Tóm tắt văn bản

Lê Thanh Hương

Bộ môn Hệ thống thông tin Khoa CNTT - ĐHBKHN

The BIG problem

- Quá tải thông tin: 3 tỉ+ URLs theo danh sách của Google
- Các cách giải quyết:
 - tìm kiếm thông tin
 - phân cụm văn bản
 - trích rút thông tin
 - hiển thị trực quan
 - hỏi đáp
 - tóm tắt văn bản

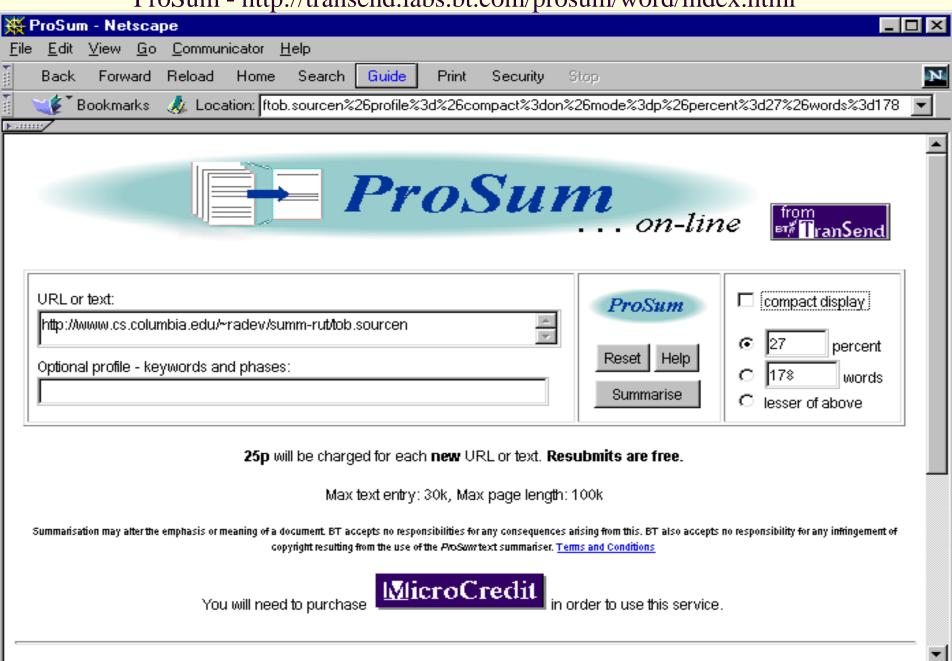
Một số khái niệm

- TT trích rút là quá trình xác định các câu quan trọng trong văn bản nguồn và đưa vào bản tóm tắt.
- TT tóm lược áp dụng các kỹ thuật XLNNTN để cắt-dán các phần quan trọng từ văn bản nguồn, có thể kết hợp với các từ, ngữ bên ngoài để tạo ra bản tóm tắt.

Các kiểu tóm tắt

- Theo số lượng
 - đơn / đa văn bản
- Theo nội dung
 - Hướng truy vấn / tóm tắt chung
- Theo thể loại
 - Headlines
 - Tóm tắt cốt truyện
 - Tóm tắt tiểu sử
 - Tóm tắt nội dung phim
 - ...

ProSum - http://transend.labs.bt.com/prosum/word/index.html



Example (New York Times)

Net Tax Moratorium Clears House

The House passed a bill to extend the current moratorium on new Internet taxes until 2006. The moratorium forbids states from trying to find new ways of taxing Internet use, like imposing taxes on monthly access charges for Internet service providers.

http://www.nytimes.com/library/tech/00/05/biztech/articles/11tax.html

House Votes to Ban Internet Taxes for 5 More Years

By LIZETTE ALVAREZ

WASHINGTON, May 10 -- In a Republican bid to woo the high-technology industry and please taxpayers, the House today rushed to the floor and then handily passed a bill to extend the current moratorium on new Internet taxes until 2006.

The moratorium, which is due to expire in October 2001, forbids states to try to find new ways of taxing Internet use, like imposing taxes on monthly access charges for Internet service providers.

The legislation passed today, which faces an uncertain future in the Senate, does not directly address the question of sales taxes; it would not stop states from trying to collect taxes for goods sold on the Internet.

By failing to address sales taxes, however, the measure alarmed some traditional retailers, as well as state governments that say they have found it nearly impossible to collect taxes for goods sold online.

