GLIDer: Fleet Management Solutions using Location Intelligence

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ABSTRACT – Fleet management is the optimization of costs, risks and efficiency in fleet operations. Such operation requires location information. However, the location information in Malaysia or address has non-standard format. It can be written in many ways. Due to its inflexibility, geocoding process for Malaysia address is hard to be conducted either by traditional or online geocoding. This paper will examine the quality of nine open source geocoding services with two metrics which are positional accuracy and similarity. Results obtained indicated a stepwise method of geocoding conducted in developing a GeoLocation Intelligence Data (GLIDer).

1. INTRODUCTION

Fleet management is a function which allows companies that rely on transportation either for business or daily operational to remove or minimize the risks associated with vehicle investment, improving efficiency, productivity and reducing their overall transportation and staff costs [1]. Each of vehicles owned by company or individual must be maintained and operated optimally which in turn maximizes customer satisfaction. To date, daily and weekly log sheets are used to record vehicle usage and defects (if any) as one of the standard of procedures (SOP). It is used later by University Authority (e.g. PPKU) for ensuring the vehicles are fit for next uses. However, text-based address used or written in reporting unfortunately cannot be analysed effectively due to important data is missing which is geo-location. Geo-location data and their spatial relationship may lead to more in-depth understanding of behaviour and influences.

In this paper, we discuss an innovative approach to enhance operational cost of University Vehicle and Fleet Management by adopting spatial analysis approach in vehicle tracking. Applying spatial methodologies to vehicle scheduling data has the potential of obtaining previously undiscovered insights [2] which is likely to provide important insights for policy and decision makers in vehicle scheduling. For this reason, a conceptual approach of fleet management solutions called GLIDer to support/aid in decision making of vehicle tracking management was developed. The GLIDer is an ongoing project to develop webGIS application that allows University Authority, policy makers, vehicle manager and public user to understand the geographic pattern, the characteristics, and the challenges faced by travellers (i.e. students). The development of GLIDer consists of several phases. This paper only shows the initial phase of the development where the Text-Based Address Normalization and Standardization process is conducted. This process is about to convert the text-based address into some geographic representation as the first step used to create the spatial data employed in subsequent spatial analyses. The address data act as a location intelligence underlying geospatial data source. The other phases which involving GLIDer Development and the functional test to measure the usability of the system by stakeholders is not be covered in this paper.

2. METHODOLOGY

In the Address Normalization and Standardization of GLIDer development, various levels of address formats used in existing logbook is identified. The most usual form of input data encountered in travel scheduling is the postal address [3]. Typically, this information includes the street name, city, province or state. However, it cannot be directly useable in a spatial-referenced environment due to no standard addressing schema. It usually varies in format. In addition, the postal address of location needs to be enhanced by adding geolocation in the framework of location intelligence. That process is called geocoding or address matching. It is a process of converting a locational description into some form of geographic representation such as geographic coordinates (latitude and longitude). There are many geocoding methods available [4], such as address range interpolation, ZIP code centroid geocoding, parcel matching and exact measurement with Global Positioning System (GPS) device.

2.1 Respondent address collection

The data used for geocoding process are collected from vehicle trip report which contains addresses. All addresses were divided into four fields: Address, City, State and Postcode. These addresses were stored as .csv for further analysis. We refer Pos Malaysia web site at www.pos.com.my for Malaysian addresses information.

2.2 Parsing and cleaning the addresses

Misspellings and missing information in the address due to lack of standardization may prohibit automated matching to an address base map. Thus, to ensure the standardization and quality of geocoding, all the addresses were verified manually for the misspelling, incomplete address fields as well as missing data.

2.3 Geocoding

There are three main methods of geocoding

available; by street address, by postal code and by boundary. Those methods are used by many services that offer geocoding; free of charge and subscription-based. This study focuses on the free geocoding tools as listed in Table 1.

Table 1 Geocoding Services (freeware)

No.	Service Provider	Reference Data/ Source
1	BatchGeocode.com	Yahoo
2	bromit.com	-
3	FFIEC	TeleAtlas
4	Geonames.org	Unknown
5	Google	TIGER + others
6	Itouchmap.com	Google, USGS, NGA
7	Map Channels	Google
8	ViaMechelin.com	-
9	maps.huge.info	TIGER

3. RESULTS AND DISCUSSION

Comparison result is shown in Figure 1. It shows the similarity of output according to tools.

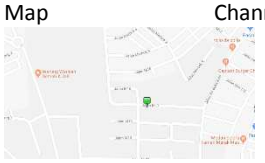
<table>
<tr><td>BatchGeocode.com
  </td><td>Bromit.com
  </td></tr>
<tr><td>Google
{"results" : [],
"status" :
"ZERO_RESULTS"}</td><td>ViaMechelin.com
Longitude : 102.26367
Latitude : 2.19945</td></tr>
<tr><td>FFIEC Address Not Found (https://geomap.ffiec.gov/FFIECGeocMap/GeocodeMap1.aspx)</td><td>Geonames.org
No record found in this area (http://www.geonames.org/maps/google_2.287_102.276.html)</td></tr>
<tr><td>Itouchmap.com
  </td><td>Map Channels
  </td></tr>
<tr><td>maps.huge.info
  </td><td></td></tr>
</table>

Figure 1 Result of Geocoding process for input address

Based on the findings, it is crucial to provide users with the best methodologies and process to improving geocoding results as those service providers use different reference databases, geocoding algorithms, address parsing, approaches, as well as accuracy reporting methods. It is important to evaluate the service features to see if the selected geocoding service provider suit and accurate to a project conducted. This study compares the use of nine free geocoding tools as shown in Table 1. There are no comparisons of that tools has yet published in mainstreams journals. Based on the experiment, we conclude a stepwise method of geocoding conducted is presented through a flow diagram in Figure 2 to produce accurate result of geocoding.

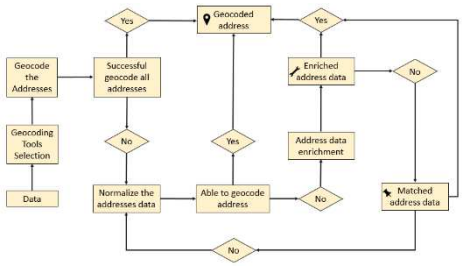


Figure 2 A stepwise method of geocoding

The figure describe that to obtain the best performance, its depending on the most potential matches, the input address should be complete as possible, free of misspellings and incomplete address as well as close to postal authority standards as possible.

4. CONCLUSIONS

Geocoded address is vital in facilitating many types of fleet management. Development of geocoded address in Malaysia is required to address several issues faces. Unfortunately, the absence of a uniform address model impeding the development of geocoded address. The biggest challenge here is to provide address and reference data in standardized format, as currently the format used are varied and show some dissimilarity for each country. Based on the experiments conducted shows that, geocoding services can locate the address geographically but still has differences of longitude and latitude (mismatch) such as between viaMechelin and Bromit.

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