



US008553034B2

(12) **United States Patent**  
**Wong et al.**

(10) **Patent No.:** **US 8,553,034 B2**  
(45) **Date of Patent:** **\*Oct. 8, 2013**

(54) **DYNAMIC VISUALIZATION OF DATA STREAMS**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 162 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/436,906**

(22) Filed: **May 7, 2009**

(65) **Prior Publication Data**

US 2009/0273602 A1 Nov. 5, 2009

**Related U.S. Application Data**

(63) Continuation of application No. 10/688,063, filed on Oct. 17, 2003, now Pat. No. 7,557,805.

(60) Provisional application No. 60/459,841, filed on Apr. 1, 2003.

(51) **Int. Cl.**  
**G06T 11/20** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **345/440**

(58) **Field of Classification Search**  
USPC ..... 345/440  
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,175,710	A *	12/1992	Hutson	367/135
6,505,207	B1 *	1/2003	Aggarwal et al.	1/1
6,760,724	B1 *	7/2004	Chakrabarti et al.	1/1
6,873,325	B1 *	3/2005	Kontkanen et al.	345/440
7,221,728	B2 *	5/2007	Edic et al.	378/8
2003/0018594	A1 *	1/2003	Aggarwal	706/12
2003/0152069	A1 *	8/2003	Schkilnik et al.	370/369

OTHER PUBLICATIONS

Deerwester et al., "Indexing by latent Semantic Analysis", University of Western Ontario, 1990.\*

\* cited by examiner

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(57) **ABSTRACT**

One embodiment of the present invention includes a data communication subsystem to receive a data stream, and a data processing subsystem responsive to the data communication subsystem to generate a visualization output based on a group of data vectors corresponding to a first portion of the data stream. The processing subsystem is further responsive to a change in rate of receipt of the data to modify the visualization output with one or more other data vectors corresponding to a second portion of the data stream as a function of eigenspace defined with the group of data vectors. The system further includes a display device responsive to the visualization output to provide a corresponding visualization.

**15 Claims, 11 Drawing Sheets**