"The single largest contributor to our economic prosperity has been the growth of information technology -- the Internet," said

Representative John R. Kasich, an Ohio Republican. "Why would we try to tax something, why would we try to abuse something, why would we try to limit something that generates unprecedented growth, wealth, opportunity and unprecedented individual power?"

Critics of the bill say the moratorium, while seemingly benign, ignores the thorny question of how state and local governments can best collect taxes on the billions of dollars of merchandise sold over the Internet each year. These taxes are expected to provide a crucial future source of revenue for states, especially as more consumers buy goods online.

The bill's opponents -- a consortium of retailers, small-business groups and governors -- say that consumers who buy merchandise over the Internet can easily circumvent the sales and "use" taxes that would be collected automatically if the same merchandise is bought at a bricks-and-mortar retail store.

The National Governors' Association is working on the best way to collect electronic sales tax. Estimates have put the loss in sales tax revenue to the states at \$8 billion a year by 2004.

Retailers and small businesses have complained that the current system unfairly places at a disadvantage the traditional retailers that do not sell their wares online and must charge sales tax.

"It's easy to imagine how these kinds of losses can affect state and local governments' ability to provide essential services," said Representative William D. Delahunt, a Massachusetts Democrat, citing the concerns of many governors. "They will be compelled to cut back local services or raise income taxes or property taxes."

The bill even drew criticism from a few Republicans. Representative Ernest J. Istook Jr. of Oklahoma circulated a letter stating, "The Internet should not be singled out to be taxed, nor to be freed from tax."

Still, the House voted overwhelmingly, 352 to 75, to pass the bill. A number of Democrats approved the measure after they received assurance that Congress would hold hearings concerning sales taxes and would try to come up with a solution.

The moratorium "has absolutely nothing to do with the sales tax -- we will have the opportunity to have that debate," said Representative Robert Goodlatte, a Virginia Republican.

The House bill faces a murkier future in the Senate. Senator John McCain, chairman of the Commerce Committee, who advocates a permanent tax moratorium, canceled a hearing on the bill last month after Republican senators, some of them former governors, expressed reservations about extending the moratorium.

The legislation also faces opposition from the Clinton administration, which signaled support today for a two-year moratorium. The full House today rejected a two-year extension in a separate vote.

Gov. George W. Bush, the likely Republican presidential nominee, has said he will support an extension of the moratorium. But the governor must tread carefully around the issue because Texas, which does not have a state income tax, would stand to lose substantial revenue if sales taxes are not made workable on the Internet.

A spokesman for Al Gore said the vice president supported a two-year extension of the moratorium "at a minimum." If a five-year moratorium is put into place, "it should include flexibility" to adjust federal policies on Internet taxation "to take into account the fast-paced change in the Internet world."

Microsoft Autosummarize output - 10% summary

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Microsoft Autosummarize output - 25% summary

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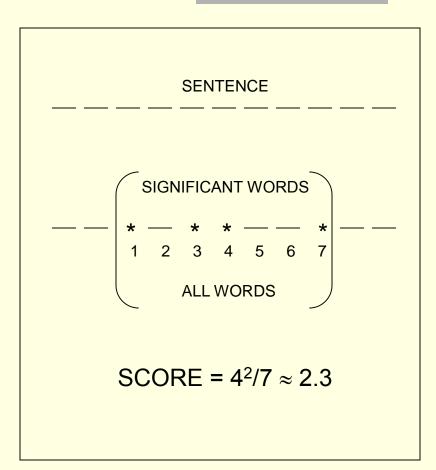
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Cách tiếp cận truyền thống

Luhn 58

- Đo khoảng cách ảnh hưởng
- Từ:
 - gốc từ
 - túi từ
- Câu:
 - tập trung vào các từ điểm cao



Edmundson 69

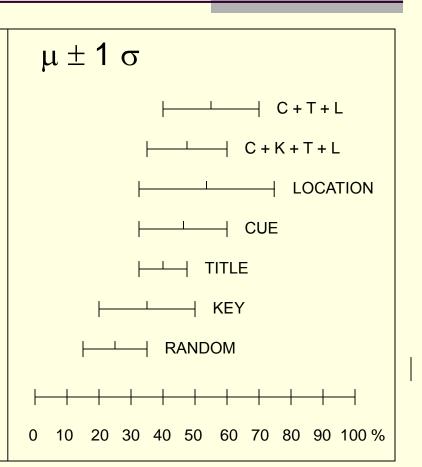
- Dựa trên từ gợi ý:
 - stigma words ("hardly", "impossible")
 - bonus words ("significant")
- Dựa trên từ khóa
- Dựa trên tiêu đề
- Dựa trên vị trí:
 - các câu sau câu tiêu đề
 - các câu gần đầu/cuối tài liệu/đoạn

