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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/261,843	01/29/2014	Frank Jan Bossen	10745/357	5783

79510 7590 12/31/2019

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EXAMINER	
BILLAH, MASUM	

ART UNIT	PAPER NUMBER
2486	

MAIL DATE	DELIVERY MODE
12/31/2019	PAPER

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte FRANK JAN BOSSEN and SANDEEP KANUMURI

Appeal 2019-001658[1]
Application 13/261,843
Technology Center 2400

Before ERIC B. CHEN, JAMES B. ARPIN, and IFTIKHAR AHMED, *Administrative Patent Judges*.

ARPIN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a), the Examiner's final rejection of claims 1, 2, 7–10, 15, and 16. Appeal Br. 2.[2] Claim 1–16 are pending. Final Act 2. The Examiner indicates that claims 3–6 and 11–14

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[1] "Appellant" here refers to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party-in-interest as NTT DOCOMO Inc. Appeal Br. 2.

[2] In this Decision, we refer to Appellant's Appeal Brief ("Appeal Br.," filed July 13, 2018) and Reply Brief ("Reply Br.," filed December 21, 2018); the Final Office Action ("Final Act.," mailed October 27, 2017), the Advisory Action ("Adv. Act," mailed February 26, 2018); and the Examiner's Answer ("Ans.," mailed October 26, 2018); and the originally-filed Specification ("Spec.," filed January 29, 2014). Rather than repeat the Examiner's findings and determinations and Appellant's contentions in their entirety, we refer to these documents.

contain allowable subject matter, but the Examiner objects to these claims as dependent from rejected base claims. *Id.* at 9–11. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

STATEMENT OF THE CASE

Appellant's claimed subject matter relates to methods and devices for "video coding and in particular to intraframe prediction enhanced with low complexity planar prediction mode coding." Spec. ¶ 2.

As noted above, claims 1, 2, 7–10, 15, and 16 stand rejected. Claims 1, 7, 9, and 15 are independent. Appeal Br. 15 (claim 1), 16–17 (claim 7), 17–18 (claim 9), 19–20 (claim 15) (Claims App.). Claim 2 depends directly from claim 1, claim 8 depends directly from claim 7, claim 10 depends directly from claim 9, and claim 16 depends directly from claim 15. *Id*. at 15–20.

Claim 9 recites "[a] video *encoder* that predicts pixel values of target pixels in a target block under a planar mode, comprising a processor of a computer system and a memory that stores programs executable by the processor to" perform "*encoding* methods," as recited in claim 1. *Id.* at 15, 17 (Claims App.) (emphases added). Claim 15 recites "[a] video *decoder* that predicts pixel values of target pixels in a target block under a planar mode, comprising a processor of a computer system and a memory that stores programs executable by the processor to" perform "*decoding* methods," as recited in claim 7. *Id.* at 16, 19 (emphases added). The Examiner relies on the same references and substantially similar arguments in rejecting claims 1, 2, 7–10, 15, and 16 (Final Act. 3–9); and Appellant does not contest the rejection of claims 2, 7–10, 15, and 16 separately from

that of claim 1 (App. Br. 10–13). Therefore, we focus our analysis on independent claim 1 and the disputed and overlapping limitations recited in independent claims 7, 9, and 15.

Claim 1, reproduced below with disputed limitations emphasized, is illustrative.

> 1. A video encoding method for predicting pixel values of target pixels in a target block under a planar mode, the method comprising computer executable steps executed by a processor of a video encoder to implement:
>
> (a) calculating *a first prediction value of a target pixel* in the target block using linear interpolation between a pixel value of a horizontal boundary pixel horizontally co-located with the target pixel, the horizontal boundary pixel being from among a plurality of horizontal boundary pixels located on an upper side of the target block, and a pixel value of one vertical boundary pixel from among a plurality of vertical boundary pixels located on a left side of the target block, wherein the first prediction value consists only of a first value derived solely from -the linear interpolation between the pixel value of the horizontal boundary pixel horizontally co-located with the target pixel and the pixel value of said one vertical boundary pixel;
>
> (b) calculating *a second prediction value of the target pixel* using linear interpolation between a pixel value of a vertical boundary pixel vertically co-located with the target pixel, the vertical boundary pixel being from among a plurality of the vertical boundary pixels and a pixel value of one horizontal boundary pixel from among a plurality of the horizontal boundary pixels, wherein the second prediction value consists only of a second value derived solely from the linear interpolation between the pixel value of the vertical boundary pixel vertically co-located with the target pixel and the pixel value of said one horizontal boundary pixel;
>
> (c) *averaging the first and second prediction values of the target pixel to derive a prediction pixel value in a prediction*

