Nearby area exploration using Augmented Reality

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Introduction

- Augmented Reality (AR) can be defined as the unification of digital software and live surroundings that generate scenes in real time, augmenting what you see to integrate the digital and physical world.
- AR applications offer an enhanced, more immersive experience for consuming information.
- Recently there have been big investments in virtual and augmented reality market by industry leaders such as Google, Facebook and Microsoft indicating a rise of interest in the field.

Motivation

- **Devices ubiquity.**
  - The growth of smartphone devices and their capabilities (internet access, big screens, variety of sensors) allow people to experience AR applications everywhere.
  - Upcoming and current dedicated head-mounted devices that promise to leverage the experience of AR and VR apps to a new level; such examples include Google Glass, Oculus Rift, Microsoft HoloLens.

- **Availability of data.**
  - The increased popularity of social media have made publicly available a plethora of data regarding ventures (location, name, reviews) from various sources such as Yelp, Foursquare, etc.

System Architecture

- Mobile User Interface
- Google Glass User Interface
- Standard three-tiers application (Client, Server, DB Server)
- Extensible server architecture for adding new data sources

Capability

- **Smart Nearby Mode.**
  - The app request from the server a range around the query point.
  - A local NN query is executed on the device ONLY for the visible region of the user.
  - This results to a clean and informative experience for the user by dynamically showing only the interesting POIs in the facing direction of the user.

- **Directions without a map.**
  - A built-in directions mode where an on-screen 3D arrow shows the direction that the user needs to follow in order to get to the POI. The distance to the destination is shown on-screen as well.
  - Someone who has no sense of direction cannot read maps. With this functionality, even someone with no sense of direction can absolutely reach his destination.

- **Spatial search and other features.**
  - Visual and powerful spatial search for places in areas that might not be nearby (Window/Range/NN/Popular Queries).
  - Support for bookmarks that are not stored locally on the device, but remotely on cloud-based storage. This way the user can access the bookmarks from everywhere.
  - The basic functionality was successfully ported to Google Glass. More specifically, the Nearby mode and the Explorer window were optimized for the device.

Related Research

- Selection of a subset of nearby POIs for the best user experience possible
- Calculation of direction arrow angle
- Efficient transmission of data with spatial metadata
- Real-time spatial data query: database, performance

Conclusion and Future Work

- The directions arrow could be used in the crowd-sourcing mode of MediaQ to guide a worker to the task location or even allow the requester to remotely guide the worker in real-time. This scenario can be applied to workers using regular smartphones but for workers using head-mounted wearable devices (such as Google Glass) is exponentially more useful.
- Focus on the upcoming dedicate AR/VR devices (such as HoloLens) and take advantage of their unique capabilities.