

PATENT N°: US 7106228 B2

Jurisdiction: US

Names of the Evaluators		
Lead Evaluator	Assistant Evaluator #1	Assistant Evaluator #2
Allen RUBENSTEIN	Jochen EHLERS	Kan ZU

The above mentioned Evaluators hereby declare that the following claim(s):

- Claim 1
- Claim 31

in the above referenced patent, is(are) essential to making, using in, selling within, or importing into, the countries of registration, any 3GPP product (the applicable Product Categories are given below) that is or purports to be in compliance with the following parts of the Third Generation Partnership Program (3GPP) technical standards:

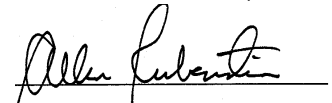
- Document 3GPP TS 26.445 V12.0.0 (2014-09): Sections 5.2.3.1.6, 5.2.3.1.6.1, 5.2.3.1.6.2, 5.2.3.1.6.9, 5.2.3.1.6.9.1.1, 5.2.3.1.6.9.1.2, 5.2.3.1.6.9.1.2.1, 5.2.3.1.6.9.1.2.2, 5.2.3.1.6.9.2.1, 5.2.3.1.6.9.2.2, 5.2.3.1.6.9.3 and 5.2.3.1.6.9.4; Figure 29

Claim 1 is relevant for 3GPP Terminal Products and 3GPP Base Station Products.

Claim 31 is relevant for 3GPP Terminal Products and 3GPP Base Station Products.

Authorized signature and date

December 12, 2017



Allen RUBENSTEIN

Gottlieb Rackman & Reisman, P.C.



US007106228B2

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

(10) **Patent No.:** **US 7,106,228 B2**
(45) **Date of Patent:** **Sep. 12, 2006**

(54) **METHOD AND SYSTEM FOR MULTI-RATE LATTICE VECTOR QUANTIZATION OF A SIGNAL**

(75) Inventors: **Bruno Bessette**, Rock Forest (CA);
Stéphane Ragot, Sherbrooke (CA);
Jean-Pierre Adoul, Castelnau le Lez (FR)

(73) Assignee: **VoiceAge Corporation**, Quebec (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 64 days.

(21) Appl. No.: **10/515,550**

(22) PCT Filed: **May 30, 2003**

(86) PCT No.: **PCT/CA03/00829**

§ 371 (c)(1),
(2), (4) Date: **Jun. 6, 2005**

(87) PCT Pub. No.: **WO03/103151**

PCT Pub. Date: **Dec. 11, 2003**

(65) **Prior Publication Data**

US 2005/0285764 A1 Dec. 29, 2005

(30) **Foreign Application Priority Data**

May 31, 2002 (CA) 2388358

(51) **Int. Cl.**
H03M 7/00 (2006.01)

(52) **U.S. Cl.** **341/106; 341/51**

(58) **Field of Classification Search** **341/51, 341/65, 106; 375/242, 254, 240.02, 240.11; 382/100, 160, 162, 238, 240, 253**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,371,544	A *	12/1994	Jacquin et al.	375/240.11
5,943,446	A *	8/1999	Pulsipher et al.	382/253
6,128,346	A *	10/2000	Suarez et al.	375/254
6,154,572	A *	11/2000	Chaddha	382/253
6,205,256	B1 *	3/2001	Chaddha	382/253
6,516,297	B1 *	2/2003	Servetto et al.	704/222
6,807,312	B1 *	10/2004	Thomas et al.	382/253

OTHER PUBLICATIONS

C. Lamblin and J.-P. Adoul. *Algorithme de quantification vectorielle sphérique à partir du réseau de Gosset d'ordre 8*. Ann Télécommun., vol. 43, No. 3-4, pp. 172-186, 1988. No month.

(Continued)

Primary Examiner—Linh V. Nguyen

(74) *Attorney, Agent, or Firm*—Kirkpatrick & Lockhart Nicholson Graham LLP

(57) **ABSTRACT**

The present invention relates to a method and system for multi-rate lattice vector quantization of a source vector x representing a frame from a source signal to be used, for example, in digital transmission and storage systems. The multi-rate lattice quantization encoding method comprises the steps of associating to x a lattice point y in a unbounded lattice Λ ; verifying if y is included in a base codebook C derived from the lattice Λ ; if it is the case then indexing y in C so as to yield quantization indices if not then extending the base codebook using, for example a Voronoi based extension method, yielding an extended codebook; associating to y a codevector c from the extended codebook, and indexing y in the extended codebook C . The extension technique allows to obtain higher bit rate codebooks from the base codebooks compared to quantization method and system from the prior art.

34 Claims, 19 Drawing Sheets

