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Title of the Assignment: REVIEW PAPER ON “The Evolution of Google Street View: Technology, Privacy, Applications, and Remote Sensing”

Name of Student: B.M DEVIKA VARMA

USN. No : 22BBTCA017

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THE EVOLUTION OF GOOGLE STREET VIEW: TECHNOLOGY, PRIVACY, APPLICATIONS, AND REMOTE SENSING"

ABSTRACT:

Google Maps has changed the way people find their way around the world. It was introduced in 2005 by a small team of engineers at Google, with a vital role played by Lars Rasmussen and his brother Jens Eilstrup Rasmussen. Google released the first version of Google Maps for mobile, which was available for the Apple iPhone. This version of the app was a huge success and quickly became the most popular mapping app on the market. A big part of its success comes from remote sensing technology, which provides the satellite images that make the maps detailed and accurate. By using pictures taken from satellites and planes, Google was able to create maps that show almost any place on earth. Over the years, they've added more features like information from users and street view photos to make the maps even better.

Google Maps essentially uses two Graph algorithms — **Dijkstra's algorithm and A* algorithm,** to calculate the shortest distance from point A (Source) to point B (destination). A graph data structure is essentially a collection of nodes are circles that are defined by edges are lines connected to circles.

As remote sensing technology advanced, Google Maps evolved into a dynamic tool, supporting real-time traffic updates, environmental monitoring, and urban planning.As a result, Google Maps transforms how we explore and understand our surroundings.

HISTORY

The story of Google Maps began in the early 2000s when the internet was rapidly growing. At that time, many online maps were there. They were difficult to use and lacked detail. **Example: Yahoo Maps, MapQuest, Live Search Maps (Microsoft).** All other mapping services were difficult to use, making it hard for people to get accurate directions. Despite their challenges, the vision for Google Maps was clear, to create a map that is accessible to everyone.

Despite their challenges, the vision for Google Maps was clear, to create a map that is accessible to everyone.In the early 2000s, a small company called Keyhole, co-founded by Lars Rasmussen and his brother, Jens Eilstrup, developed the software that allowed users to view and navigate 3-D maps using satellite imagery. The technology caught the attention of Google, and in 2004, Google acquired Keyhole and its technology. Aiming to create a mapping solution that would be more user-friendly, accessible, and web-based mapping application. The team focused on making the platform interactive, allowing users to zoom in and out and drag the maps to explore different areas easily.

Google Maps was launched in 2005 as an online navigator. Over the years, the team continued to improve the service by adding features like Google Street View in 2007, which provides views of streets.

TECHNOLOGICAL ADVANCEMENTS

UNDERSTANDING GOOGLE STREET VIEW:

Google Street View is a feature that allows users to explore streets and neighborhoods through 360-degree views. Launched in 2007, it quickly became a valuable tool for anyone seeking to navigate or learn more about a particular area.

HOW GOOGLE STREET VIEW IS CREATED:

Creating Google Street View involves various advanced technologies and surveys. Google collects images using specially equipped vehicles, which are fitted with high-resolution cameras that capture images from all angles. These cameras, paired with LiDAR sensors, use laser beams to measure distances and create detailed 3D maps of the environment.

GPS sensors are used for georeferencing these images, tracking the vehicle's location in real time. Once the images are collected, advanced software processes them to stitch together individual images. Further processing blurs faces and license plates for privacy protection.

THE GOOGLE TREKKER:

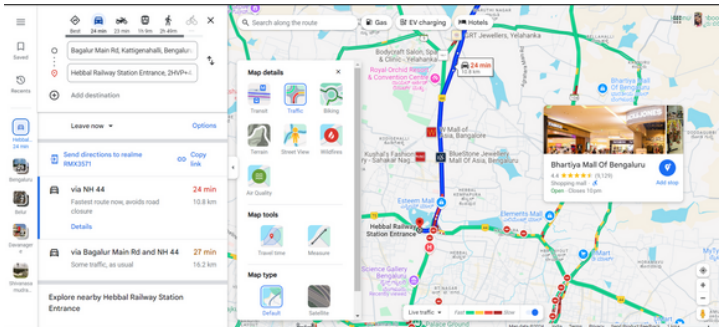
To capture images in inaccessible locations, Google developed the Google Trekker, a backpack equipped with a camera. This allows the collection of Street View data in places like hiking trails, parks, and pedestrian areas.

Historical Imagery:

Google Street View has a feature called "Time Travel" that allows users to view historical imagery of a location. By clicking the small clock icon in the bottom right corner, users can see how areas have changed over time.

Real-Time Traffic Visualization:

It provides real-time traffic data on major roads. This feature assists users in assessing traffic conditions using a color-coding technique: green signifies smooth traffic, yellow/orange indicates moderate traffic, red represents heavy congestion, and dark red shows severe traffic delays. This helps display current traffic conditions.



Indoor Mapping:

Street View not only captures outdoor locations but also includes indoor imagery for places like shopping malls, museums, airports, and universities. Users can explore these indoor spaces as if they were walking through them, making it easier to navigate large complexes.

Privacy Measures:

Google employs machine learning to automatically blur faces and license plates for privacy. Users can also request to blur their homes or other personal property, ensuring control over privacy while accessing detailed imagery.

Machine learning plays a crucial role in enhancing Google Street View and its functionalities.

Google Street View has really changed the way we explore our neighborhoods and cities, largely due to the incredible capabilities of machine learning. One of its standout features is how it stitches together thousands of images to create a smooth, panoramic view of streets. This isn't just about pretty pictures; advanced algorithms work hard to make sure we can navigate easily. On top of that, machine learning models, especially convolutional neural networks (CNNs), help identify and categorize objects in the images. This makes it much easier for us to find landmarks and get around in unfamiliar places.

Privacy is a big deal for Google, and they take it seriously. To keep our personal information safe, machine learning algorithms automatically detect and blur out sensitive details, like faces and license plates, in the images. It's a smart use of technology that helps strike a balance between giving us an open view of public spaces and protecting our privacy. In today's digital age, where privacy concerns are on everyone's minds, this approach is crucial for keeping user trust intact.

Machine learning also plays a huge role in making navigation on Google Maps more efficient. By analyzing things like traffic patterns and user behavior, these algorithms can predict travel times and suggest the fastest routes. This not only helps us get to our destinations more quickly but also offers personalized recommendations that can make our journeys more enjoyable. Thanks to these advancements, Google Street View has become an invaluable tool for anyone wanting to explore urban areas in a more engaging and informative way.

CONCLUSION

The evolution of Google Street View shows just how far mapping technology has come, especially with the use of remote sensing. a simple map has grown into something much more with features like Street View, making it an essential tool for getting around, exploring new places, and even city planning , traffic managing . By combining satellite images, AI, ML Algorithms and input from users, Google Maps has changed how we see and interact with the world around us. Although there have been privacy concerns along the way , Street View keeps improving and is now a key part of urban development, environmental tracking, and helping us better understand our planet.

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