



Office of
Naval Research
Human Systems
Department



Massachusetts
Institute of
Technology
Artificial Intelligence
Laboratory
Design & Computation
Group

E WALL ELECTRONIC CARD WALL



MASSACHUSETTS INSTITUTE OF TECHNOLOGY

**Collaboration and
Knowledge
Management
Workshop**
Adelphi, Maryland
January 14-16th 2003

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Sponsor
Office of Naval
Research
Human Systems
Department,
Cognitive and Neural
Science Division

OBJECTIVES

To conceptualize, develop and test EWall; a computational framework for collaboration and knowledge management that will ...

- 1.** provide customizable solutions to help decision-makers solve problems more efficiently and effectively.
- 2.** enable decision-makers to quickly view, collect, organize, and communicate large amounts of information.
- 3.** facilitate the collaboration of decision-makers with different levels of involvement in large, distributed and decentralized teams across organizational boundaries.

Objectives for fiscal year 2003: To develop a basic (demonstrative but not testable) prototype for each of the five proposed software modules as well as to complete the detailed documentation of all proposed concepts and computational mechanisms.

MODULES

The EWall Modules support five essential activities in collaboration and knowledge management:

EWall **WorkSpace** Module to collect and organize information.

EWall **Information** Module to evaluate and keep track of new information.

EWall **Knowledge** Module to store, retrieve and search for information.

EWall **Collaboration** Module to exchange information.

EWall **Visualization** Module to view information.

EWall **WorkSpace** Module

To package, abstract and represent information in a standardized way that allows for an easy visualization, comparison, organization, exchange, trade and collection of information.

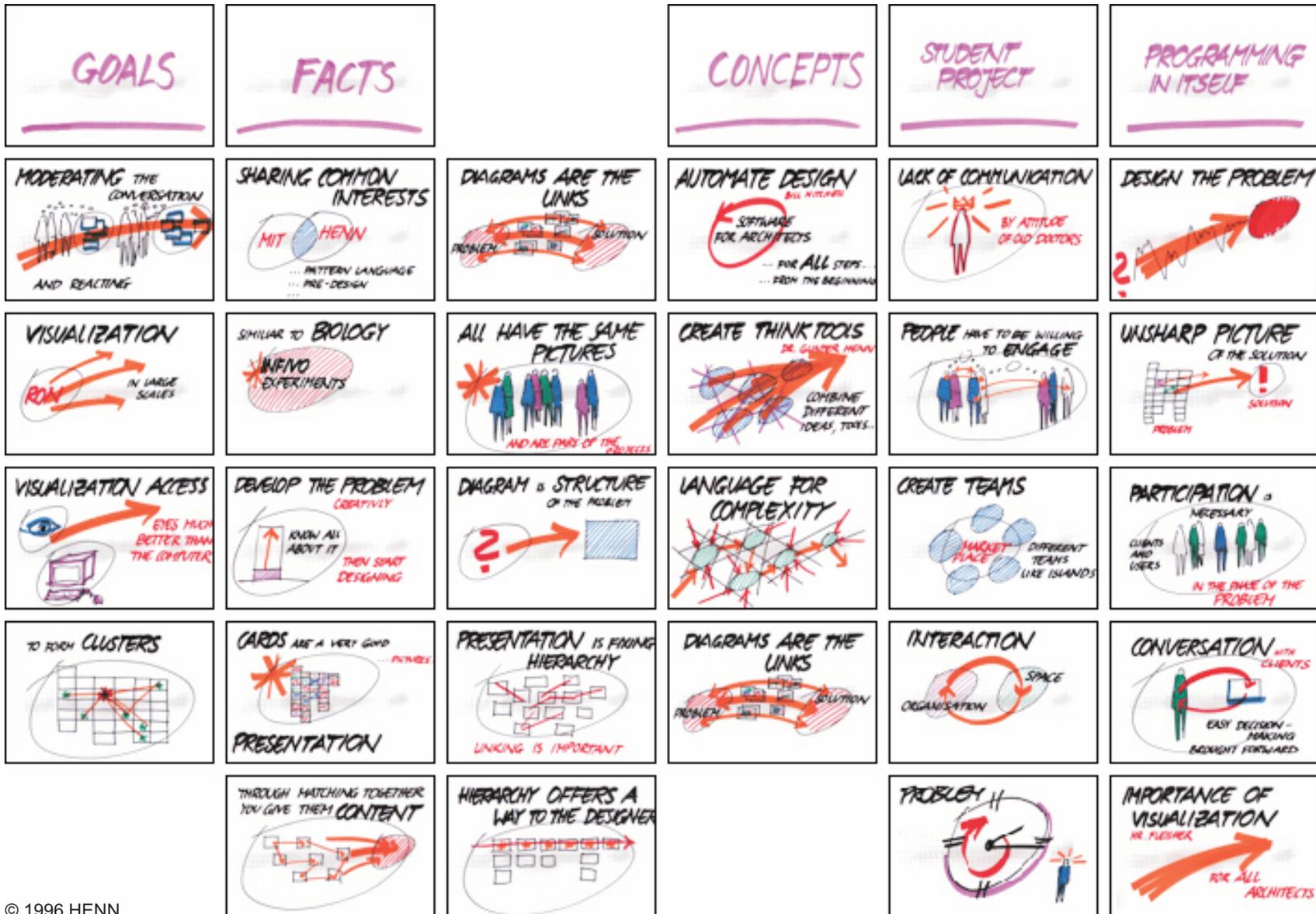
To computationally recognize implicit relations in user generated spatial information arrangements and how to convert such relations for the use with database applications and visualization tools.

Prototype Development: Started in Summer 2002, 25% completed.

Algorithms: 17/17 conceptualized, 17/17 documented, 3/17 implemented, 0/17 evaluated and tested.

Key Terms: Architectural User Programing, Card, Information Object, World Making

References: 1. William M. Pena, Problem Seeking: An Architectural Programming Primer. 4th Edition, John Wiley & Sons, 2001. 2. Nelson Goodman, Words, Works, Worlds. in Ways of Worldmaking. pp. 1-22, Hackett Publishing Company, 1988.



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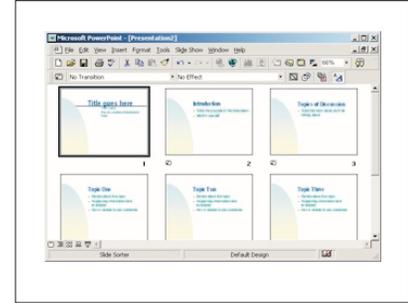
Credit Cards



