



- (51) **International Patent Classification:**
G10L 19/038 (2013.01) *H03M 7/30* (2006.01)
- (21) **International Application Number:**
PCT/SE2015/050743
- (22) **International Filing Date:**
25 June 2015 (25.06.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
62/029,586 28 July 2014 (28.07.2014) US
- (71) **Applicant:** TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) [SE/SE]; SE-164 83 Stockholm (SE).
- (72) **Inventor:** SVEDBERG, Jonas; Lingonstigen 75, S-973 33 Luleå (SE).
- (74) **Agent:** EGRELIUS, Fredrik; Ericsson AB, Patent Unit Kista DSM, 16480 Stockholm (SE).
- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

- (54) **Title:** PYRAMID VECTOR QUANTIZER SHAPE SEARCH

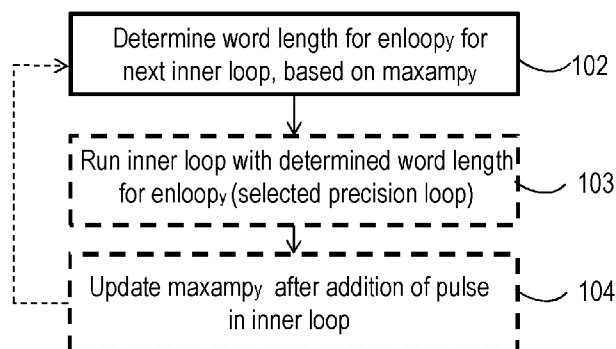


Figure 1

(57) **Abstract:** An encoder and a method therein for Pyramid Vector Quantizer, PVQ, shape search, the PVQ taking a target vector x as input and deriving a vector y by iteratively adding unit pulses in an inner dimension search loop. The method comprises, before entering a next inner dimension search loop for unit pulse addition, determining, based on the maximum pulse amplitude, $maxamp_y$, of a current vector y , whether more than a current bit word length is needed to represent $enloop_y$, in a lossless manner in the upcoming inner dimension loop. The variable $enloop_y$ is related to an accumulated energy of the vector y . The performing of this method enables the encoder to keep the complexity of the search at a reasonable level. For example, it enables the encoder to apply an increased precision loop only when it may be needed, by analyzing whether the "worst case scenario" in the upcoming inner loop would require an inner loop with a higher precision than the one currently used.