block, wherein the prediction pixel value consists only of an average of the first and second prediction values; and

(d) repeating steps (a)-(c) on a reset of the target pixels in the target block.

Id. at 15 (Claims App.) (emphases added).

REFERENCES AND REJECTIONS

The Examiner relies upon the following references in rejecting the claims:

Name[3]	**Number**	**Pub'd**	**Filed**
Shiodera	US 2009/0310677 A1	Dec. 17, 2009	Jan. 27, 2009
Takada	US 2010/0054617 A1	Mar. 4, 2010	May 26, 2009

Specifically, claims 1, 2, 7–10, 15, and 16 stand rejected as unpatentable under 35 U.S.C. § 103 over the combined teachings of Takada and Shiodera. Final Act. 3–9.

Appellant contests the obviousness rejection of independent claim 1 and relies on the alleged deficiencies in that rejection to overcome the rejection of the other independent claims and the dependent claims. Appeal Br. 10–13. Because we determine that reversal of the rejection of independent claim 1 is dispositive, except for our ultimate decision, we do not discuss the merits of the rejection of claims 2, 7–10, 15, and 16 further herein. We review the appealed rejection of independent claim 1 for error based upon the issues identified by Appellant, and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential). We address the rejection of claim 1 below.

[3] All reference citations are to the first named inventor only.

ANALYSIS

1. Obviousness of Claim 1 Over Takada and Shiodera

As noted above, the Examiner rejects independent claim 1 as obvious over the combined teachings of Takada and Shiodera. Final Act. 3–7. In particular, the Examiner finds that Takada teaches or suggests claim 1's limitations (a) and (b) (*id.* at 3–6), but the Examiner acknowledges that Takada does not explicitly teach claim 1's limitations (c) and (d) (*id.* at 6).[4]

The Examiner finds, however, that Shiodera teaches "(c) averaging the first and second prediction values of the target pixel to derive a prediction pixel value in a prediction block"; and "(d) repeating steps (a)-(c) on a reset of the target pixels in the target block," as recited in claim 1. *Id.* at 6 (citing Shiodera ¶¶ 153 (allegedly teaching limitation (c)), 284 (allegedly teaching limitation (d))); *see* Appeal Br. 15 (Claims App.). The Examiner concludes that a person of ordinary skill in the art would have had reason to combine the teachings of Takada and Shiodera to achieve the method of claim 1. Final Act. 6–7.

Appellant contends that the Examiner erred in rejecting claim 1 over the combined teachings of Takada and Shiodera. Appeal Br. 10–12. For the reasons given below, we agree with Appellant.

a. Takada's Deficiencies

Initially, we note that, in limitation (a), claim 1 recites the step of "calculat[ing] a first prediction value of *a* target pixel in the target block." Appeal Br. 15 (Claims App.) (emphasis added). In limitation (b), claim 1

[4] Claim 1's limitations (a)–(d) are substantially the same as limitations (a)–(d) in each of claims 7, 9, and 15. Appeal Br. 15–20 (Claims App.).

