Anywhere, Anymail and Intelligentization

A geo-routing solution for digital postal service

1. Change

In 2018, the global postal delivery business approach 100 billion amongst which more than 50 billion are from China. The total number of customers is more than 3.6 billion.

A piece of mail (letter or parcel) goes through a process of collection, transit, dispatching, sorting and distribution before arrives its destination. Namely, a mail from mail sender to mail recipient needs to go through a few transit/sorting points. The transit/sorting points a mail goes through form a transit/sorting path, i.e. a mail path. Therefore, the precise optimizations in advance for routing at the two ends of mail collection and distribution, and the accurate predetermination of the transit/sorting path between become the key elements that all matter a digital scheme for mail delivery efficiency.

As the technology of mobile internet has a wide range of application, the postal customers have new needs besides their mails are not incorrectly sorted or distributed. They would like to have a transparent delivery process and be able to locate their mails at any given time. They wish to be able to have options to choose mail delivery time, fee and service provider. They also like to have easy access to connect couriers to make appointments for mail pick-up or delivery.

Currently, filling in address and postal code are necessary in mail delivery. Unknown, outdated or wrong addresses will result in hardly or wrongly sorting or delivery. Also note that the database representing the work ranges of the transit/sorting points is not updated in time and the addresses along with postal codes are not consistent with the transit/sorting points. All these cause an inaccurate or impossible predetermination of the transit/sorting points that a mail goes through. Therefore, the intelligentization in the transit/sorting planning can not be applied. On the other hand, conversion from address to the longitude and latitude does not only require a big database but some addresses can’t be converted, which would cause difficulty in the route optimization in mail collection and distribution. This further implies that none of the UGV, UAV or delivery robot can be implemented since all of these no doubtfully rely on the longitudes and latitudes. In addition, international

mails encounter more difficulties from no uniformity of languages and postal codes. Therefore, the conventional method based on address and postal code restricts in mail delivery the precise optimization of routing in advance at the two ends of the mail process and the accurate predetermination of the transit/sorting path between, and so does the delivery efficiency and the intelligentization. It also hardly meets what customers are expecting and have expected such as for a transparent process in mail delivery.

A patent of "METHOD AND DEVICE FOR DETERMINING MAIL PATH INFORMATION"(PCT/CN2013/074342) granted in China, US, Japan, Korea, Eurasia, Australia, Canada, Mexico and Indonesia (also in process such as in India and Brazil) changes the conventional method based on address and postal code. The patent method enables people directly through GNSS (i.e. Global Navigation Satellite System) built in the smart mobile to have inputted the coordinates of longitude and latitude [Anywhere] and send [Anymail] which realizes the [Intelligentiztion] now and then.

The main patent right is a method in determining mailing path. It also includes a method in sorting based on the mail path and a method in labeling destinations in terms of the longitudes and latitudes. When "Implementation of the patent" is shown later in this article, a "super transit code" is introduced. As long as a postal delivery company predefines the "super transit code" in its software system for each courier according to the courier's work range with the boundary expressed in the longitude and latitude, every time in mailing the software system calculates the two "super transit codes" based on the two inputted longitudes and latitudes from the sender and the recipient to produce the entire transit/sorting path in advance from the courier to pick up the mail to the courier to deliver the mail [geo-routing].

Most significantly, the patent method gives the complete foundation of a digital scheme to achieve the efficiency in mail delivery. In the light of the predetermined transit/sorting path and the longitudes and latitudes from the mail sender and the recipient, namely the geo-routings in advance both from the two ends and the between in the whole mailing process, a scheme for digital postal solution is developed which enhances the mailing efficiency in the whole process of mail collection, transit, dispatching, sorting and distribution in a complete, optimal and sustainable way. Meanwhile, it realizes the new needs from the customers. Here comes a remark on why the patent does not include calculation for route optimization in mail collection and distribution [geo-routing]. It is simply that given the longitudes and latitudes for all mails, there are many ways through GIS to optimize routes to pickup and deliver the mails.

(See more at http://www.tobeing.com.cn/index_en.html and http://www.tobeing.com.cn/expound_en.html)

Note: Transit/sorting point, super transit code and mail transit/sorting path in this article are equivalent to collector-distributor point, information of all collector-distributor points and mail path in the patent, respectively.

2. Fundamental difference of the patent method and the conventional method

The conventional method uses address or postal code to determine transit/sorting path, and to indicate mail locations and working scopes of transit/sorting points.

The patent method adopts the coordinates of the longitudes and latitudes to express mail locations and working scopes of transit/sorting points (particularly including work ranges of couriers), and to determine transit/sorting path based on the information of collector-distributor points. Namely, in the patent method, mail sender and recipient can through GNSS from mobile phone directly obtain the longitudes and the latitudes to indicate their positions with no need of address or postal code.