Edmundson 69

Kết hợp tuyến tính 4 yếu tố:

$$\alpha_1 C + \alpha_2 K + \alpha_3 T + \alpha_4 L$$

- Gán nhãn thủ công tập dữ liệu luyện
- Từ khóa không quan trọng

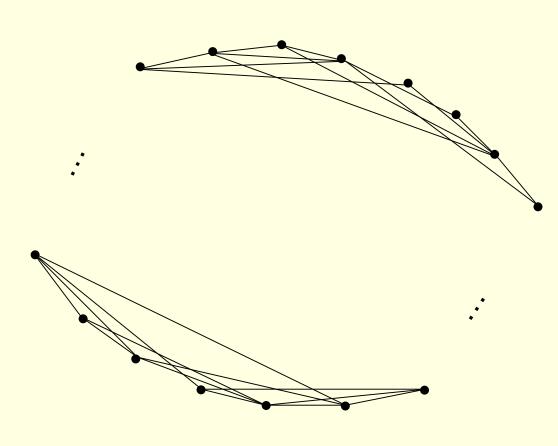


Brandow et al. 95

- ANES: tin tức kinh tế từ 41 nhà xuất bản (20,997 tài liệu)
- từ được chọn dựa trên tf*idf
- các đặc trưng dựa trên câu:
 - từ hiệu
 - vị trí
 - từ đồng tham chiếu
 - độ dài bản tóm tắt

Salton et al. 97

- phân tích tài liệu dựa trên liên kết nghĩa giữa các cặp đoạn - dựa trên độ tương đồng từ vựng
- Các đường nối nhiều đoạn có vẻ chứa thông tin chính của tài liệu



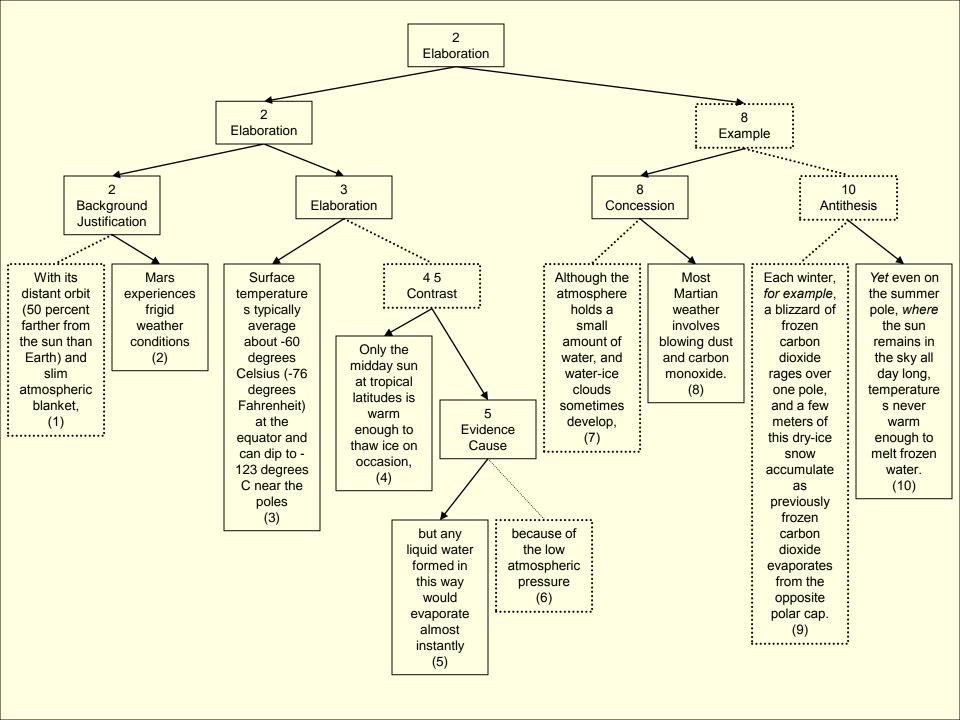
Salton et al. 97

Sự trùng nhau giữa các bản tóm tắt thủ công: 46%

Algorithm	Optimistic	Pessimistic	Intersection	Union
Global bushy	45.60%	30.74%	47.33%	55.16%
Global	43.98%	27.76%	42.33%	52.48%
depth-first	4- 400/			
Segmented bushy	45.48%	26.37%	38.17%	52.95%
Random	39.16%	22.07%	38.47%	44.24%
	3311070		00.1170	

