Expedia Affiliate Network

Using EAN Databases for Geographical Solutions

EAN Partner:Connect

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Overview

As part of EAN's offerings to partners, we create and maintain a full set of relational files (34 in total), as well as custom scripts to automatically manage and update your local database file collection.

You can now cross-search using the latitude & longitude coordinates stored in various tables by using a set of extra tables and stored procedures included in our database creation script. This will allow you to not only to search geographically for any hotel, but also to use other publicly available databases to search for points of interest like airports, train stations and more.

We have to created a process that uses built-in database functions and traditional indexes, avoiding the need for geospatial extras and making for a more portable system.

In this paper, we will focus on these stored procedures and how to get the most benefit from them.

Hotel GeoPoints

All EAN hotel properties have latitude and longitude coordinates associated with them. These values use the `GPS84` standard, and are stored in fields of the same name on the `ActivePropertyList` table. For the purposes of this document, we will refer to a set of individual coordinates as a **GeoPoint**.

The `ActivePropertyList` is the main hotel database table for all Expedia properties. Basic hotel information (IDs, names, addresses) and GeoPoints are included. It includes more than 160,000 records, as part of the structure you have the basic address information and other important fields.

Use the following example query to retrieve all available records from all fields within `ActivePropertyList`:

```
QUERY:
USE eanprod;
SELECT EANHotelID, Name, Address1, Address2, City, StateProvince, PostalCode, Country,
Latitude, Longitude, AirportCode, RegionID
FROM activepropertylist;
```

```
RESULTS:
```

EANHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	Latitude	Longitude	AirportCode	RegionID
118583	Circus Circus Hotel & Casino	2880 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.13636	-115.16225	LAS	2008
342258	Best Western Plus Casino Roya	3411 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.12073	-115.17208	HSH	2008
135542	Excalibur Hotel Casino	3850 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.09921	-115.1731	LAS	2008
118903	Stratosphere Hotel - Casino &	2000 Las Vegas Blvd S		Las Vegas	NV	89104	US	36.14699	-115.1553	LAS	2008
123792	Monte Carlo Resort and Casino	3770 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.10384	-115.17604	LAS	2008
121569	Tropicana Las Vegas - A Doubl	3801 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.10077	-115.17138	LAS	2008
122212	Luxor Hotel and Casino	3900 S. Las Vegas Blvd		Las Vegas	NV	89119	US	36.09659	-115.17309	LAS	2008
115163	The Quad Resort & Casino	3535 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.11794	-115.17277	LAS	2008
152625	Golden Nugget Hotel & Casino	129 Fremont St		Las Vegas	NV	89101	US	36.16996	-115.14461	LAS	2008
161293	Paris Las Vegas	3655 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.11153	-115.17274	LAS	2008

This information allows for a typical address search and/or filtering by rough location, e.g. “Las Vegas, NV, USA” or “89109”.

By passing a hotel’s GeoPoint to the appropriate stored procedure, you can calculate the distance to other GeoPoints (for a hotel, POI, or otherwise) within a radius you define. All we do in the Stored Procedures is based on the calculated distance of the Hotel Latitude & Longitude to the other GeoPoint passed.

The **Haversine formula** is an equation used in navigation, giving great-circle distances between two points on a sphere from their longitudes and latitudes. That’s just what we’ve implemented in our stored procedure to enable GeoPoint distance search.

For more information on the math behind this powerful formula, visit this page:
http://www.movable-type.co.uk/scripts/latlong.html

To see how we implemented this formula, see the source of `my_sql_create_eanprod.sql`; on the table we want to search, we add a compound index based on latitude and longitude.

Stored Procedure Guide

Hotels Near GeoPoint

The most basic stored procedure uses a single GeoPoint and a search radius to locate any other GeoPoints in the database.

Let’s start by looking at a famous location that lies between two countries: Niagara Falls. This is the collective name for the three waterfalls that straddle the international border between Canada and the United States. With respect to how city is defined, there are two separate cities defined on either side of the international border: Niagara Falls, ON, CA and Niagara Falls, NY, USA.