Game Cards



Business Cards



Presentation Slides



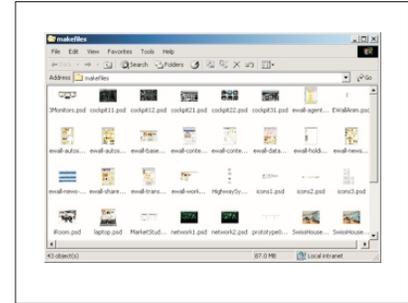
Slides



Index Cards



Trading Cards



Desktop Icons



Post Cards



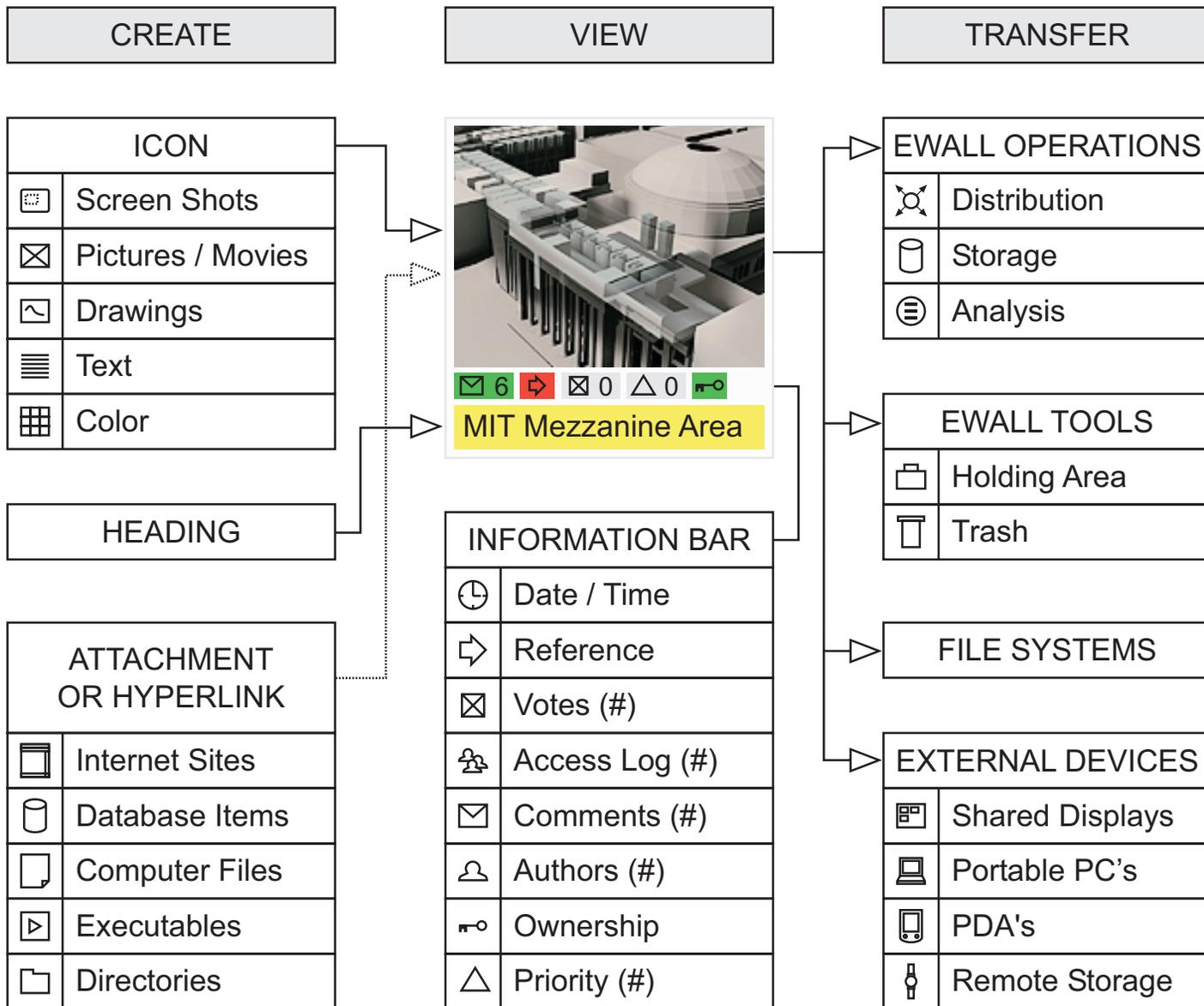
Post-its



Ribbons



Traffic Signs



EWall - Desktop

File Edit View

EWall - Holding Area

File Edit View

EWall - Work Area

File Edit View

EWall - Content View

File Edit View

Air defense systems rebuilt since 1991 but probably still limited. Mobile missile systems such as SAM-6. Believed still to have some modified Scud missiles with chemical or biological warheads. Range up to 450 miles (750 km).

Update on Iraqi Forces

Population: 22m
Capital: Baghdad
Languages: Arabic, Kurdish
Religion: Islam
Government: Republic
Monetary: Iraqi Dinar
Exports: Crude Oil
Domain: .ig

Iraq Information

30 weapons production sites
27 air defense systems
20 command control centers
10 republican guard bases
8 palace and elite units

Destroyed Targets



Weapon factory

Iraq came close to developing a workable nuclear device shortly before the Gulf War, in violation of the Nuclear Non-Proliferation Treaty. However, the IAEA (International Atomic Energy Agency) is optimistic that it

TARGET INFORMATION



Key Locations in Baghdad



Confirmed Strikes

The Iraqi air force has around 580 combat aircraft, including 50 MiG-23 multi-role fighters, MiG-21s, MiG-25s, MiG-29s, Sukhoi Su-17s, Su-20s and Su-25s, and some Mirage planes.

Iraqi Air Force

http://news.bbc.co.uk/1/hi/english/events/crisis_in_the_gulf

IRAQI FORCES

Iraq has around 400,000 troops, and 580 combat aircraft: MiG-23 fighters, MiG-21s, MiG-25s, MiG-29s, Sukhoi Su-17s, Su-20s and Su-25s and some Mirage planes.

Defence system rebuilt since 1991 but probably still limited.

Iraq's Navy was largely destroyed in the Gulf War and

GOALS

Target TV Stations

Limit Broadcasting Capabilities

Maximize Repair Time



Possible consequences

UN reaction unclear

NATO may be in disagreement

Require detailed target information

Target may be heavily guarded

Russia is opposed to NATO's actions

GB seems undecided

We require a central database

Intelligence activities unsuccessful

Daily patrol flights must continue

Increase Satellite surveillance

Increase in terrorist activities

Maintain strategic locations

The Iraqi no-fly zones



The no-fly zones over Iraq may have taken on a greater significance in the Gulf following the end of Operation Desert Fox.

BBC Defence correspondent Nick Childs says the zones are now crucial to the US and British containment policy against Saddam Hussein.

"In the light of the fact that there are no inspections on the ground at the moment one could argue that the no-fly zones have become to some extent a more important plank in that containment policy at least for the time being," he said.



British Jaguar aircraft on patrol

Daily patrols are made in the no-fly zones either by British or US aircraft. At present Britain has four Jaguar aircraft based at Incirlik in southern Turkey patrolling the northern zone, and 18 Tornados flying over the southern zone, 12 based in Kuwait and six in Saudi Arabia.

The United States has more than 200 aircraft based in the Gulf, including B52 bombers and B1 stealth bombers, some based on the UK's Indian Ocean island of Diego Garcia.

Holding Area

Work Area

Content View

MOCK-UP

EWall Client Application - Test

File Network Help

AutoSort View AutoSort Manager

Work Area Algorithm View Algorithm Sum View Algorithm Manager

TARGET INFORMATION

Key Locations in Baghdad

Confirmed Strikes

TV Station

The Iraqi air force has around 580 combat aircraft, including 50 MiG-23 multi-role fighters, MiG-21s, MiG-25s, MiG-29s, Sukhoi Su-17s, Su-20s and Su-25s, and some Mirage planes.