(Also see item 4 in FAQs from http://www.tobeing.com.cn/faq_en.html)

3. Improvement of the patent method over the conventional method

3.1 Improves the accuracy in transit/sorting

The transit/sorting path in mailing includes the point of courier. The conventional method using addresses and postal codes does not contain this transit/sorting point. Therefore, the adoption in the form of a set of addresses (or postal codes) indicating the work ranges of couriers will result in hardly or incorrectly determining the work ranges of couriers due to the ambiguity or outdatedness of addresses. The patent method adopts the longitudes and latitudes to indicate mail locations and work scopes of transit/sorting points. The longitude and latitude is not only able to stand for any location on the earth but precise and consistent, which ensures the accuracy in determining to which work scopes of collector-distributor points a location in longitude and latitude belongs. Therefore, it improves the accuracy in mail transit or sorting.

3.2 Predetermine transit/sorting path

The conventional method uses address and postal code to determine part of the transit/sorting points, which needs to establish a set of addresses or postal codes. Note that address and postal code are not exactly consistent with the transit/sorting points in the way they are defined. For instance, a postal code or a city as part of an address may have a few transit/sorting points such as dispatching stations. Work range of a transit/sorting point may have overlaps for more than one postal code or city indicated by an address. In other words, the unified address and postal code in a country do not usually coincide with transit scheme designed by postal/delivery companies. The patent method uses the collective and distributive information that are all directly created from mail scheme defined by any given individual postal delivery company. They coincide with the transit/sorting points which avoid to establish such set of addresses or postal codes. Therefore, the

information of collector and distributor points in the patent method excels address and postal code. Such advantage enables the possibility of determining mail transit/sorting path in advance.

3.3 Avoid conversion from address to longitude and latitude

Technically, the accurate optimization in routing at the two ends (i.e. mail collection and distribution) requires the longitudes and latitudes of mail locations now and in the future. The conventional method converts addresses to their longitudes and latitudes. This conversion not only needs a huge database and a mapping for every address to its longitude and latitude but becomes impossible due to new or ambiguous addresses. The patent method can in use of GNSS from mobile phones directly obtain the longitudes and latitudes both for mail sender and recipient, which can be used for GIS to calculate the transit/sorting path and the routes at the two ends. Therefore, it avoids the conversion from address to its longitude and latitude.

(Also see item 5 in FAQs from http://www.tobeing.com.cn/faq_en.html)

4. Implementation of the patent

Note that locations of mail sender and recipient can be any places on the earth, the implementation of the patent needs a "Cloud platform" in a terminology of current digital technology.

4.1 Predefine two types of data

First, predefine a "Super transit code" with its boundary represented by the longitudes and latitudes for each courier according to courier's work range (see figure 1 below). For instance, China - Northwest region - Qinghai province - Xining city – Qinghai University dispatching point – Courier A. China – Beijing – Qinghua University dispatching point – Courier B.

Figure 1

Figure 2

When a deletion or an adjustment of couriers' work range becomes a need, an administrator only needs to take such action accordingly on an electronic map. That is relatively easy. If a mail scheme previously well defined by a postal delivery company needs an adjustment, the administrator also only needs to reset the new collective and distributive information.

4.2 Obtain and connect the longitudes and the latitudes of locations of mail sender and recipient

When a mail sender sends a mail to a recipient, the longitudes and latitudes of their locations can be mainly gained through an APP with function of GNSS or LBS by their mobile phones, or through an electronic map according to their addresses. Then the above coordinates of the longitudes and latitudes along with their phone numbers (or IDs) will be registered in the "cloud platform". Therefore, such unique phone numbers (or IDs) replace the longitudes and latitudes where the latter are hard to be written and memorized. When the mail sender obtains and inputs the recipient's registered phone number, the longitudes and the latitudes of the sender and the recipient are connected.

4.3 Generate a transit/sorting path and a barcode

Once the longitudes and the latitudes of the sender and the recipient become known, with the electronic work ranges of the predefined "super transit codes" with boundaries represented by the longitudes and latitudes the corresponding couriers along with their "super transit codes" of the mail collector and distributor can be firstly identified through GIS.

Secondly, the "cloud platform" determines all the transit/sorting points and so the transit/sorting path between the mail sender and the recipient in this mailing according to the information carried by the sender's and recipient's "super transit codes". It comes true that all transit/sorting points of the mailing path in the mail are precisely determined when the waybill is submitted. At the same time, the "cloud platform" creates a code and records it as a barcode for this mail. This barcode will be connected to the above transit/sorting path.

