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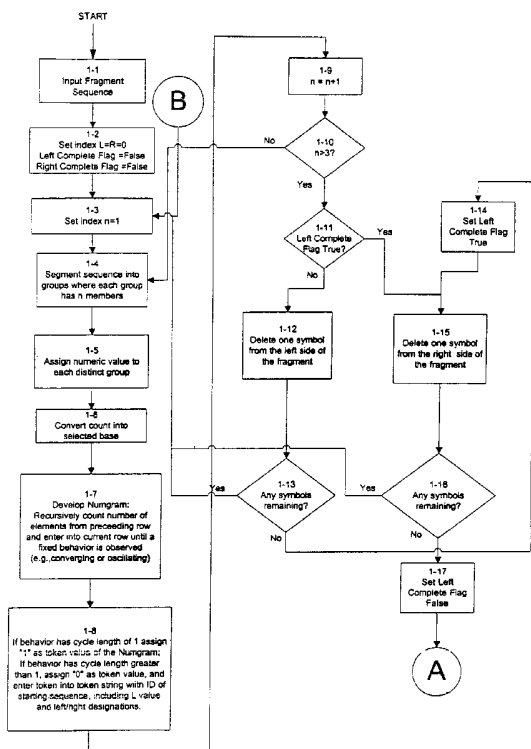
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(54) Title: METHOD OF DETECTING, INTERPRETING, RECOGNIZING, IDENTIFYING AND COMPARING N-DIMENSIONAL SHAPES, PARTIAL SHAPES, EMBEDDED SHAPES AND SHAPE COLLAGES USING MULTIDIMENSIONAL ATTRACTOR TOKENS



(57) Abstract: A method of detecting, interpreting, recognizing, identifying and comparing N-dimensional shapes, partial shapes, embedded shapes and shape collages is disclosed. One embodiment of the invention allows for the characterization of shapes as sequences of unit vector descriptions, attributes of unit vector descriptions, shape segments, and shape segment collages whereby the detection, interpretation, recognition, identification, comparison and analysis of one- to n-dimensional shapes in one- to n-dimensional spaces can be accomplished using multidimensional attractor tokens. These attractor processes map the sequence from its original sequence representation space (OSRS) into a hierarchical multidimensional attractor space (HMAS). The HMAS can be configured to represent equivalent symbol distributions within two symbol sequences or perform exact symbol sequence matching. The mapping process results in each sequence being drawn to an attractor in the HMAS. Each attractor within the HMAS forms a unique token for a group of sequences with no overlap between the sequence groups represented by different attractors. The size of the sequence groups represented by a given attractor can be reduced from approximately half of all possible sequences to a much smaller subset of possible sequences. The mapping process is repeated for a given sequence so that tokens are created for the whole sequence and a series of subsequences created by repeatedly removing a symbol from the one end of sequence and then repeating the process from the other end. The resulting string of tokens represents the exact identity of the whole sequence and all its subsequences ordered from each end.

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US03/30454

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : G06K 9/36; G06T 17/00; G06N 5/04  
 US CL : 382/280; 706/060

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 U.S. : Please See Continuation Sheet

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
 EAST

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,173,947 A (CHANDE et al) 22 December 1992.	1 - 56
A	US 5,636,297 A (ELLER et al) 03 June 1997.	1 - 56
A	US 6,128,003 A (SMITH et al) 03 October 2000.	1 - 56
A,P	US 6,504,541 B1 (LIU et al) 07 January 2003.	1 - 56

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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## INTERNATIONAL SEARCH REPORT

## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,393,143 B1 (PIPITONE) 21 May 2002.	1 - 56
A	US 6,393,159 B1 (PRASAD et al) 21 May 2002.	1 - 56
A	US 6,459,431 B1 (BROWNE et al) 01 October 2002.	1 - 56

**INTERNATIONAL SEARCH REPORT**

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**Continuation of B. FIELDS SEARCHED Item 1:**

345/419-428; 345/586; 345/441,467,622; 703/2; 382/159,160,165,181,187,190,191,199,201,203,205,206,209,216,218,219,220,221