Iraqi Air Force

GOALS

Target TV Stations

Limit Broadcasting Capabilities

Maximize Repair Time

Latest CNN report on Iraq

POSSIBLE CONSEQUENCES

UN reaction unclear

NATO may be in disagreement

Require detail target inform

Target may be heavily guarded

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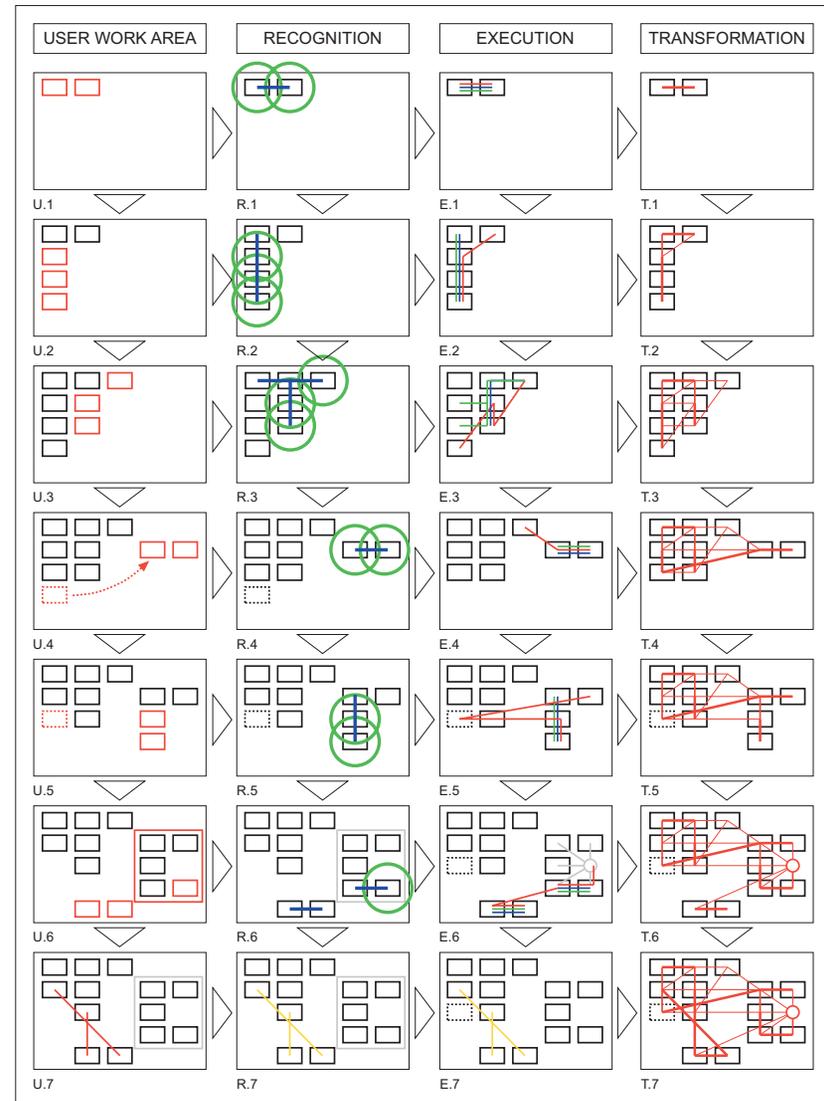
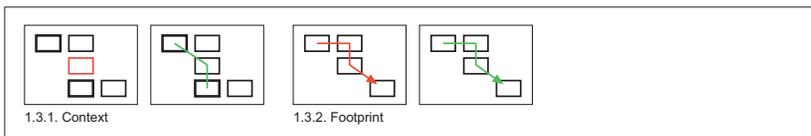
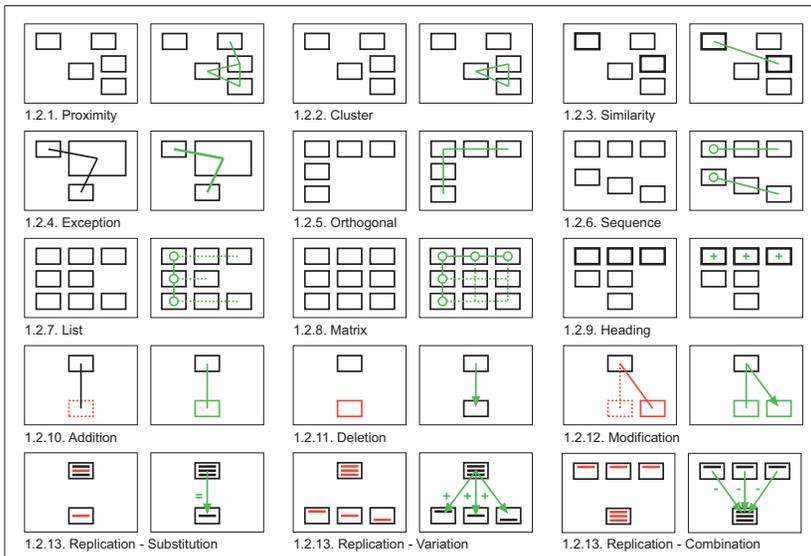
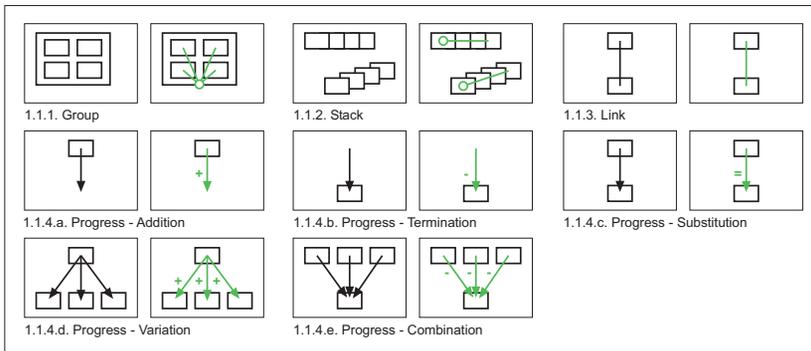
Intelligence activities unsuccessful

