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[Continued on next page]

(54) Title: SYSTEMS AND METHODS FOR DETECTING SMALL PATTERN CHANGES IN SENSED DATA

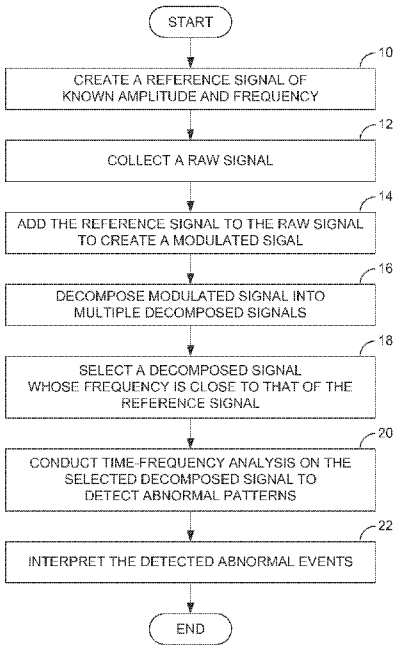

FIG. 1

(57) Abstract: In one embodiment, a system and a method involve receiving a raw signal collected by a sensor that pertains to a temporal trend, creating a reference signal of a known amplitude and frequency, adding the reference signal to the raw signal to form a modulated signal, decomposing the modulated signal to obtain a decomposed signal, and conducting time-frequency analysis on the decomposed signal to detect abnormal patterns.

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A. CLASSIFICATION OF SUBJECT MATTER

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B. FIELDS SEARCHED

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eKOMPASS(KIPO internal) & Keywords:auto-modulatin pattern, AMP, detection, reference, signal, decompose, abnormal, frequency and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7817254 B2 (HEGYI, A. et al.) 19 October 2010 See the whole document.	1-20
A	EP 0493718 A2 (GOLDSTAR CO. LTD.) 08 July 1992 See the whole document.	1-20
A	KR 10-0235249 B1 (SAMSONG INDUSTRIES, LTD.) 15 December 1999 See the whole document.	1-20
A	JP 2006-317194 A (MITSUBISHI HEAVY IND. LTD.) 24 November 2006 See the whole document.	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7817254 B2	19.10.2010	EP 2085763 A2	05.08.2009
		JP 2009-180728 A	13.08.2009
		US 2009-0190121 A1	30.07.2009
EP 0493718 A2	08.07.1992	EP 0493718 A3	07.04.1993
		KR 93-0011141 B1	24.11.1993
		US 05253070 A	12.10.1993
KR 10-0235249 B1	15.12.1999	US 6233006 B1	15.05.2001
JP 2006-317194 A	24.11.2006	JP 4616695 B2	19.01.2011