Marcu 97-99

- Dựa trên RST
- RST: rhectorical structure theory, phát hiện các quan hệ chính - phụ
 - VD: bằng chứng (evidence)
 - [The truth is that the pressure to smoke in junior high is greater than it will be any other time of one's life:][we know that 3,000 teens start smoking each day.]
 - Evidence: Kết hợp C P tăng sự tin tưởng của người đọc vào C
- dựa trên sự kết nối văn bản
- so khớp các thành phần quan trọng nhất trong tài liệu: 70% P và R



Các cách tiếp cận dựa trên tri thức

Radev and McKeown 98

Sinh văn bản từ các mẫu

MESSAGE: ID TST3-MUC4-0010

MESSAGE: TEMPLATE 2

INCIDENT: DATE 30 OCT 89
INCIDENT: LOCATION EL SALVADOR
INCIDENT: TYPE ATTACK

INCIDENT: STAGE OF EXECUTION ACCOMPLISHED

INCIDENT: INSTRUMENT ID INCIDENT: INSTRUMENT TYPE

PERP: INCIDENT CATEGORY TERRORIST ACT PERP: INDIVIDUAL ID "TERRORIST" PERP: ORGANIZATION ID "THE FMLN"

PERP: ORG. CONFIDENCE REPORTED: "THE FMLN"

PHYS TGT: ID PHYS TGT: TYPE PHYS TGT: NUMBER

PHYS TGT: FOREIGN NATION PHYS TGT: EFFECT OF INCIDENT PHYS TGT: TOTAL NUMBER

HUM TGT: NAME

HUM TGT: DESCRIPTION "1 CIVILIAN"

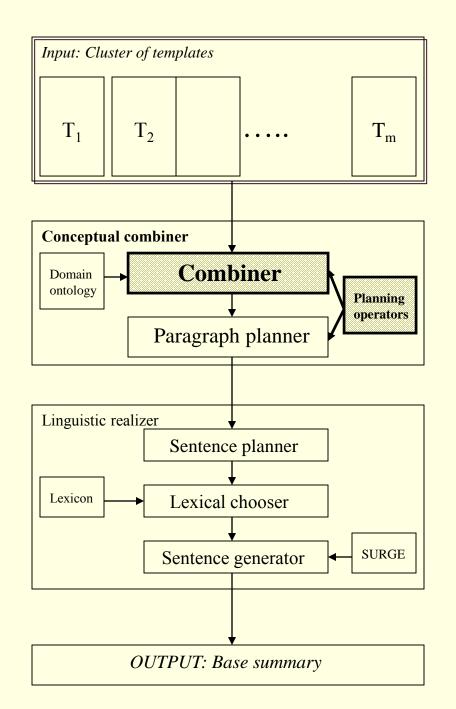
HUM TGT: TYPE CIVILIAN: "1 CIVILIAN"

HUM TGT: NUMBER 1: "1 CIVILIAN"

HUM TGT: FOREIGN NATION

HUM TGT: EFFECT OF INCIDENT DEATH: "1 CIVILIAN"

HUM TGT: TOTAL NUMBER



Tóm tắt từ nhiều bản tin

people in four attacks in nine days.

in the street, the sidewalks were strewn with blood.