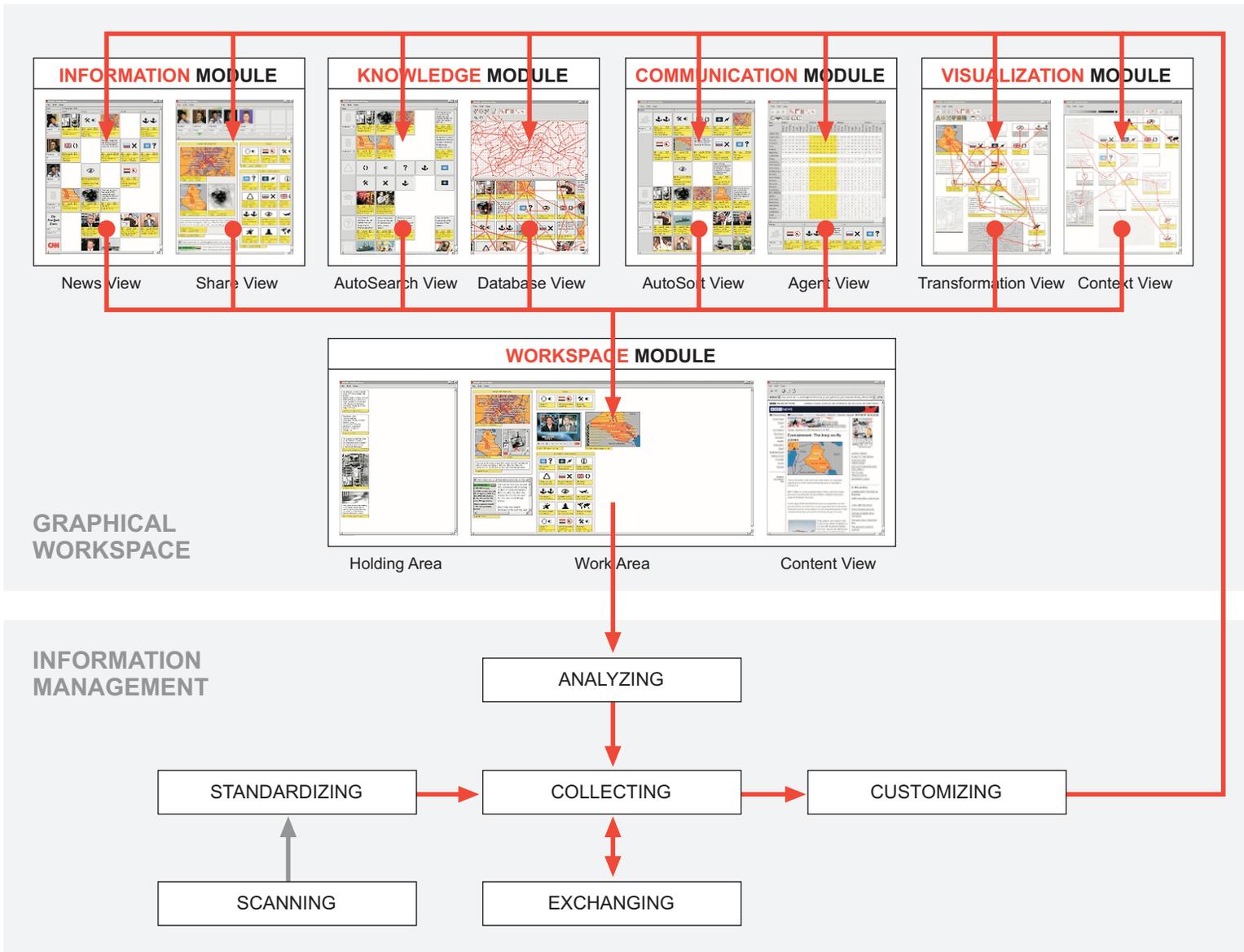
Daily patrol flights must continue

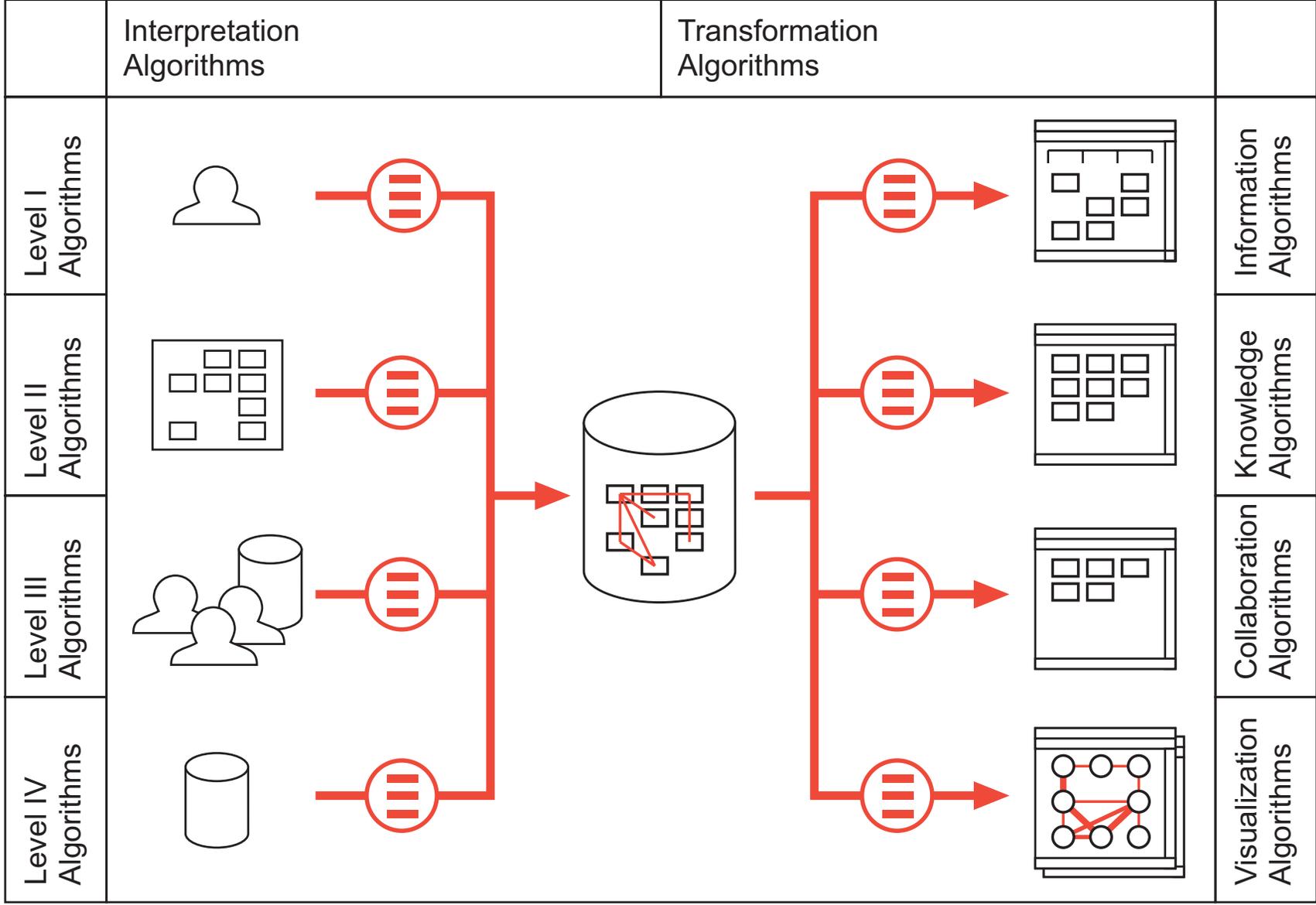
Increase Satellite surveillance

Increase in terrorist activities

Maintain strategic locations







EWall Collaboration Module

To automate and prioritize the information exchange among multiple collaborating users.

To support the subdivision of teams and the formation of sub-tasks.

To enable users to easily switch between teams or participate simultaneously in multiple teams.

To enable a larger number of users to collaborate on a decision making task.

To allow for individual contributions to develop in ways that are beneficial to a team-oriented goal.

To sustain the users individual ways of working in a collaborative setting.

To support negotiation and how to control competition without the direct intervention of a discussion leader.