4.4 The courier who collects mail prints out and places barcode

After the "cloud platform" through the longitude and latitude registered by the mail sender identifies the courier for a mail collection, the collector will receive a reminder for picking up the mail on the courier's mobile APP. The courier prints out a barcode (see Figure 2 above) and sticks it to the mail at the time to pick up the mail.

Meanwhile, the collector will also input two types of information, the weight and the type (standard or nonstandard) of the mail. This information will be used for the "cloud platform" to calculate the data for transit transportation plan and for dispatching, respectively. The volume and shape can be directly eye-measured.

4.5 Calculate and implement the dispatching and transit data

At this point, the transit/sorting path for all mails on a given day is available in advance. The "cloud platform" is able to calculate the volume of the mail between any transit/sorting points. It further calculates the data for dispatching and transit transportation according to the mail's weights and types.

4.6 Calculate and utilize the transit/sorting data

If the "cloud platform" sets up transit/sorting data for all transit/sorting points along the mailing path including mail barcode and name for next sorting point, then the mail can be transited and sorted automatically up to the courier for mail distribution at the recipient location by scanning the barcode and obtaining the sorting data.

In the event of manual sorting, the two "super transit codes" can be directly printed on the waybill. The manual sorting can be done by looking at the two "super transit codes".

4.7 Distribute intelligently

The courier's mobile APP has all mails labeled by their longitudes and latitudes within the courier's electronic work range. With these longitudes and latitudes, it becomes easy to calculate the distribution route. According to the distribution route, mails can be given a certain order number for the delivery.

(Also see "Application procedure of the patent technology" at http://www.tobeing.com.cn/Procedures_en.html
and item 10 in FAQs from http://www.tobeing.com.cn/faq_en.html)

5. Extension of the patent method

Currently, the UGV, UAV or delivery robot are developed one after another and applied in the postal delivery field. It is understood that the transit/sorting path and the longitude and the latitude of the patent method will be the fundamental data in the implementation of the above artificial intelligent technology and instrument for digital calculation on shared transportation, shared delivery, distribution route, distribution order and distribution navigation.

6. Sustainability of the patent method

In the field of mail delivery, key elements in the determination of transit/sorting path rely on three types of basic data, mail location, working scopes of transit/sorting points and transit/sorting scheme well-defined by individual postal delivery companies. In the patent method, the longitude and the latitude are employed to represent mail locations, working scopes of the transit/sorting points and all transit information

transformed from the transit scheme (i.e. “super transit code”), which is not substitutable. Therefore, the patent method is sustainable.

(Also see item 8 in FAQs from http://www.tobeing.com.cn/faq_en.html)

7. The patent method hasten the realization of a digital postal network

In the recent years, the e-commerce and its globalization grow rapidly. The inner and outer factors create a more urgent need of innovation and shared cooperation such as shared postal network, shared main transportation, shared sorting devices and shared mail distribution. This not only lets postal delivery entities avoid same and redundant investment but also their data be shared and used to increase the operation efficiency and service for customers’ better experience.

In October of 2016 the Universal Postal Union (UPU) advocated strategies of “innovation, integration, inclusion”in its 26th international conference. With the strategies, it gave a vision of “Vision 2020”as a blueprint: Innovation and sharing to realize a complete amalgamation of postal network for all nations, regions and even the whole globe, obtain a broad recognition of inclusion for various population, economic bodies and territories. Meanwhile, “geo-routing services” and “A global digital-physical mail network” become the vision of modern mail for US Postal Service (USPS).

The patent method exactly fits in the vision of UPU and USPS, which is also the industrial trend of the development in postal delivery sector. In aid of the longitude and latitude regardless of borders between countries, and the “super transit code” defined by respective postal delivery entities with the boundaries represented by the coordinates of the longitudes and latitudes in the patent method, namely based on three geo-routing (i.e. the transit/sorting path between and the two routes for mail collection and distribution at two ends), a digital postal network can be established.

The digital postal network enables not only a shared cooperation among postal delivery companies within a region or a country but also a complete merging in postal network globally for all regardless of populations and territories. This would realize all value of the shared cooperation, satisfy the customer’s new need and new expectation and after all provide customers with new experience.

--adoption of longitude and latitude becomes need for neither address nor postal code, which is more accurate and overcomes the language barrier for international mails;

--simulation of mailing path provides customers with good experience of mailing time and fee options as their new needs;

--determination of the transit/sorting path in advance helps transit planning and transportation sharing in cooperation;

--the predetermined transit/sorting path ensures accurate sorting up to the level at courier;

--the longitudes and latitudes on courier's mobile APP can be used for navigation and calculation for distribution route (geo-routing);
--pre-identification of couriers, transit path and distribution route can effectively manage and monitor all activities in the operation process;
--mobile APP between customers and couriers realizes customer's new experience in mail tracking and communication.