International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Geocoding and its Effectiveness in India

Arjun Pokale

[1]Department of MCA, Vivekanand Education Society's Institute of Technology, Chembur, Mumbai, India

Abstract: ***Geocoding is used in geographical information systems which converts an address into spatial data and associates the exact geographical coordinates for that address. Geocoding plays an important role in businesses which majorly rely on location data. The well-structured or standard addressing scheme across the country makes geocoding an easier task. This paper provides an overview of geocoding and how effectively it is if used in India.***

Keywords: Geocoding, forward geocoding, reverse geocoding, addressing scheme in India, GIS, geographical co-ordinates

1. Introduction

Geocoding is a process of converting the human readable location name into machine processable address like geographical coordinates (Latitude and Longitude). The geographic coordinates help to locate the converted addresses in the map or can be used for geographic information processing. The geocoding is also called as forward geocoding. Reverse geocoding is a process of converting geographical coordinates (Latitude and Longitude) into associated textual location name like street name or area name.

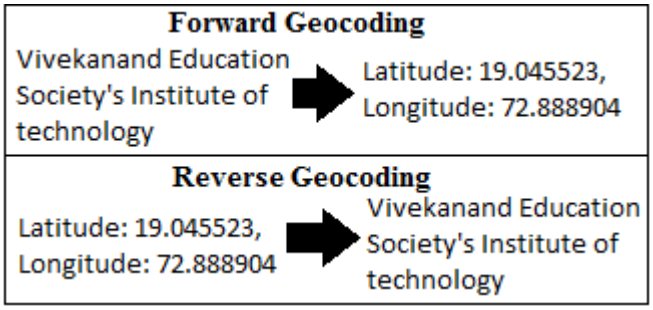

Figure 1: An example of forward geocoding and reverse geocoding.

Geocoding has its application on various aspects of businesses such as logistics, transportation, e-commerce, field of operations etc. To make use of geocoding a certain level of precision is necessary which it is easily achieved in developed countries.

As the need of geolocation-based addresses increases with business day by day it is necessary to have a look on how reliable the branch of geolocation i.e. geocoding is? In developing country like India

2. Literature Review

2.1 Definition of Geocoding

Geocoding is the computational process of transforming a physical address description to a location on the Earth's surface (spatial representation in numerical coordinates) as expressed by Wikipedia [1]. According to ArcGIS geocoding can be defined as 'Geocoding is the process of transforming a description of a location—such as a pair of coordinates, an address, or a name of a place—to a location on the earth's surface.' [2].

2.2 Application Area of Geocoding

There is a wide range of application where geocoding can be used from customer management to businesses and from simple data analysis to distribution techniques.

1) Address Data Analysis: With geocoded addresses, one can spatially display the address locations and begin to recognize patterns within the information.
2) Customer Data Management: Usually businesses require an address of customer with geocoding its easier for them to maintain the addresses and establish marketing strategies.
3) Distributed Geocoding Applications: Geocoding functionality can be shared through various methods which includes from collecting data to sharing via compact disc or through internet.

2.3 Methods of Geocoding

In order to perform geocoding, it must contain an information regarding the location such as postal codes, boundaries, street addresses, area name etc.

Geocoding can be categories mainly into three standard methods which are as follows:

1) Geocoding by Street Address.
2) Geocoding by Postal Codes.
3) Geocoding by Boundary.

2.4 Geocoders in India

There are number of geocoders (service providers) available for the purpose of geocoding of physical addresses. However, all the geocoders use different algorithms, different approaches, different data sets, error handling methods, address parsing methods, which may subsequently result in different result-sets [3]. The few service providers of geocoding service are listed in the TABLE 1 along with the type of services provided by them (Free/Paid) [3]. However, the free version has the limitation of usage.