Prototype Development: Started in Summer 2002, 25% completed.

Algorithms: 10/10 conceptualized, 0/10 documented, 2/10 implemented, 0/10 evaluated and tested.

Key Terms: Collaborative Filtering, Decentralized and Distributed Teams, Remote Collaboration

References: Michael Reddy. The Conduit Metaphor: A Case of Frame Conflict in Our Language about Language. Metaphor and Thought. 2nd Edition, Cambridge University Press, 1993, pp. 284-310.

EWall Client Application - Test

File Network Help

AutoSort View AutoSort Manager

Muthanna Fall
No-fly-zone
CHEM/BIOLOGICAL SITES
Possible Military Targets

Bagdad

Right landing gear causing difficulties during takeoff.
F117A Takeoff

Population: 22m
Capital: Baghdad
Languages: Arabic, Kurdish
Religion: Islam
Government: Republic
Monetary: Iraqi Dinar

Maximize Repair

Work Area Algorithm View Algorithm Sum View Algorithm Manager

TARGET INFORMATION

Al Taji Airport 15 miles from Baghdad
Military Intelligence HQ
Ministry of Defence
Muthanna Airport
TV Station
Iraqi Service Intelligence
Communications Centres
National Air Defence Operations Center
Secret Police complex
Baath Party HQ
Presidential Palace
Rasheed Airport
Key Locations in Baghdad

Jebel Makhoul Mosul
Samarra Tikrit
Taji Baghdad
Iraq Latifya
Basra
Confirmed Strikes
TV Station

The Iraqi air force has around 580 combat aircraft, including 50 MiG-23 multi-role fighters, MiG-21s, MiG-25s, MiG-29s, Sukhoi Su-17s, Su-20s and Su-25s, and some Mirage planes.
Iraqi Air Force

GOALS

Target TV Stations
Limit Broadcasting Capabilities

POSSIBLE CONSEQUENCES

UN reaction unclear
NATO may be in disagreement
Require detail target information

Target may be heavily guarded
Russia is opposed to NATO's actions
GB seems undecided

We require a central database
Intelligence activities unsuccessful
Daily patrol flights must continue

EWall Client Application - Test

File Network Help

AutoSort View AutoSort Manager

Jebel Makhoul Mosul
Samarra Tikrit
Confirmed Strikes

The Iraqi air force has around 580 combat aircraft, including 50 MiG-23 multi-role fighters, MiG-21s, MiG-25s, MiG-29s, Sukhoi Su-17, Su-20s and Su-25s, and some more
Iraqi Air Force

NATO may be in disagreement
Latest CNN report on Iraq

Work Area Algorithm View Algorithm Sum View Algorithm Manager

Jebel Makhoul IRAN
Muthanna Fallujah
Samarra Radwaniyah
Iraq Baghdad
Muthanna
Al Ramadi
Chem/Biol Sites
Ship Sites
Samawah
Nassiriyah
Rumaylah Basra
As Salman
Az Zubayr
Targets in Iraq

The Lockheed F-117A was developed in response to an Air Force request for an aircraft capable of attacking high value targets without being detected by hostile radar systems.

Right landing gear causing difficulties during takeoff.
F117A Takeoff

Span: 43 ft. 4 in.
Length: 65 ft. 11 in.
Height: 12 ft. 5 in.
Weight: 52,500 lbs. max.
Armament: Up to 4,000 lbs.
Engines: 2 x 10,600 lbs.
Crew: One
Cost: \$42,600,000
F117A Specifications

F117A Stealth Fighter

Defense systems rebuilt since 1991 but probably still limited.
Mobile missile systems such as SAM-6. Believed still to have some modified Scud missiles with chemical or biological warheads. Range up to 450 miles (750 km).
Update on Iraqi Forces

Population: 22m
Capital: Baghdad
Languages: Arabic, Kurdish
Religion: Islam
Government: Republic
Monetary: Iraqi Dinar
Exports: Crude Oil
Domain: .iq
Iraq Information

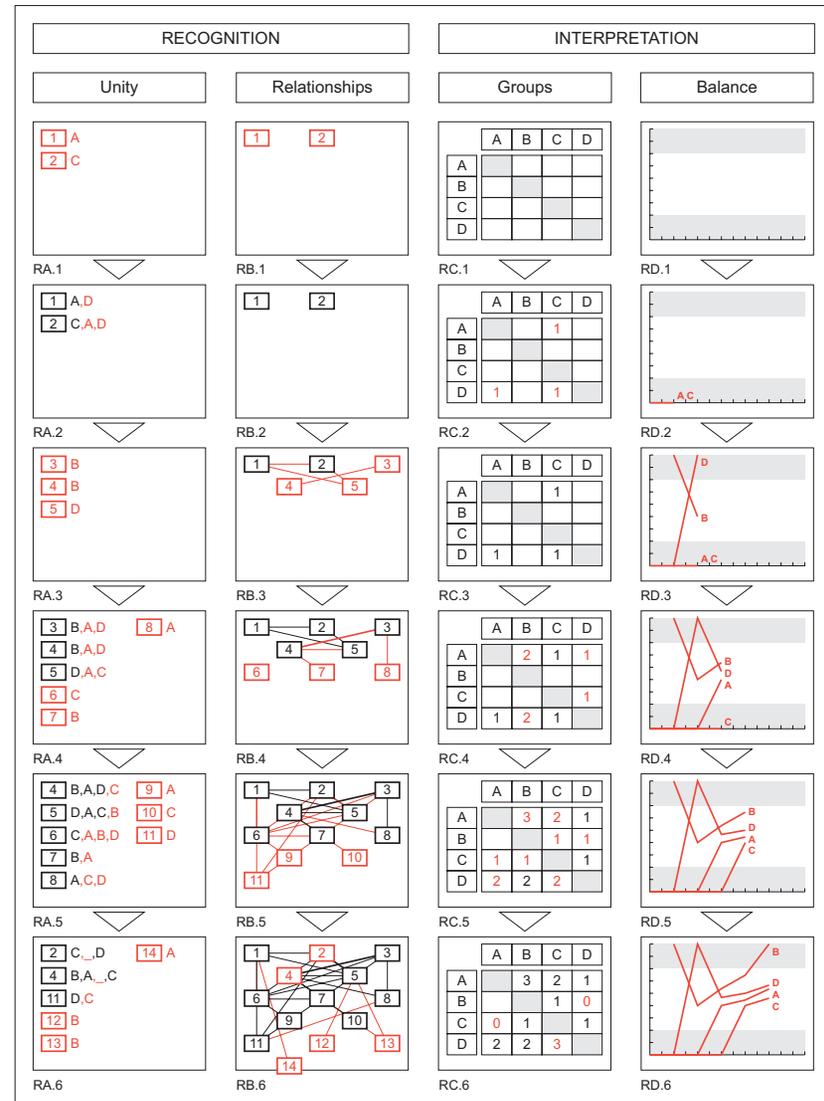
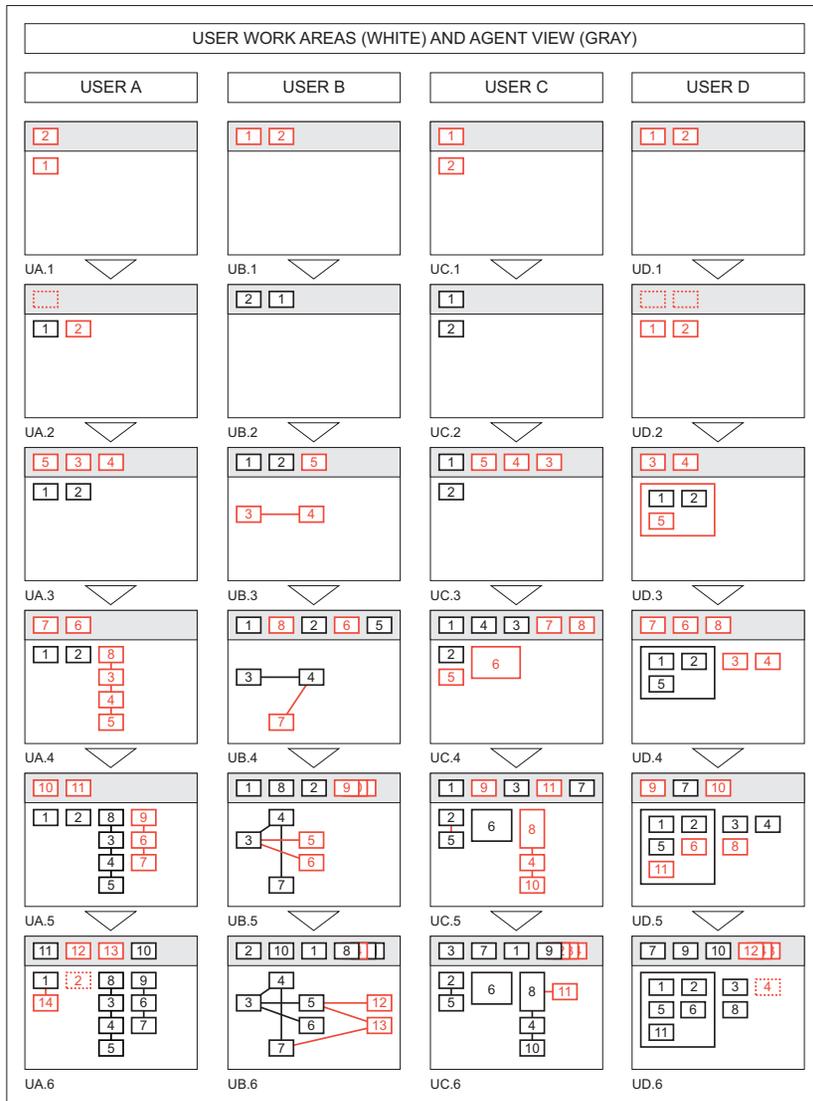
30 weapons production sites
27 air defense systems
20 command control centers
10 republican guard bases
8 palace and elite units
Destroyed Targets