On the USA side you can see the nearby city of Buffalo, and on the Canadian side you can see the city of St. Catharines. In this example, we will use the stored procedure sp_hotels_from_point to define a search radius with Niagara Falls as the origin.

First, we determine this landmark's GeoPoint as 43.08, -79.071 by using the public map site OpenStreetMap. Our most basic GeoPoint stored procedure uses the following format:

```
sp_hotels_from_point(latitude,longitude,radius in miles)
```

The stored procedure only supports miles by default. If you want to use kilometers instead of miles, you must do the conversion prior to sending the parameter, or alter the stored procedure to do so internally.

Using our example data, the call for Niagara Falls is as follows:

```
use eanprod;
call sp_hotels_from_point(43.08,-79.071,5);
```

Results (128 records / .217 sec):

EanHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
197260	Thriftlodge Niagar...	4945 Clifton Hill		Niagara Falls	ON	L2G3N5	CA	1.5	54.1100	55.1100	43.09152	-79.07511	1
260275	President Motor Inn	6503 Stanley...		Niagara Falls	ON	L2G 7L2	CA	1.5	182.4900	183.4900	43.08045	-79.08419	1
440484	All Star Inn	5384 Kitchen...		Niagara Falls	ON	L2G 1B7	CA	2.0	0.0000	0.0000	43.09538	-79.08369	1
440463	Rainbow Bed & Br...	4436-8 John St		Niagara Falls	ON	L2E 1A5	CA	3.0	0.0000	0.0000	43.09463	-79.06868	1
440578	Villa Alexandrea B...	5287 River Road		Niagara Falls	ON	I2E3G9	CA	3.5	0.0000	0.0000	43.09783	-79.06575	1
231394	Holiday Inn Niagar...	114 Buffalo Ave		Niagara Falls	NY	14303	US	3.0	80.0000	154.0000	43.08330	-79.06119	1
447201	Cozy Inn Bed & Br...	5725 Robinso...		Niagara Falls	ON	L2G 2B3	CA	3.5	0.0000	0.0000	43.08651	-79.08821	1
325783	Absolute Elegance...	6023 Culp Street		Niagara Falls	ON	L2G 2B6	CA	3.0	153.3434	194.7446	43.08614	-79.09343	1
376020	SHERATON AT TH...	300 Third Street		Niagara Falls	NY	14303	US	3.0	95.0000	199.0000	43.08616	-79.05912	1
152241	HAMPTON INN NI...	501 RAINBOW...		Niagara Falls	NY	14303	US	2.0	209.0000	279.7200	43.08348	-79.05587	1

You can see that it returns 128 records in .217 sec in my test server, so it is very fast.

The records are sorted by `distance`. You will note that `distance` uses an `integer` data type, as we do not really care exactly how far the hotel is, only for them to be properly sorted by distance. You can change the source of the stored procedure to return the `real` value of the distance if you wish.

The returned distance value is rounded, as follows: if the value is 0 the hotel is 0 to 1 mile away from the GeoPoint. A value of 2 will mean 1 to 2 miles range, 3 means 2 to 3 miles, etc. The input value is inclusive (0 miles to your value).

To the right is the effective search radius created for our example.

We are looking for all hotels inside the circle, which falls on both the US and Canadian sides of the border. For this reason, this specific usage of the stored procedure is best used for locations away from international borders.

The next examples will show you the various filtering options available.

Hotels Near GeoPoint, Filtered by City Name

For some situations, filtering by city or country may be necessary for optimal results. That is what the stored procedure `sp_hotels_from_point_restrict` is designed to do.