Table 1: Service Providers in India

Geocoder	Type (Free/ Paid)

HERE	Free/ Paid
Google	Free
ArcGIS	Paid
MapMyInida	Free
LocationIQ	Free/ Paid
Yahoo	Free
Geocode.xyz	Paid
Csv2geo	Paid
SmartyStreets	Paid


```
▼ Array(1)
  ▼ 0:
      address: "1600 Amphitheatre Parkway"
      cc: "US"
      city: "Mountain View"
      formatted: "1600 Amphitheatre Parkway,
      lat: 37.4224082
      lng: -122.0856086
      postal_code: "94043"
      state: "California"
      state_code: "CA"
      street_address: "Amphitheatre Parkway"
      street_number: "1600"
```


Figure 1: An example of json file for geocoded data

3. Addressing System in India

To implement geocode in an effective manner one needs to understand the detailed structure of addresses. A location in modern day is described by a collection of data which consists of information such as building name, apartment, plot and other address structure [4]. Address is a fundamental means by which people of modern era conceptualize location [5].

There are importantly two type of Addresses:

1) Relative Address: Addresses which are propagation to something else. Example: Across the street or opposite to Landmark [4], [5].
2) Absolute Address: Addresses which have definite location. Example: House Number, Apartment Name, Street Name, Locality, Town, State, other address component [4], [5].

Components of Addresses are House Number/Apartment Number, Street Name, Street Type, Zip code and Political Boundaries.

Urban address

Mr. Rajiv Rattan	*addressee*
4, Amrita Shergill	*Road premise + street*
New Delhi	*locality*
110003	*postcode*
INDIA	*country*
with district	
Mr. N Gopalarathnam	*addressee*
32/1, 2nd Main Road	*premise + street*
8th Block	*sub-loc 2*
Jayanagar	*sub-loc*
Bangalore	*locality*
Karnataka	*province*
560082	*postcode*
INDIA	*country*
with building	
Jagannath Srinivasan	*addressee/*
Flat 408, Tagore Road Hostel	*door + building*
Tagore Road	*street*
New Delhi	*locality*
110002	*postcode*
INDIA	*country*
Popular Electronics	*addressee*
Astro High Complex, Near Old Taxi Stand	*building + descriptive information*
Main Road	*street*
Ranchi	*locality*
Jharkhand	*province*
834001-34	postcode + secondary

Figure 2: An example of urban addresses in India [6].

Rural address

Lakshmi	*addressee*
Wife of Chikka Ramudu Dhobi	*addressee*
Bukkapatnam	*Village sub-loc*
BUKKAPATNAM	*locality*
Pennukonda Taluk	*sub-prv 3*
Anantpur District	*sub-prv 2*
515144	*postcode*
INDIA	*country*
Kula Nand, S/o late Sh Sarita Nand	*addressee*
Village Manjari, Post Office Kulasu, Tehsil Jyotolsun	*village + post office + sub-loc 2*
District Pauri Garhwal	*sub-prv 2*
Uttrakhand	*province*
248312	*postcode*
INDIA	*country*
Bina Kumari, W/o Juna Ram	*addressee / mailee*
VPO Nagwain, Tehsil Kullu	*post office + sub-prv 3*
District Kullu	*sub-prv 2*
Himachal Pradesh	*province*
175114	*postcode*
INDIA country	
P.O. Box address	
Mr. Rajiv Rattan	*addressee*
Post Box No. 4380	*p.o. box*
Kalkaji Post Office	*post office*
New Delhi	*locality*
110019	*postcode*
INDIA	*country*

Figure 3: An example of rural addresses in India [6].

4. Challenges of Geocoding in India

In India to use geocoding in an effective manner it has to face lots of challenges due to its unstructured addressing system, which vary depending upon the area/ locality. Most importantly the locals don't follow the standard/ formal addresses assigned to the area, this can be seen when towns or the cities expand and people still follow the same old addresses [7].

In comparison to the developed countries like US or UK where the postal codes are more structured, the geocoding is more effective in such countries with few meters of accuracy, while in India the postal codes/ pin codes provide an average solution to the geocode [8]. The data of addresses available in India is either inaccurate, incomplete, unstructured or lacks precision. India also faces the challenge of multi

lingual address problem where locals know how to pronounce the location name in local language but cannot translate it to English language which leads to error in spellings [4], [7].

