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Addresses and Discrete Grid Systems

by
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Identifying a location has always been useful to people—from ancient evidence of local inhabitants identifying locales by naturally-occurring landmarks to the naming a major roadways and city gates to the instituting of street names and building numbers. For thousands of years, many identifications were local, but some were known over great distances.

Over the course of history, addresses developed in cities and towns and expanded out to more rural areas. This is continuing today in less developed areas around the world. The first government-sponsored addresses were used for taxation and policing. They were only later used for the delivery of mail, in part because mail delivery to ordinary citizens is a relatively recent occurrence, with the concept of service to all a yet unrealized one.

Postal systems as we know them today are around 300 – 400 years old, much more recent than addresses. (Messengers and couriers, some governmental and some private, have existed for much longer. The locations of communities, families, and individuals, particularly those important to their communities, were known before the existence of addresses.) As postal systems and addresses developed, the posts took a larger and larger role in defining addresses. The affinity makes sense: an address allows for the identification of a delivery point for the post. Technology, at whatever stage of development, played in role in both delivery logistics and in address developments.

Over the course of those centuries, the height of delivery technology moved from horses to drones and manual sorting of mail to automated sorting with machine-read address and barcodes. Computers have, and will continue to have, a major impact in the development of address and delivery logistics.

Where We Are Now

All countries have postal service, regulated and often owned by the government. Under an initiative of the Universal Postal Union, attention has been given to the "unaddressed", that portion of the world's population that does not have an address. One might choose to include—or to exclude—those in countries where all mail delivery is at a post office, whether over the counter or to a post office box. While the number of unaddressed is disputed, that the number is substantial is not. It probably lies somewhere between 1.8 and 2 billion people.

Since addresses began in individual countries, many different ways of accomplishing the goal of providing unique addresses to postal delivery points exist. Some designate buildings by distance from an intersection of streets, others number buildings along a designated street, and still others use a unique number within a postal code. These last are often combined with street names to make them easier for residents and visitor to find. All of these systems can be supplemented by additional instructions, such as building, door, floor, or apartment designations, to add precision and aid in routing.

The traditional development of postal addresses has been funded and done by national governments or government agents. It can be a lengthy, expensive and complex process that involves mapping the county to identifying buildings and roads, creating a logical way of identifying those buildings and roads (often by names or numbers), assigning the names and numbers to all the buildings and roads, putting up signs with those names and numbers, and, finally, making residents aware of the new addresses and encouraging (or insisting on) their use. This very expensive process cannot be afforded by all countries, where other approaches may be used. There are often points of conflict along the way among various groups involved or interested in the process and the final addresses.

Adding to the difficulty, for practical purposes, each potential postal delivery point needs a unique address. That is, a unique combination of all the items that might be part of an address. So the same

street name and building number or the same post office box number might exist in other towns or post offices or postal codes, but it should exist only once in that town or post office or postal code or some combination of them. It must also include all the information necessary to deliver mail to the person or organization addressed. More than one building (residences or offices) may be on the same parcel of land and share the same postal address, requiring supplemental information to determine the delivery point—building names or other designations. In large office or apartment building, supplementary information—an apartment, suite, door or floor number-- may be needed to determine the specific postal delivery point for a particular person or organization.

This principle of uniqueness allows for unambiguous determination of the postal delivery point for each item of addressed mail. But it has other uses. Emergency services—police, fire, and ambulances—can determine where to go from the address. Private delivery services and visitors can find a residence or business. Utility services, such as water or electricity, can determine the service location. Visitors, including tourists, can more easily find their destinations. In many countries, an address is needed to register with the government to obtain an identity card or a driving license or to vote. As digital and computerized geographic identification and navigational systems become more common, these need to be more unambiguous, as these systems are exceptionally exacting about uniqueness of data and formality of the data's structuring.

It is useful for some, but not necessary to all, of these that the addresses have a logical structure. In particular, if a person is looking to find the building numbered 135 on a street designated as 23, it is helpful is street 23 is between streets numbered 22 and 24 and that building 135 is between or across from buildings 134 and 136. There may be intervening streets with names rather than numbers or buildings with sub-designations like 134b. This logical structure of proximity indicators allows for a person to find an address that has not been previously visited, whether that person is delivering pizza or visiting a relative at a new home.

