Center for Advanced Knowledge Enablement (CAKE)

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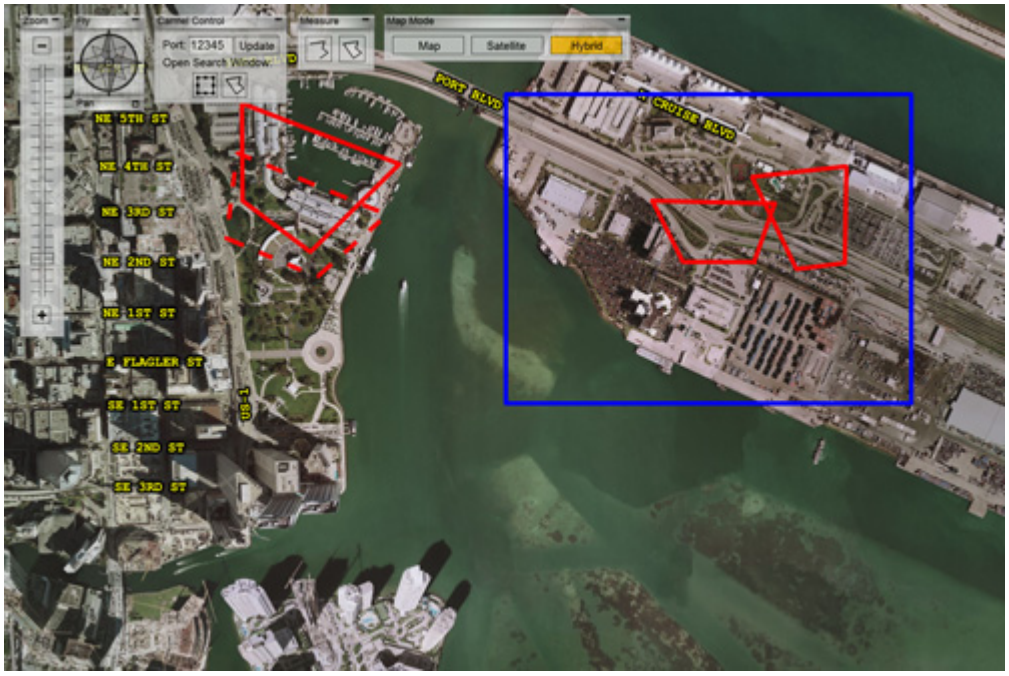
TerraFly Maps Enable Monitoring of Airborne Cameras

Although video surveillance recording is the state-of-the-practice, the video collected is normally used only after the fact – it cannot easily be accessed in real time, does not have accurate geolocation capabilities, and cannot be easily integrated with other forms of critical information. This state-of-the-practice lack of situational awareness will be overcome by the CARMEL-TerraFly system.



CARMEL-TerraFly user interface. The map shows the Port of Miami with moving traces of areas videotaped by airborne cameras. Solid trapezoids are ground projections synchronized with playback, dotted trapezoids are real-time projections of cameras' views. The blue rectangle allows selection of video fragments at times and locations of interest.

The project integrates cutting-edge Context Aware Rich Media Extensible Middleware technology (known as CARMEL) from IBM Research – Haifa (http://www.haifa.ibm.com) with the TerraFly Geospatial System at the Center for Advanced Knowledge Enablement (CAKE). This integrated system offers innovative situational awareness technology, while helping expand the Center's international influence and connections. By combining IBM Haifa's Geographic Information Systems (GIS) and streaming technology research, CARMEL is a geographically anchored, video-on-demand streaming infrastructure that provides: 1) scalable, end-to-end low-delay and resilient streaming technologies; 2) on-demand bandwidth adaptation (transcoding); 3) highly accurate geographical searches, 4) real-time, geo-located notification, and; 5) high performance, service oriented architecture-enabled technologies.

TerraFly is a technology and tools for the visualization and querying of geospatial data. It provides users with the experience of virtual "flight" over maps comprised of aerial and satellite imagery overlaid with geo-referenced data. The data drilling and querying component of the system allows the users to easily explore geospatial data, create geospatial queries, and get instant answers supported by high-performance multidimensional search mechanisms. TerraFly's server farm ingests, geo-locates, cleanses, mosaics, and cross-references 40TB of basemap data and user-specific data streams. The interface allows rapid deployment of interactive Web applications. It is accessible from anywhere via any standard Web browser, with no client software to install.

This novel technology would transform public safety assurance and the ability to quickly respond to situations. The CARMEL-TerraFly project marries these two technologies, providing geographically anchored streaming services that can be combined with and accessed via the intuitive TerraFly user interface. Users will be able to select a geographic area of interest, retrieve multimedia data from sensors in the area and view streaming video of moving objects in real time (e.g., vehicles, people, animals, etc.). Users will also be able to set temporal and geographic constraints to view the path traversed by a specific moving object or group of objects. There are numerous potential applications for this advanced technology, particularly for command and control operations such as homeland security, law enforcement and disaster response. For example, using the CARMEL-TerraFly system, law enforcement could be alerted to a situation such as a hit-and-run accident. Officers would be able to quickly pin-point the geographic location, view streaming media of the current location to quickly assess the situation, and, through the use of additional sensors, track the offender's vehicle.

> **Economic Impact:** The potential economic impact of CARMEL-TerraFly is substantial because it can be a cost effective public safety tool that reduces law enforcement costs, increases effectiveness of situational evaluation and response and contribute to economic improvement of areas. Litigation costs could also be decreased as more timely and accurate evidence becomes available for use in and out of the courtroom. In addition, the system could improve the effectiveness of situational evaluations and subsequent responses by providing tools for better resource allocation, thus improving the safety of responders and the public, and ultimately saving lives and property. Finally, use of this system could ultimately reduce crime, which, in turn, would lower the cost of doing business and contribute to local and national economic improvement.

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