Collaborative Project Phase 3 Report Team 8

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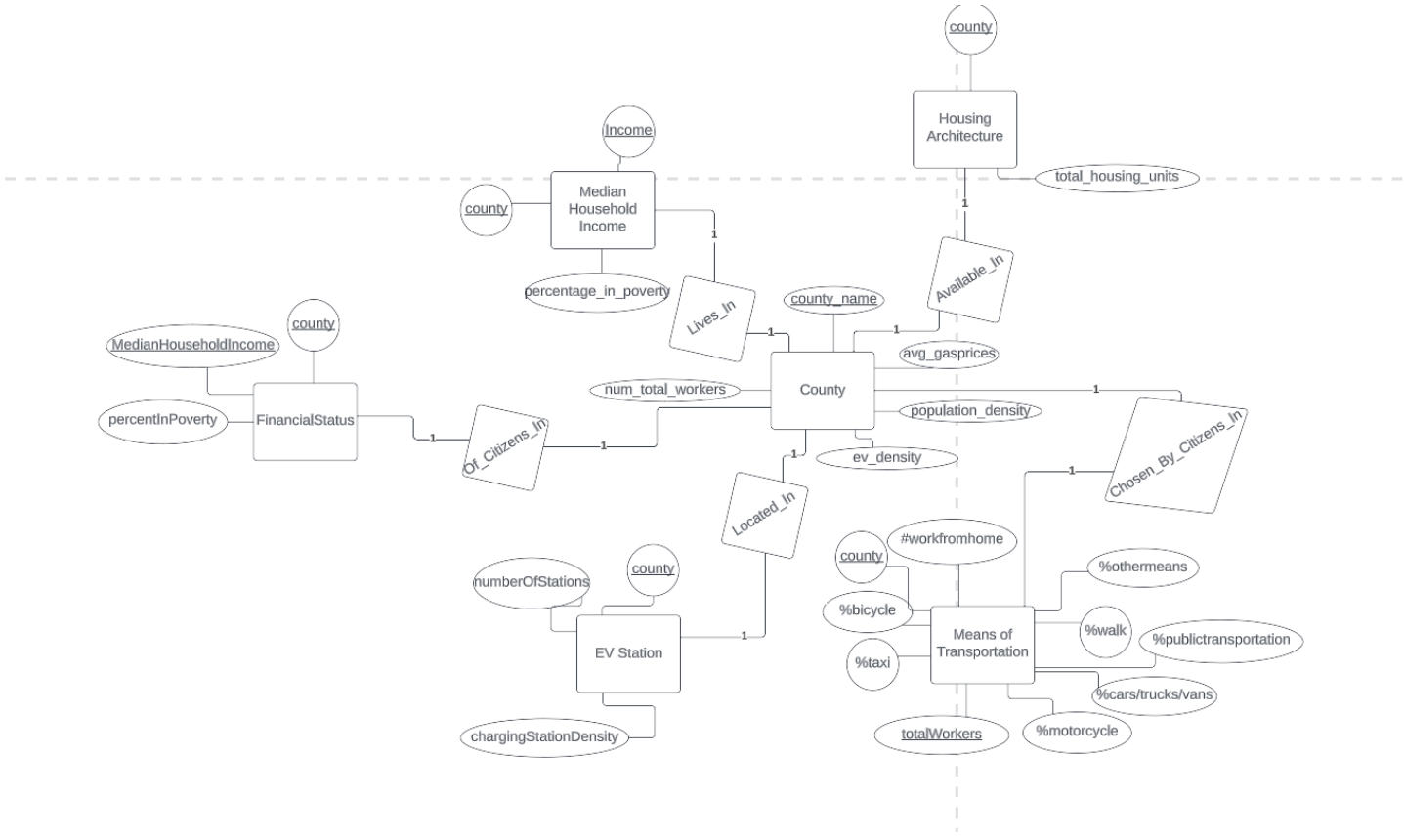
A General Description of Relational Databases

Relational databases are a type of database management system that organizes data into tables consisting of rows and columns. Each table contains related data, with columns representing specific attributes and rows representing individual records. The relationship between the tables is established through shared columns or keys, which allow data to be easily accessed, queried, and manipulated using Structured Query Language (SQL). Relational databases are valuable because they provide a secure and scalable way to store and manage data. They ensure data consistency and accuracy, with the ability to enforce data integrity constraints to prevent errors and inconsistencies. Relational databases are also highly flexible, allowing changes to the data model and enabling the system to scale to handle increasing amounts of data. They also provide robust security features, such as user authentication and encryption, to protect sensitive data from unauthorized access.