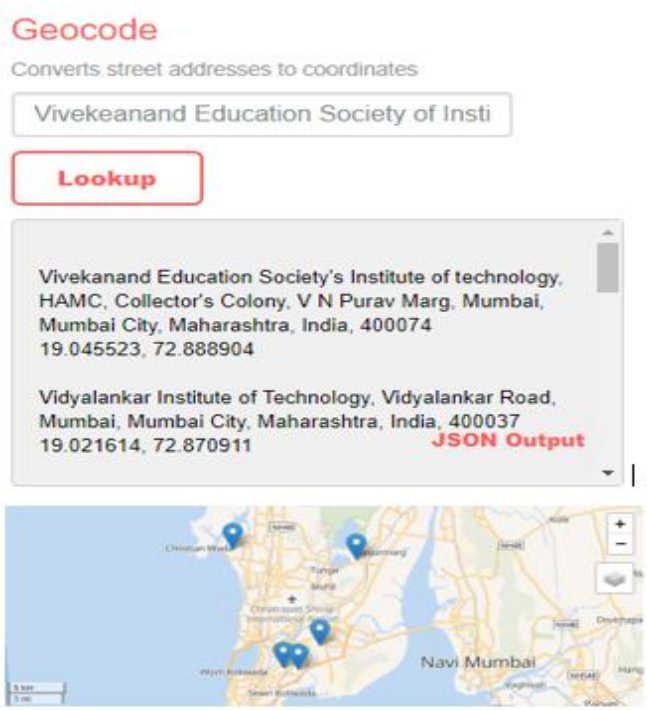

Figure 4: Multiple result of geocode when searched through street address.

4.1 Possible Ways to Overcome Challenges

There are a few possible ways through which challenges can be overcome by implementing standard way of writing addresses or standardization by government bodies, address correction, multi lingual phonetic support, different geocoders must make use of large data set to overcome address irregularities, make use of multiple data sources for data completeness, address normalization [4].

The other few possibilities to overcome the geocode challenges are by making use of machine coded addressing system which are categorically divided into 3 categories which are short-codes, auto-codes, and street-codes [8]. These machine coded addresses although doesn't provide the 100% solution but it's better than the geocode.

5. Conclusion

Geocoding provides an average solution to Indian address system. There is a need of standardization of the address across India similar for both urban as well as rural areas. Machine codes addressing system can be used alternative to the geocoding in India, in order to achieve a business process and goals more efficiently.

References

[1] 'Geocoding', Wikipedia. [Online] Available: https://en.wikipedia.org/wiki/Geocoding
[2] 'What is geocoding?', ArcGIS Desktop. [Online]. Available: http://desktop.arcgis.com/en/arcmap/latest/manage-data/geocoding/what-is-geocoding.htm
[3] 'Evaluating two freely available geocoding tools for geographical inconsistencies and geocoding errors.' SpringerLink. [Online]. Available: https://link.springer.com/article/10.1186/s40965-017-0026-3.
[4] 'The World of Geocoding and Challenges in India'. [Online] Available: https://www.slideshare.net/NishantSinha3/the-world-of-geocoding-and-challenges-in-india/45-Overcome_the_challenge_Standardization_of
[5] Geocoding for beginners. [Online]. Available: https://www.slideshare.net/AkanshaMishra4/geocoding-for-beginners
[6] Universal Postal Union Website. [Online]. Available: http://www.upu.int/fileadmin/documentsFiles/activities/addressingUnit/indEn.pdf
[7] 'Learning to Decode Unstructured Indian Addresses' [Online]. Available: https://medium.com/@kabirrustogi/learning-to-decode-unstructured-indian-addresses-c80ffcda2e84
[8] What is the right addressing scheme for India? [Online] Available: http://mitemergingworlds.com/blog/2017/11/22/what-is-the-right-addressing-scheme-for-india