberry PI is stored in 2 columns one being latitude and the other longitude. This data is retrieved through the Read API and displayed on the Maps application over the Markers layer. A route can also be obtained from the current location to any preferred destination. Updating this data every few seconds traces the path traveled by the user thus leaving a travel footprint that can be shared among friends and family for a safe trip.

IV. Experimental Results and Discussions

Initially data scrapped from Instagram is in '.json' format. The collected information on posts from this social media is to the extent of thousands, and about 40% of which doesn't have the required information. The Pandas library is used to get a better visual understanding of the data retrieved. This data is further modified, improved and adjusted to the requirements by text processing using Machine Learning though the current dataset is minimum, a larger data set would produce more accurate results.The dataset thus obtained is used to create a heat map layer and marker layer.

id	shortcode	caption	display_url	loc_id	loc_name	loc_lat	loc_lon	owner_id	ov
1382	2281285520610587424	#instafood #instagramanet #instatag #food #foo	https://instagram.fhyd2-1.fna.fbcdn.net/v/t51....	17326249	Moscow, Russia	55.755826	37.617300	32266540046	
1383	2281285451719586560	There's nothing in the store that I wouldn't e	https://instagram.fhyd2-1.fna.fbcdn.net/v/t51....	339987145	Roma, Italia / Rome, Italy	41.902783	12.496365	19055368520	
1384	2281285548298738688	In Frame :- Lulu Special Pull Apart Garlic Bre	https://instagram.fhyd2-1.fna.fbcdn.net/v/t51....	662614107440029	Fat Lulu's Jaipur	26.910961	75.795275	15472496366	Jaipur_
1385	2281285876646827520	#instafood #instagramanc1 #instatag #food #foo	https://instagram.fhyd2-1.fna.fbcdn.net/v/t51....	17326249	Moscow, Russia	55.755826	37.617300	32266540046	
1386	2281286063577953024	Yediikçe yedirilen nefis tirtaçe 😋😍 'n#denizli #d...	https://instagram.fhyd2-1.fna.fbcdn.net/v/t51	195764874332451	Denizli Adalet Mahalesi	37.781492	29.031445	11207579677	sukranin_m

Fig. 2.Data frame created from the scrapped Hashtag data originally.

A heat map is generated to further understand the trends and most popular locations. As shown in the following picture the red area would be the most frequented and yellow, for decently popular areas and so on. A click on individual markers allows the Instagram post to pop-up along with the caption.

Fig. 3. Heat map showing the data points that have been plotted. Indicating the more popular areas.

The current location of the Raspberry PI has been found through Google Geo-Location, sent through API keys to Thing Speak, and retrieved to the PC. The retrieved Latitude and Longitude values are located on the map along with the route and destination. The location values are updated every few seconds and the resultant map also traces the path and zooms in according to the user's movement. The output of the mentioned has been verified.Lots of enhancements and integrations can be added to this to allow a hassle-free experience for better user interaction. Both by increasing the original data set as an Instagram developer, using the Internet of Things to understand the users' requirements on a larger perspective.

Fig. 4. A single marker is clicked on to see the details of the post.

Though slightly inaccurate due to disturbances, the co-ordinates are seen to be updated into ThingSpeak and the values are retrieved and displayed as anticipated. With the current location values in Hyderabad being 17.386070, 78.351135. When a destination is set the route is retrieved from the current location to the destination and the result displayed as shown in the figure below.
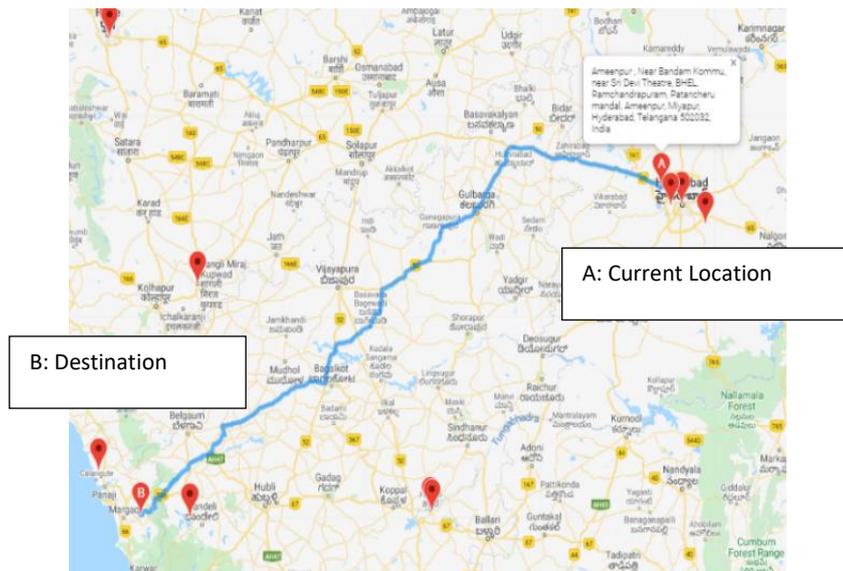

Fig. 5. Retrieved Route, with Marker Layer and Current Location.

V. Conclusion

In conclusion, this work proposed a road trip planner wherein the output obtained displays a significant method to improve an individual's travel experience by instantly suggesting a trendy Instagram post. Crowdsourced information gathered from social media proved to be more useful when integrated with google maps platform to discover both a person's neighborhood and a new location. The ease of accessing such data directly on a geographical view substantiates to more travel insights than what previously existed. Advantages of access to such a dataset include, ensuring the user of the knowledge on what place has to offer, encouraging travel, and saving the effort that goes into creating an itinerary. The future works involves expanding its connectivity to other devices, applications, networks, figures and sensors in order to contain technological modernity which provides a viable product.

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