County
cName
average_gas_price
population_density
EV_density
total_workers
Means of Transportation
cNAME
total_workers
%cars/trucks/vans
%public-transport
%taxi
%motorbike
%bicycle
%walk
%other_means
%work_from_home
Financial Status of Citizens
cName
median_household_income
%population_in_poverty
Housing Architecture
cName
units_by_structure
total_housing_units
EV Station
cName
num_of_stations
zipcode
chargingstation_density
Housing Architecture
cName
units_by_structure
total_housing_units


county
Housing Architecture
total_housing_units
Income
Median Household Income
county
percentage_in_poverty
Lives_In
Available_In
county_name
avg_gasprices
county
MedianHouseholdIncome
percentInPoverty
FinancialStatus
Of_Citizens_In
num_total_workers
County
population_density
ev_density
Chosen_By_Citizens_In
Located_In
#workfromhome
county
%othermeans
%bicycle
%walk
%taxi
Means of Transportation
%publictransportation
%cars/trucks/vans
totalWorkers
%motorcycle
numberOfStations
county
EV Station
chargingStationDensity
1

ER Diagram

The ER diagram reveals several important elements of our database model. Firstly, it shows the different entities that are included in the database, including County, Means of Transportation, Financial Status of Citizens, Housing Architecture, and EV Station. Each of these entities has its own set of attributes, which are used to store specific types of data. The diagram also includes relationships between the entities, which show how they are connected to each other. The relationships include Lives_In between County and Median Household Income, Available_In between County and Housing Architecture, Of_Citizens_In between County and Financial Status, Located_In between County and EV Station, and Chosen_By_Citizen_In between County and Means of Transportation. These relationships have a cardinality constraint of one-to-one, which means each record in one entity corresponds to exactly one record in the other entity. The diagram also reveals the keys used in the database. Each entity has a primary key, which is used to uniquely identify each record in the database. In addition, some entities have partial keys, which are used in conjunction with the primary key to uniquely identify records of weak entities. For example, Means of Transportation has a partial key of total_workers, which means that the combination of total_workers and cName uniquely identifies a record in the database.

Reasoning Behind Database Design

The database includes multiple tables that capture different aspects of the EV infrastructure and its relationship with various factors such as financial status, housing architecture, means of transportation, and EV station locations. The table for EV

stations provides a critical data point as it captures the number of stations in a particular county and their location, which is essential to understand the current EV infrastructure. Additionally, the County table includes important demographic data such as population density, total workers, and EV density that can help determine the areas where there is a high demand for EV infrastructure. The Means of Transportation table provides a comprehensive view of the different modes of transportation used in a county, including the percentage of cars, public transportation, taxi, motorbike, bicycle, walk, and other means, as well as the number of workers who use them. This information can help determine the areas where there is a high demand for EV infrastructure based on the transportation patterns in the county. The Financial Status of Citizens table provides information on the median household income and the percentage of the population living in poverty, which can help understand the purchasing power of the residents in a county, and inform the decision on where to invest in EV infrastructure. Finally, the Housing Architecture table captures data on the units by structure and total housing units in a county, which can provide insight into the type of housing available in a particular area and inform the decision on where to prioritize EV infrastructure expansion.

Use case description:

1. The actor will enter the system
2. The actor will choose whether to filter by: median income, type of housing by units, gas prices, existing ev charging stations.

3. The system will display the counties that are deemed suitable for more charging stations.
4. The user interprets the results and changes the filters to test different scenarios.
5. The system responds with an updated counties list.

Community_Profile_Data_08.21.22

Median Household Income: 4 * 1133 rows = 4532 bytes

Percent of Population in Poverty: 4 * 21 counties = 84 bytes

Means of transportation percentages: 4 bytes * 8 = 32 bytes

Units by structure: 4 bytes * 7 = 28 bytes

Avg gas price: 4 bytes * 564 municipalities = 2256 bytes

Sum = 6904 bytes

Electric Vehicle (EV) Ownership Data

Total personal vehicles: 4 bytes * 1133 rows = 4532 bytes

#EVs = 4 bytes * 1133 rows = 4532 bytes

%EVs = 4 bytes * 1133 rows = 4532 bytes

Sum = 13596 bytes

Searches:

Our algorithm will not require many searches and will have to only calculate basic divisions and multiplications. Our algorithm will search for the data based on the given parameters and will only do a single search.