JERUSALEM - A Muslim suicide bomber blew apart 18 people on a Jerusalem bus and wounded 10 in a mirror-image of an attack one week ago. The carnage could rob Israel's Prime Minister Shimon Peres of the May 29 election victory he needs to pursue Middle East peacemaking. Peres declared all-out war on Hamas but his tough talk did little to impress stunned residents of Jerusalem who said the election would turn on the issue of personal security. JERUSALEM - A bomb at a busy Tel Aviv shopping mall killed at least 10 people and wounded 30, Israel radio said quoting police. Army radio said the blast was apparently caused by a suicide bomber. Police said there were many wounded. A bomb blast ripped through the commercial heart of Tel Aviv Monday, killing at least 13 people and wounding wounding more than 100. Israeli police say an Islamic suicide bomber blew himself up outside a crowded shopping mall. It was the fourth deadly bombing in Israel in nine days. The Islamic fundamentalist group Hamas claimed responsibility for the attacks, which have killed at least 54 people. Hamas is intent on stopping the Middle East peace process. President Clinton joined the voices of international condemnation after the latest attack. He said the "forces of terror shall not triumph" over peacemaking efforts. TEL AVIV (Reuter) - A Muslim suicide bomber killed at least 12 people and wounded 105, including children, outside a crowded Tel Aviv shopping mall Monday, police said. 4 Sunday, a Hamas suicide bomber killed 18 people on a Jerusalem bus. Hamas has now killed at least 56

The windows of stores lining both sides of Dizengoff Street were shattered, the charred skeletons of cars lay

The last attack on Dizengoff was in October 1994 when a Hamas suicide bomber killed 22 people on a bus.

4 khuôn mẫu

MESSAGE: ID
SECSOURCE: SOURCE
SECSOURCE: DATE
PRIMSOURCE: SOURCE
INCIDENT: DATE
INCIDENT: LOCATION
INCIDENT: TYPE
HUM TGT: NUMBER

PERP: ORGANIZATION ID

 \bigcirc 1

TST-REU-0001 Reuters March 3, 1996 11:30

March 3, 1996 Jerusalem Bombing "killed: 18" "wounded: 10" MESSAGE: ID

SECSOURCE: DATE PRIMSOURCE: SOURCE INCIDENT: DATE INCIDENT: LOCATION INCIDENT: TYPE HUM TGT: NUMBER

SECSOURCE: SOURCE

PERP: ORGANIZATION ID

TST-REU-0002 Reuters

March 4, 1996 07:20 Israel Radio March 4, 1996 Tel Aviv

Tel Aviv
Bombing

"killed: at least 10"

"wounded: more than 100"

MESSAGE: ID

SECSOURCE: SOURCE SECSOURCE: DATE PRIMSOURCE: SOURCE INCIDENT: DATE

INCIDENT: LOCATION INCIDENT: TYPE HUM TGT: NUMBER

PERP: ORGANIZATION ID

TST-REU-0003

Reuters

March 4, 1996 14:20

March 4, 1996 Tel Aviv Bombing

"killed: at least 13"

"wounded: more than 100"

"Hamas"

MESSAGE: ID

SECSOURCE: SOURCE SECSOURCE: DATE

PRIMSOURCE: SOURCE

INCIDENT: DATE INCIDENT: LOCATION

INCIDENT: TYPE

HUM TGT: NUMBER

PERP: ORGANIZATION ID

TST-REU-0004

Reuters

March 4, 1996 14:30

March 4, 1996

Tel Aviv Bombing

"killed: at least 12"

"wounded: 105"

Bản tóm tắt trôi chảy

Reuters reported that 18 people were killed on *Sunday* in a bombing in Jerusalem. *The next day*, a bomb in Tel Aviv killed at least 10 people and wounded 30 according to Israel radio. Reuters reported that *at least 12 people* were killed and *105* wounded *in the second incident. Later the same day*, Reuters reported that Hamas has claimed responsibility for the act.

(OUTPUT OF SUMMONS)

Các thao tác

If there are two templates

AND

the location is the same

AND

the time of the second template is after the time of the first template

AND

the source of the first template is different from the source of the second template

AND

at least one slot differs

THEN

combine the templates using the contradiction operator...

Các thao tác

Thay đổi thông tin: Cùng nguồn tin nhưng thay đổi nhỏ ở một số chỗ

March 4th, <u>Reuters</u> reported that a bomb in Tel Aviv killed at least 10 people and wounded 30. *Later the same day*, <u>Reuters</u> reported that *exactly* 12 people were *actually* killed and 105 wounded.

Đối lập: Khác nguồn thông tin, các giá trị khác nhau ở một số chỗ

The afternoon of February 26, 1993, <u>Reuters</u> reported that a suspected bomb killed *at least six people* in the World Trade Center. *However*, <u>Associated Press</u> announced that *exactly five people* were killed in the blast.