Geographic Information System (GIS) and Geocodes

A database of addresses could make use of a more random distribution of the address numbers used in the above example. Each address can be associated with a geocode, whether latitude and longitude or one of the many systems based on latitude and longitude. This would provide the logical structure to determine location of the addresses, but it does not allow for navigation or routing unless all routes are included, which move into GIS. Routing is essential for delivery of services and goods, such as mail. Further, a person, such as a visitor or tourist, who did not have access to the database information, might be unable to find an address.

A more sophisticated Geographic Information System (GIS) with addresses and geographic information could go further than simply providing the location. Depending on the information included GIS can assist with route planning, utility and school locations, and planning for expansion of emergency services.

A number of geocode systems have been developed that provide a short designator for the geographic location of a structure. Some geocodes provide a sufficiently precise location to designate a light post or a fire hydrant; others define larger areas of the size of a house or building. The differences in the size of the defined area are the granularity resolution, with finer granularity defining a smaller area. These systems are based on latitude and longitude but create a code that has fewer digits than the number of digits in latitude and longitude, making the code easier for a person to remember or type into a device or on a form. This code can describe the precise location of a house or a stop sign or other structure. However, addressing in multi-level structures with geocodes cannot be done is a way that is satisfactory for precise identification of an apartment or office within a multi-level building. Databases and humans, though, have few issues. multi-level structures.

Over the past couple of decades, an increasing number of these systems have been developed. They divide the entire globe into a grid and are called a discrete global grid, or sometimes discrete squares. The grid sections can be of equal size or have equal angles. The scientific community investigating natural occurrences has preferred an equal size grid, while many of those applying grids to geocoding structures have preferred equal angles. Since the earth is not flat, any representation using Euclidian geometric structures will make accommodations that introduce some error. Some, usually small, degree of error is accepted by the scientific community for the advantages of the representation. Although the term "squares" is sometimes used, the sections making up the grid are not technically squares with 4 right angles (90°) and 4 equal sides. They may be trapezoids (in the U.S., trapezium in the U.K.) or pentagons or some other polyhedron.

A Geocode is a Location, but is it a Postal Address?

Both a geocode and an address indicate a point on the surface of the world. This basic, shared commonality has led to the suggestion that geocodes could solve the problem of addressing for those areas lacking street or building addresses. Proponents argue the codes created in various discrete global grid schemas could be more easily generated for any area than other types of addresses; that these codes are easier to remember; and that they are more scientific. To many others, this seems like a solution looking for a problem to solve. With the use of computer mapping and GIS, the cost and difficulty of creating addresses for an area or a country have both lessened nor do traditional addresses do not seem to tax the memories of residents. Finally, whether geocodes are more scientific is not the issue; it is whether they are more useful and practical than addresses.

The scope of an address enables and caters to far more than any current geocode. A geocode refers to a theoretical (but not always correct in the real world) point on the 2-D surface of the Earth, which is a subset of the natural environment and theoretically static. Addressing can also cater to the built environment, which can be multi-dimensional, and may have sub-delivery point identifiers, is dynamic, and is not necessarily fixed. Demographics are not constant; people come, move and go.

Current geocodes proposed as addresses for postal use do not currently meet all the needs of postal address at this time. They would need, at a minimum, to be supplemented by the same additional information as other types of addresses—floor, door, apartment, suite, or building designation. This could be done, but it removes some of the supposed advantages of geocodes as a complete solution.

In short, geocodes have many disadvantages. They are not easily understood by an individual without assistance from a computer mapping application, requiring an electronic device or, at the very least, a printed map to determine the location of each code. They may be as prone to human error as more traditional systems, with numbers transposed or words misspelled. With more traditional addresses, the other information may allow an error to be rectified. (For example, there may be no number 543 on that street but there is a 534.) Finally, some, but not all, of these code systems are proprietary, and cannot be used without paying a fee. As addresses are part of the national infrastructure, it is important for a national government or its designated postal operator to own the data and control it. This can be impossible with a proprietary system.

Once addresses are developed and deployed, the completion of the many details for sorting of mail items for forwarding and delivery and delivery route planning is required. Since these need to be considered in the development of addresses, some preliminary planning should have occurred before the completion of the address development and deployment. The regular and efficient delivery to all those addresses requires continuous updating to the requirements for sorting and delivery, as the routes change with the expansion or contraction of population over time. This may present greater and ongoing challenges than the planning and deployment of addresses.