Target TV Stations
Limit Broadcasting Capabilities

Maximize Repair Time
Daily patrol flights must continue

Maintain strategic locations
Increase Satellite surveillance

We require a central database
GOALS



EWall **Information** Module

To deal with the continuous flow of new information from multiple different sources.

To engage the human cognitive abilities in the tracking, discovery, evaluation, validation and selection of new information.

Prototype Development: Started in Summer 2001, 50% completed, 2 prototypes under evaluation

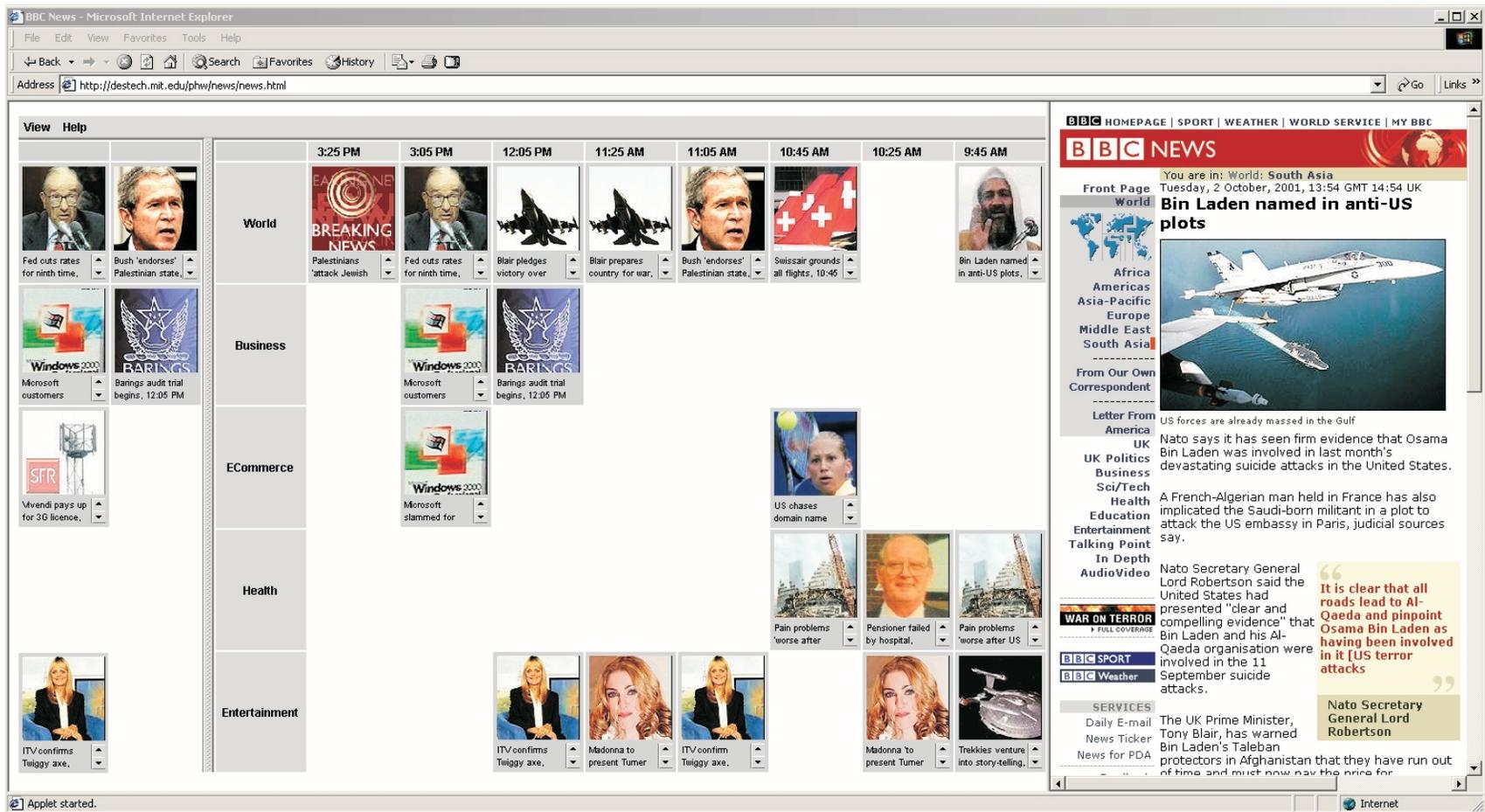
Key Terms: Information Tracking, Information Filtering

Related Applications: Columbia Newsblaster newsblaster.cs.columbia.edu, Infogate www.infogate.com, eNow www.enow.com, Screaming Media www.screamingmedia.com



Prototype 1: Collaborative Version

Subject Rows: Information, Research, Architecture, Web Sites, Installations, Theory



Prototype 2: News Version

Subject Rows: World, Business, ECommerce, Health, Entertainment

EWall **Visualization** Module

To engage the human analytic capability in the “creative” discovery and analysis of data and data relations.

