Docket #: S07-033

Navigational Video and Virtual Tours

This portfolio of inventions provides the tools for an advanced navigational system and panoramic virtual tours – technology that is incorporated in Google Street View. The technology synthesizes missing images to provide a continuous panoramic tour from arbitrary viewpoints and the ability to tag video. When applied to navigation, the system can generate a map using location and scene data from a variety of sensors including GPS, laser scanners, and cameras, for off and on road terrains – moving vehicle position is precisely tracked on the generated map. The technology was demonstrated in the 2005 and 2007 DARPA Autonomous Vehicle Challenges.

Technologies in the Portfolio

Multi-point Viewing of Panoramic Video (S06-418) – A software system that allows a user to view panoramic videos from arbitrary viewpoints using separate, non-overlapping, geo-referenced, panoramic video streams, synthesizing missing panoramic images to provide the user with a complete video sequence.

Tagging Objects in Panoramic Videos (S06-419) - This user interface enables a user to define tags within virtual tour applications that label objects in panoramic images and video – a process that has been very difficult to achieve prior to this invention.

User Interface for Displaying and Navigating Video (S07-033) - Stanford researchers developed this responsive, intuitive user interface to enable a user to explore a dataset consisting of many location-referenced image panoramas (mapped scene data), with a client-server architecture that minimizes critical user viewing or video play wait times.

Software System for Collecting, Storing, Processing & Serving Panoramic Images and Movies (S07-034) - This software system acquires panoramic video footage and makes the data viewable on a Web browser. The system enables a human editor to select specific subsequences of the data, and organize it, and have others view it.

**These can be licensed separately or in combination.*

Applications

- **Navigation Systems**
  - Mapping & Positioning
  - Advanced driver assistance
  - Unmanned ground vehicles
- **Video and Graphics**
  - Virtual tours
  - Interactive videos
  - Panoramic videos at multiple resolutions
- **Computer and Internet Software**
  - Panoramic data storage in real-time
  - Data processing for interactive viewing
  - Data serving on a Web browser

Advantages

- **Navigation Systems**
  - Improved accuracy, resolution and reliability for relative vehicle localization
  - Independence of requirement for “landmark” features to generate maps
  - Robust mapping under all weather conditions
- **Video and Graphics**
  - Multiple viewpoint viewing
  - Multiple segmented videos
  - Improved user interface providing intuitive way of selecting images from a large database
- **Computer and Internet Software**
  - Quick uploaded display of panoramic data over low-bandwidth data links
  - Use in either Web-based application or client server application

Publications

- Arfidsson, Joakim, Hendrik Dahlkamp, Andrew Lookingbill, and Sebastian Thrun. "Process for displaying and navigating panoramic video, and method and user interface for streaming panoramic video and images between a server and browser-based client application." U.S. Patent 8,074,241, issued December 6, 2011.
- System and process for synthesizing location-referenced panoramic images and video US Patent Application US20080106593
- System and method for tagging objects in a panoramic video and associating functions and indexing panoramic images with same US patent Application US20080106594

Patents

- Published Application: 20080244648
- Issued: 8,074,241 (USA)

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