

# CONTRACTOR'S PROGRESS STATUS AND MANAGEMENT REPORT

*Intelligent Collaboration and Visualization*

for the period 1 April to 26 June 2000

Report #13

CDRL A001

Contract N66001-97-C-8517

2 August 2000

SUBMITTED TO

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## Quarterly Status Report

Intelligent Collaboration and Visualization  
for the period 1 April to 31 June 2000  
Cooperative Agreement N66001-97-C-8517  
CDRL A001

### 1.0 Purpose of Report

This status report is the quarterly contract deliverable (CDRL A001) which summarizes the effort expended by the Carnegie Mellon University team in support of Intelligent Collaboration and Visualization (IC&V) on Contract N66001-97-C-8517. As coordinated with Rich Laverty, this report consists of the Annual Summary data prepared for DARPA's Information Technology Office (ITO).

### 2.0 Project Members

Wactlar	35% of effort
Christel	71
Faloutsos	11
Hauptmann	70
Reddy	17
Stevens	0
Other staff:	1,375%

### 3.0 Project Description (last modified 2/97)

This work will develop tools, techniques, and systems allowing people to capture a complete record of their personal experiences, and to share them in collaborative settings. Users may range from rescue workers carrying personalized information systems in operational situations to remote crisis managers in coordinating roles. Personal Informedia Experience-on-Demand (EoD) units record audio, video, GPS and other sensory data, which can be annotated by human participants. The EoD environment synthesizes data from many EoD units into a "collective experience" – a global perspective of ongoing and archived personal experiences. Distributed collaborators are thereby brought together over time and space to share meaning and perspectives.

Each constituent EoD unit captures and manages information from its unique point of view, making this information available to others in the EoD environment. Each operates as a portable, interoperable, Informedia system, allowing search and retrieval by both its human operator and remote systems. The EoD environment thus enables integration of the multiple points of view to provide more details for local decision-making and superior event coverage in support of real-time collaboration. The EoD capability will significantly improve situation awareness and analysis, both in real-time and retrospectively. The indexed and summarized information also enables "remembering" analogous past experiences and "projecting" into future simulated ones. Techniques will be developed to manage the vast quantities of information and to search, summarize, and visualize video,

audio, and text content and annotations from multiple perspectives. The foundation for this work, the Informedia Digital Video Library (DVL) Project, has demonstrated the successful application of speech, image, and natural language processing in automatically creating a rich, indexed, searchable multimedia information resource. We will build on these technologies, moving beyond a DVL into new information spaces by addressing collaboration and summarization of multiple simultaneous information generators integrated across people, time, and space.

### **TIDES option:**

The TIDES program utilized an otherwise unfunded option line on this project's contract to fund the work of other researchers, herein reported and annotated as "TIDES option".

This research effort addresses several challenges related to significantly improving the effectiveness of collaborative teams working with material in multiple languages. The integration of translingual capability into teamwork support tools can:

1. improve overall translingual capability and
2. improve the quality of team interaction and product while working with translingual material. With respect to (1), the research emphasis is on multilingual content threading and multi-document summarization.

## **4.0 Performance Against Plan**

Spending proceeded as planned during this reporting period.

## **5.0 Major Accomplishments to Date**

- Integrated VOOCR (video optical character recognition) into EoD's underlying Informedia system, allowing EoD to "read" some naturally occurring scene text.
- Improved our image-retrieval method by exploiting color-cluster and image-region characteristics.
- Tested image-retrieval performance using a larger image set (20,000 images) from the Informedia database.
- Modularized our image-retrieval method to facilitate integrating it into the EoD system.
- Developed a map-based display and query mechanism enabling better access to and visualization of library data.
- Developed a method to synthesize a basic panoramic view from multiple perspectives that might be provided by concurrent EoD users.
- Developed a technique for motion detection in video, by comparing against reference frames.
- Automatic silence filtering integrated into video processing.
- Location names can now be disambiguated automatically in geocoding.

## **6.0 Technology Transition (FY 1999)**

- Collaborated with the local public television station, WQED, to develop a library of realtime recorded EoD experience data integrated with historical and archived footage from their stock.

- In discussion with General Motors concerning their interest in using EoD technology onboard in their automobiles to provide an intelligent, interactive “tourguide” upon request.

## **7.0 Issues**

7.1 Open issues with no plan, as yet, for resolution:

- None.

7.2 Open issues with plan for resolution:

- None.

7.3 Issues resolved:

- Improved scene text detection with backward propagating neural nets.
- Designed a more fault-tolerant EoD architecture.
- Reduced bandwidth requirements.
- Collected real-time EoD views from multiple units.

## **8.0 Near-term Plan**

Responding to the government’s desire to have EoD participate in the PI meeting and demonstrations currently scheduled for the latter part of September 2000, a no-cost extension until September 2000 has been requested and granted.

## **9.0 Completed Travel**

Jianbo Shi - June 2000 - CVPR’2000, Computer Vision Pattern Recognition Conference, Savannah, Georgia

## **10.0 Equipment Purchases and Description**

None.

## **11.0 Summary of Activity (FY 2000)**

- Automatically generated maps that cover the locations spanned by a query’s result set of relevant video segments. Dynamically summarized the video events recorded by different EoD units occurring in the same spatial region by overlaying the respective routes traversed onto a single interactive map display. Selecting a particular video segment will thus highlight one specific route of an EoD collection unit on the display; conversely, selecting one route from those presented will recall the corresponding video segment.
- Conducted field trials using multiple participants, each wearing EoD data collection equipment, exploring the same area at the same time. Existing digital wireless communications infrastructure was used to transmit EoD video, audio, and GPS data back to a base processing station in near real-time.

- Incorporated historic and archived video footage into the EoD system. This footage was geocoded and merged with recent EoD-collected data to provide contrasting pre-existing views of the same location, as might be useful in a disaster or battlefield situation.
- Devised and built a mechanism for detecting bodies in video. The method uses motion information to identify possible locations of joints, and then determines the globally optimal body configuration. Body detection can successfully track one or more individuals in relatively complicated video.

**TIDES option:**

- Initial scale-up studies of structural differencing for shared file systems. This resulted in a new architectural approach to asynchronous collaborative systems, which has been subsequently pursued in a separately funded project.
- Developed a prototype object-oriented GUI for integrated translingual information retrieval, gisting machine translation, and summarization, to allow experimentation with different styles of user interaction in a cross-language information management workstation. This also provided educational opportunities for two graduate students in GUI design.

**11.1 Significant Events:**

- None.

**FINANCIAL INFORMATION:**

Contract: N66001-97-C-8517

Contract period of performance: 6/26/97-6/25/00

Ceiling value: \$3,361,474

Reporting period: 4/1/00 – 6/26/00

**Current period:**

	Cost
Prime contractor	
Labor	359,754
ODCs (travel, etc.)	25,759
Equipment	0
 Total this period	 385,513

**Cumulative:**

	Cost
Prime Contractor	
Labor	2,521,092
ODCs (travel, etc.)	298,701
Equipment	197,537
 Total to date	 3,017,330