Các thao tác

Làm mịn

On Monday morning, <u>Reuters</u> announced that a suicide bomber killed at least 10 people in Tel Aviv. *In the afternoon*, <u>Reuters</u> reported that *Hamas* claimed responsibility for the act.

Thống nhất

The morning of March 1st 1994, *both* <u>UPI</u> and Reuters reported that a man was kidnapped in the Bronx.

Sinh văn bản

According to UPI, three terrorists were arrested in Medellín last Tuesday. Reuters announced that the police arrested two drug traffickers in Bogotá the next day.

A total of five criminals were arrested in Colombia last week.

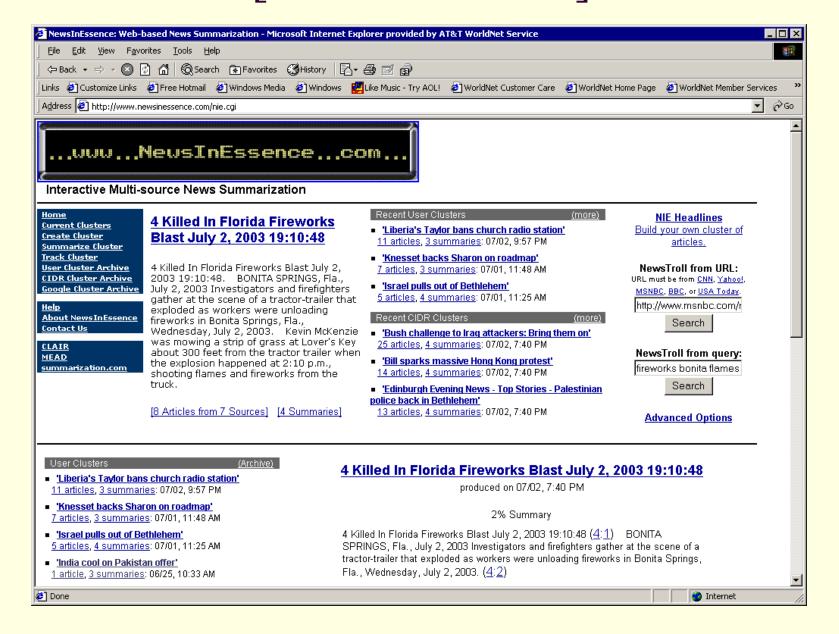
Đánh giá

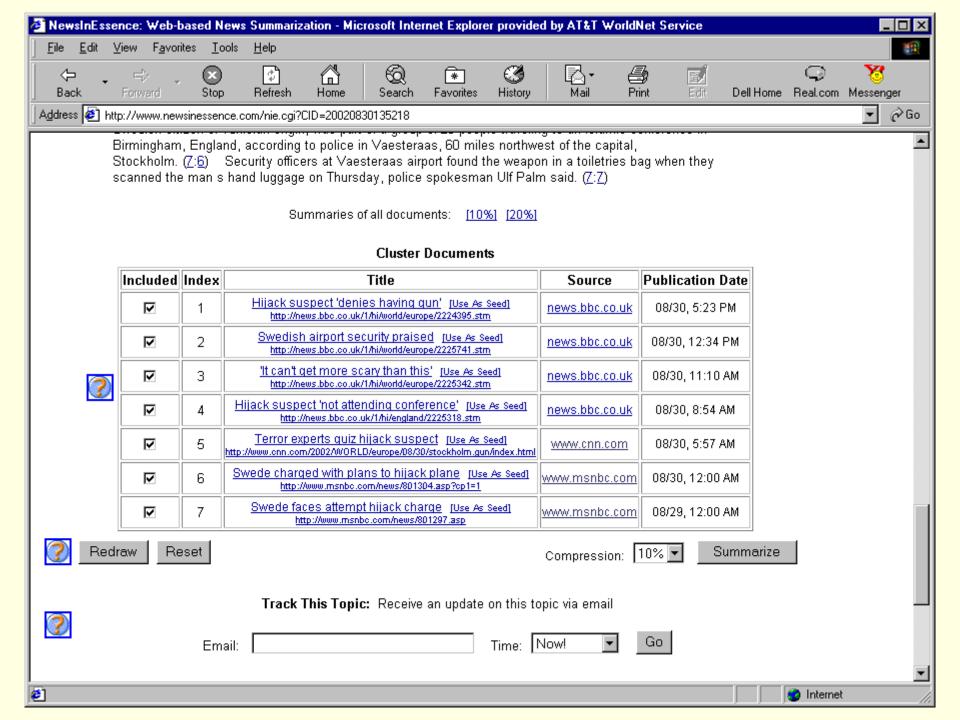
	Thuộc bản tóm tắt	Không thuộc bản tóm tắt
Hệ thống chọn	Α	В
Hệ thống không chọn	С	D

