VOTERS system integration, architecture, and automation

VOTERS created an expandable flexible distributed multi-OS system architecture suitable for many mobile heterogeneous (multi-modal) sensing systems. A centralized Fleet Manager communicates with, coordinates, and tracks fleet vehicles with sensing platforms. The VOO Manager coordinates a network of sensor subsystems on the sensing platform and provides the interface to the control center. A tight time synchronization (critical feature) across all subsystems is provided, which enables geo-referencing of all data and sensor fusion across multi-modal sensors, e.g. acoustic, video, radar. The modular system architecture contains all necessary functionality for such a system to be autonomous from the vehicle operator, controllable by the Fleet Manager, and fully automated, which is very important, because e.g., the VOTERS system can easily collect 100’s of GB a day.

The automation includes start and stop of the coordinated data acquisition through monitoring of a GPS-based home zone and partitioning of data sets into hierarchical, expandable definition of data streams containing the data and meta-data files. Once the mobile sensor system returns back home and after detecting the presence of the home network the automatic bulk data upload to the data server starts. Automatic processing of individual or multiple data streams and in what sequence is controlled by a configurable Plugin Manager. Plugins are designed to run either in now-time on the vehicle or on any server back at the control center. Raw or processed data are automatically placed in the database through data-take-in-plugins also controlled by the Plugin Manager, which interfaces with the Oracle database and the GIS software. Data layers are created automatically within the GIS and can be visualized locally and published to the web-based Silverlight or Flex interfaces for access to the results over the internet. The system is complemented by an automated software distribution process, custom error handling and fault management, real-time tracking, message logging.

Features

- Implementation of a system architecture suitable to manage a fleet of autonomous mobile sensor systems with heterogeneous distributed sensor systems
- Based on a modular hierarchical and expandable system architecture
- Utilize distributed Middleware for control and status messages; FTP for O(100GB) data (VOO Manager and Fleet Manager)
- Scalable and adaptive Plugin System for now-time and post-processing (Plugin Manager)
- The effort of integrating additional new sensor systems is minimal

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