The stored procedure uses the following format:

```
sp_hotels_from_point_restrict(latitude,longitude,radius as miles, country, city)
```

So to filter the Canadian side of the Niagara Falls city, we use:

```
use eanprod;
call sp_hotels_from_point_restrict (43.08,-79.071,5,'CA','Niagara Falls');
```

Results (109 records / .150 sec):

EanHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
240338	Quality Hotel Fallsview Cascade	5305 Murray St		Niagara Falls	ON	L2G2J3	CA	2.5	53.2200	71.2500	43.08389	-79.07873	0
434967	Stardust Inn	5528 Buchana...		Niagara Falls	ON	L2G3T8	CA	2.0	0.0000	0.0000	43.09448	-79.08391	1
268376	Diplomat Inn	5983 Stanley Ave		Niagara Falls	ON	L2G3Y2	CA	2.0	89.2900	90.2900	43.08813	-79.08484	1
204293	Canuck Inn and Suites	5334 Kitchen...		Niagara Falls	ON	L2G1B5	CA	2.0	49.6034	99.2068	43.09541	-79.08229	1
216780	Niagara Plaza by FairBridge...	5807 Ferry St		Niagara Falls	ON	L2G1S8	CA	2.5	129.3700	155.2500	43.08963	-79.09123	1
197260	Thriftlodge Niagara Falls at...	4945 Clifton Hill		Niagara Falls	ON	L2G3N5	CA	1.5	54.1100	55.1100	43.09152	-79.07511	1
260275	President Motor Inn	6503 Stanley...		Niagara Falls	ON	L2G 7L2	CA	1.5	182.4900	183.4900	43.08045	-79.08419	1
191644	Travelodge At the Falls	4943 Clifton Hill		Niagara Falls	ON	L2G3N5	CA	2.5	53.6600	63.1300	43.09110	-79.07406	1
202666	Knights Inn by the Falls	6276 Main St		Niagara Falls	ON	L2G6A4	CA	1.5	28.1400	29.1400	43.08372	-79.08624	1
219222	Americas Best Value Chalet...	5577 Ellen Av...		Niagara Falls	ON	L2G3P5	CA	2.0	62.2400	188.5100	43.09355	-79.07575	1
267302	Ritz Inn Niagara	5630 Dunn St...		Niagara Falls	ON	L2G2N7	CA	1.5	44.2000	76.6700	43.07912	-79.08594	1
124485	Baymont Inn & Suites Niagar...	5234 Ferry Str...		Niagara Falls	ON	L2G1R5	CA	3.0	44.2900	66.8200	43.08958	-79.08077	1
271886	Inn By The Falls	5525 Victoria...		Niagara Falls	ON	L2G 3L3	CA	2.0	244.8300	245.8300	43.09436	-79.07275	1
381454	Victoria Motor Inn	5869 Victoria...		Niagara Falls	ON	L2G 3L6	CA	2.0	54.8400	55.8400	43.09044	-79.07887	1

Only hotels in the Ontario, Canada side of Niagara Falls are returned. Running the same query with “US” instead of “CA” will return only the New York, USA side of Niagara falls:

```
use eanprod;
call sp_hotels_from_point_restrict (43.08,-79.071,5,'US','Niagara Falls');
```

Results (19 records / .152 sec):