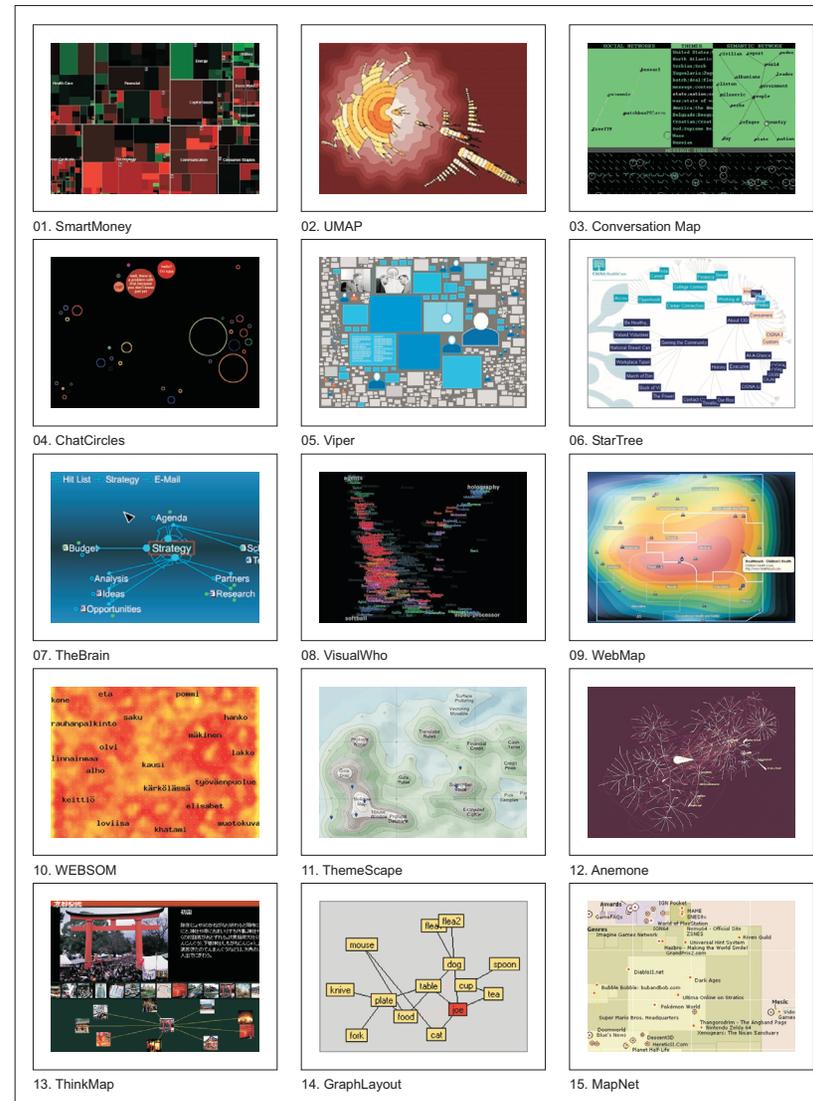
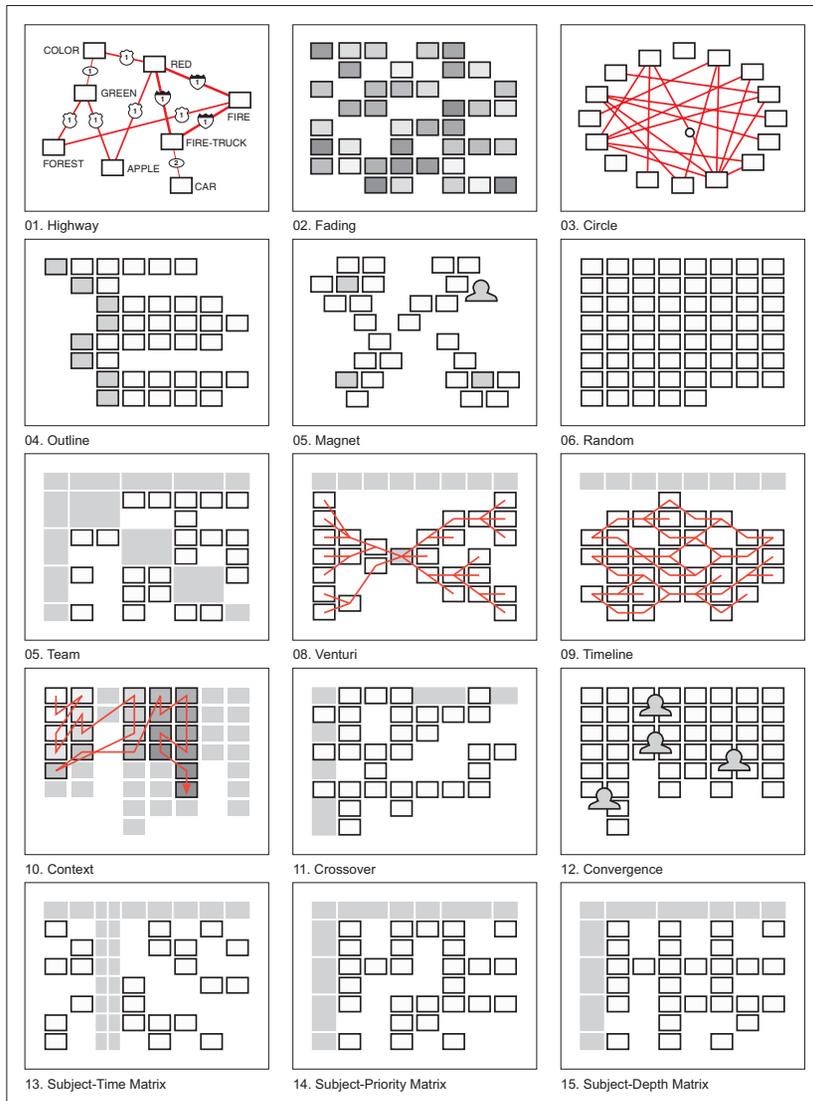
To respond to the users individual ways of reading and comprehending data and data relations.

Prototype Development: Started in Fall 2002, 10% completed.

Algorithms: 10/10 conceptualized, 0/10 documented, 1/10 implemented, 0/10 evaluated and tested.

Key Terms: Information Visualization, Data Analysis, Information Filtering, Perspective-Taking, Parallelism

References: 1. Edith Ackermann. Perspective Taking and Object Construction. in Constructionism in Practice: Rethinking the Roles of Technology in Learning, Edited by Y. Kafai and M. Resnick. MIT Media Laboratory, 1994. 2. Edward R. Tufte. Parallelism: Repetition and Change, Comparison and Surprise. in Visual Explanations: Images and Quantities, Evidence and Narrative, pp. 79-104. Graphic Press, 1997.