Precision:
$$P = \frac{A}{A+B}$$

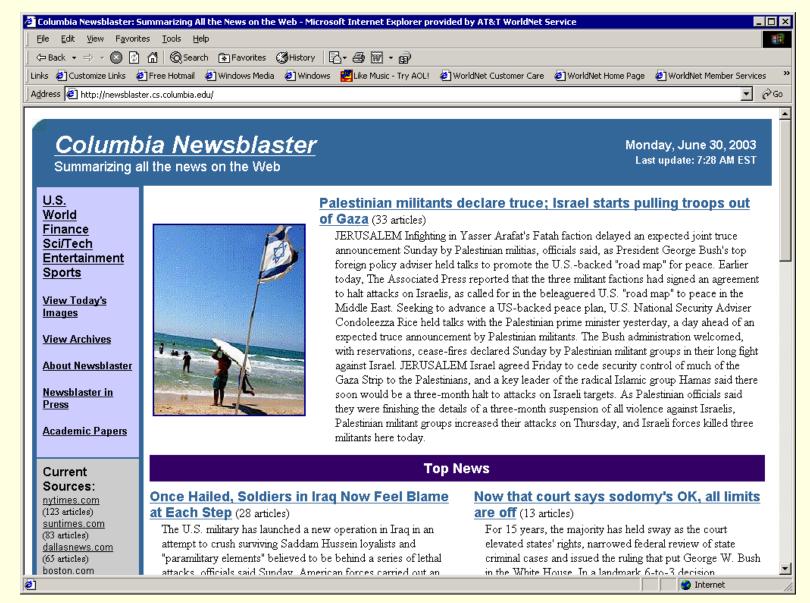
Recall:
$$R = \frac{A}{A+C}$$
 $F = \frac{2PR}{(P+R)}$

Newsinessence [Radev & al. 01]

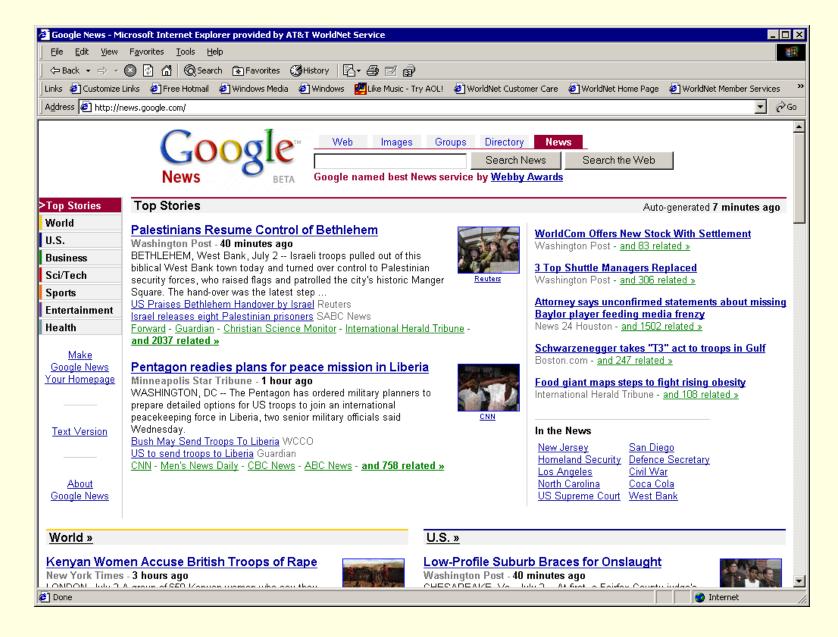




Newsblaster [McKeown & al. 02]



Google News [02]



Tập dữ liệu

- DUC corpus
 - http://duc.nist.gov
- MEAD/NIE corpus
 - send mail to <u>radev@umich.edu</u>
- SUMMAC corpus
 - send mail to mani@mitre.org
- <Text+Abstract+Extract> corpus
 - send mail to <u>marcu@isi.edu</u>
- Open directory project
 - http://dmoz.org