EanHotelID	Name	Address1	Add...	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
432521	The Red Coach Inn	2 Buffalo Ave		Niagara Falls	NY	14303	US	3.0	111.0000	439.0000	43.08417	-79.06336	0
276049	Seneca Niagara Casino & Hotel	310 4th St		Niagara Falls	NY	14303	US	3.5	95.4900	245.4900	43.08578	-79.05778	1
152241	HAMPTON INN NIAGARA FA...	501 RAINBOW BLVD		Niagara Falls	NY	14303	US	2.0	209.0000	279.7200	43.08348	-79.05587	1
376020	SHERATON AT THE FALLS H...	300 Third Street		Niagara Falls	NY	14303	US	3.0	95.0000	199.0000	43.08616	-79.05912	1
231394	Holiday Inn Niagara Falls Sc...	114 Buffalo Ave		Niagara Falls	NY	14303	US	3.0	80.0000	154.0000	43.08330	-79.06119	1
150311	Days Inn Niagara At The Falls	443 Main St		Niagara Falls	NY	14301	US	2.0	47.2000	79.0000	43.08946	-79.06266	1
267439	RODEWAY INN NIAGARA FALLS	492 Main Street		Niagara Falls	NY	14301	US	1.0	59.0000	60.0000	43.09067	-79.06107	1
118411	Comfort Inn The Pointe	1 Prospect Pointe		Niagara Falls	NY	14303	US	2.0	79.0000	99.0000	43.08706	-79.06313	1
114073	Quality Hotel & Suites At Th...	240 1st Street		Niagara Falls	NY	14303	US	3.0	69.0000	79.0000	43.08572	-79.06174	1
326420	The Giacomo	222 First Street		Niagara Falls	NY	14303	US	3.0	179.0000	180.0000	43.08526	-79.06170	1
191625	Econo Lodge at the Falls	200 Rainbow Blvd		Niagara Falls	NY	14303	US	2.0	54.9500	55.9500	43.08428	-79.06027	1
217550	Super 8 Niagara Falls	795 Rainbow Blvd		Niagara Falls	NY	14303	US	2.0	50.9900	69.9900	43.08359	-79.05287	1
161746	Sheraton at the Falls	300 3rd St		Niagara Falls	NY	14303	US	3.5	149.0000	150.0000	43.08616	-79.05912	1
108928	Howard Johnson Closest to...	454 Main St		Niagara Falls	NY	14301	US	2.0	135.1500	169.0000	43.08968	-79.06236	1

Now only hotels from Niagara Falls, New York, USA are returned. This stored procedure can be used to solve cross-border search issues caused by shared city names like Niagara Falls, or for cities very close to borders or one another.

Hotels Near GeoPoint, Filtered by Postal Code

You may also wish to filter results beyond city or country. City postal codes are a great way to isolate results from a specific area within a city. To filter by postal code, use the following stored procedure format:

```
sp_hotels_from_point_restrict_postal(latitude,longitude,radius as miles, postalcode as string)
```

The Canadian postal code L2H1H1 covers a single city block in Niagara Falls, ON. To filter results only within this postal code, we use:

```
use eanprod;
call sp_hotels_from_point_postal(43.08,-79.071,5,'L2H1H1');
```

Results (109 records / .150 sec):

EanHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
117789	Niagara Lodge & Suites	7720 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	31.9300	56.6900	43.08898	-79.12526	3
127069	Howard Johnson Expres...	8100 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	28.8600	45.1000	43.08887	-79.13365	3
193313	Villager Lodge	8054 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	44.2000	62.2400	43.08890	-79.13260	3
440579	Maplehaven Motel	7770 Lundys Lane		Niagara Falls	ON	L2H1H1	CA	2.0	0.0000	0.0000	43.08898	-79.12656	3

Notice that the postal code data sometimes will include a space within the data, but the stored procedure takes care of that by eliminating all whitespaces. This filter is useful when exposed directly to customers or as part of a region or neighborhood filter system.

Airports near GeoPoint

Using the same distance technique that we have been using to locate hotels, we have the ability to relate to other travel-related data as well. You can utilize our stored procedure to locate airport names and codes near a GeoPoint with this format:

```
sp_airport_from_point(latitude, longitude, country code VARCHAR(2),max records INT)
```

So to find the nearby airport for a hotel located in Spain (near the Santiago Bernabeu Stadium), we use:

```
use eanprod;
call sp_airport_from_point(40.451585,-3.690375,'ES',2);
```

Results (109 records / .150 sec):

AirportID	AirportCode	AirportName	CountryCode	Latitude	Longitude	distance
6000387	MAD	Madrid, Spain (MAD-Barajas)	ES	40.468064	-3.568577	7
6031954	SLM	Salamanca, Spain (SLM-Matacan)	ES	40.940301	-5.502291	102

You can also use this procedure to locate airports nearby properties that do not have an AirportCode entry in the property list file.

Conclusion

As we have presented in this paper, you can rely on the distance calculation to find hotels given any other point, but you can also reverse the logic to search the other way around, like hotels close to an airport.

In our next paper we will discuss using this same technique to find data supplied by many other public database to find nearby locations like restaurants and train stations.

Stay tuned!