EWall **Knowledge** Module

To structure and maintain a collaborative database without specific knowledge about its future use.

To deal with redundant and outdated information in a collaborative database.

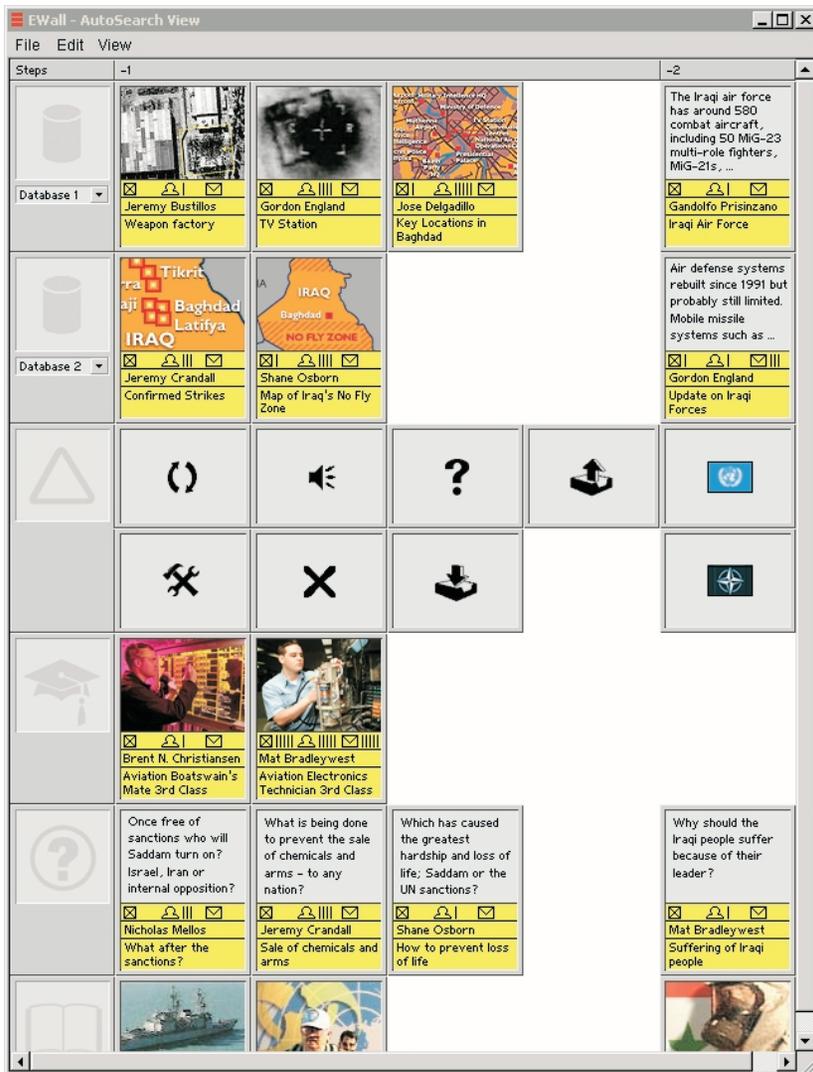
To retrieve relevant as well as potentially relevant information from a collaborative database.

Prototype Development: No work on this module planned until Fall 2003.

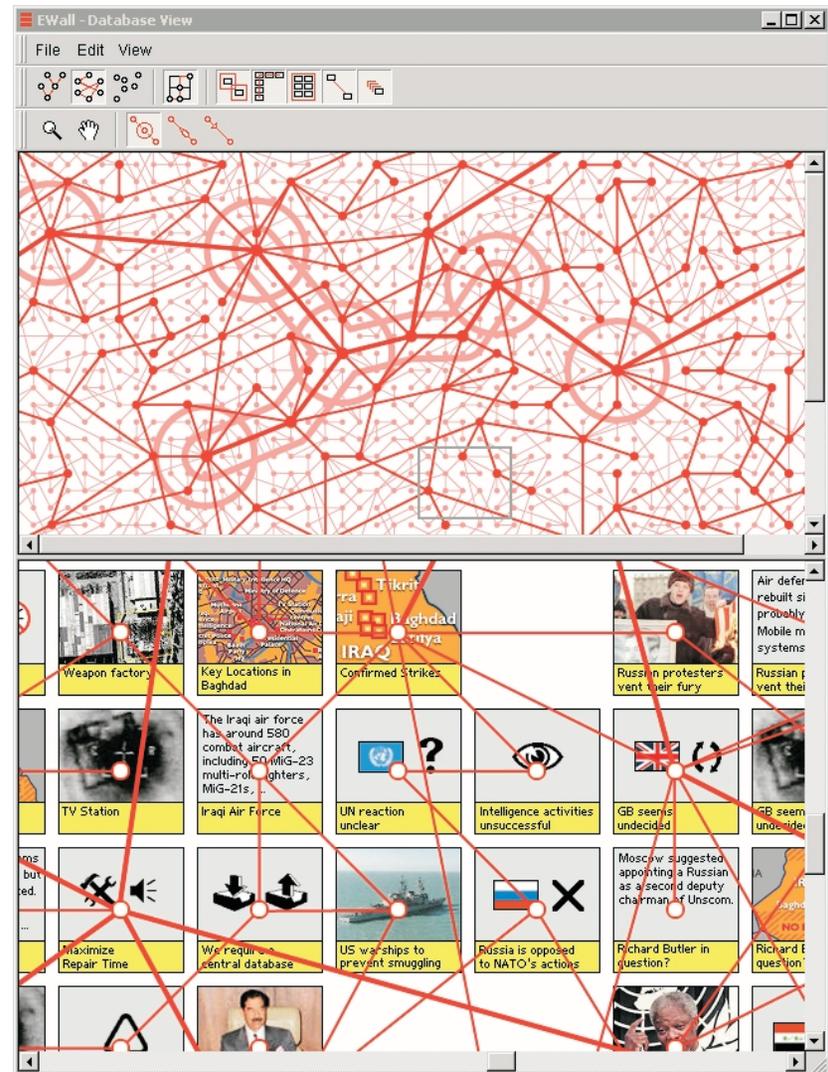
Algorithms: 2/2 conceptualized, 0/2 documented, 0/2 implemented, 0/2 evaluated and tested.

Key Terms: Data Search, Unstructured Data Space, Data Mining, Machine Learning

References: Paul Keel. DataBox: Unstructured Data Space. Project Report, SNFS, 2000.



AutoSearch View



Database View

MOCK-UP

TIMELINE

Year		FY 2000			FY 2001			FY 2002			FY 2003			FY 2004		
Semester		Fall	Spring	Summer												
Design	Objectives	█	█	█												
	Concepts				█	█	█	█	█	█						
	Modules					█	█	█	█	█						
	Systems						█	█	█	█	█	█	█			
	Algorithms							█	█	█	█	█	█	█		
Prototyping	WorkSpace Module								█	█	█	█	█	█	█	█
	Information Module						█	█	█	█	█	█				
	Knowledge Module								█	█	█			█	█	█
	Collaboration Module								█	█	█	█	█	█	█	
	Visualization Module								█	█	█	█	█			
Testing	Usability								█	█	█		█	█	█	█
	Effectiveness								█	█	█			█	█	█