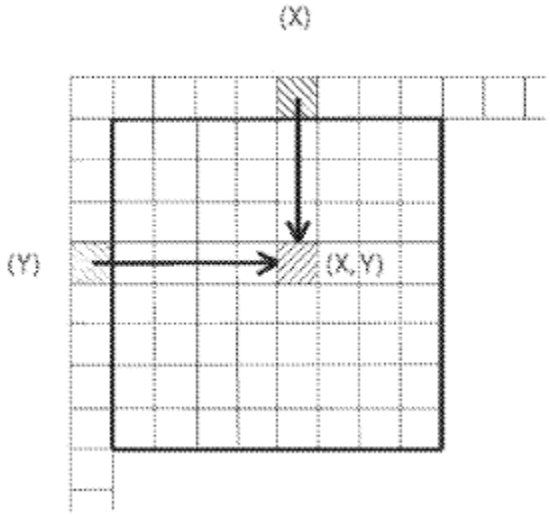
recites the step of "calculat[ing] a second prediction value of *the* target pixel." *Id.* (emphasis added). Thus, the claim recites calculating first and second prediction values for the same target pixel. *See id.* at 2–3.

Moreover, claim 1 narrowly recites the manner in which the first and second prediction values are calculated. *Id.* Specifically, in limitation (a), claim 1 recites that the first prediction value is calculated

> using linear interpolation between a pixel value of a horizontal boundary pixel horizontally co-located with the target pixel, the horizontal boundary pixel being from among a plurality of horizontal boundary pixels located, and a pixel value of one vertical boundary pixel from among a plurality of vertical boundary pixels located, wherein the first prediction value *consists only of* a first value *derived solely from* the linear interpolation between the pixel value of the horizontal boundary pixel horizontally co-located with the target pixel and the pixel value of said one vertical boundary pixel.

Id. at 15 (emphases added). Limitation (b) includes corresponding restrictions. *Id.*

To assist in understanding this limitation, Appellant provides the figure reproduced below.



Id. at 3. The figure depicts an 8X8 target block bordered on two edges with horizontal and vertical boundary pixels. A target pixel (X,Y) is located within the target block. A first prediction value for the target pixel is determined by linear interpolation between the pixel value of a co-located pixel (X) on the horizontal boundary and the pixel value of a pixel (Y) on the vertical boundary. *Id.* at 2. That is, pixel value (X) is added to pixel value (Y) and the sum is divided by 2 to calculate the first prediction value of the target pixel. Adv. Act. 2 (citing Takada, Fig. 10 (describing matrix prediction of pixel value X based on the pixel values A and C in the equation "X=(A+C)/2")). This calculation is repeated for "the target pixel" using a co-located pixel on the vertical boundary and a pixel on the horizontal boundary. Appeal Br. 3. The first and second prediction values for the same target pixel then are averaged (e.g., added and their sum divided by 2) in limitation (c). *Id.*

Although Takada teaches use of linear interpolation to predict a pixel value, the Examiner fails to show where Takada teaches or suggests making *two* predictions of the value of the *same* target pixel. *See* Final Act. 3–4 (citing Takada ¶¶ 14, 102, 133, Fig. 12). In particular, Takada discloses

> Next, with the conventional technique that uses the pixel of the previous resolution and the pixel of the present resolution together in order to predict the value of the not-yet-coded pixel from the already-coded pixels, the prediction precision of the pixel Y is enhanced as compared with the technique of using only the pixel of the previous resolution because, as shown in FIG. 12, the pixel Y can refer the already-coded pixels in the left, left upper, and right upper sides besides the two low-resolution pixels already coded that exist in the upper and lower sides.

Takada ¶ 14. Thus, Takada teaches using previously predicted pixel values to make future predictions of the values of other pixels.

In addition, referring to Takada's Figures 4 and 5, Takada depicts calculating final pixel values for multiple pixels. Takada, Fig. 5 (steps S216 "CALCULATING FIRST PIXEL VALUE" and S228, "CALCULATING THIRD PIXEL VALUE"); *see* Appeal Br. 11. Takada discloses that the values of multiple target pixels may be predicted in sequence using values of previously predicted pixels. Takada ¶ 102. In particular, referring to Takada's Figure 6, linear interpolation may be used to predict the value of pixel 6 (e.g., a target pixel) by averaging the values of pixel 2 and pixel 5. *See id.* ¶ 157; *see also* Reply Br. 3 ("an average value of (2) and (5) is defined as a predicted value of (6)"). However, in Takada's Figure 7, Takada discloses predicting a value for pixel 3 (e.g., a target pixel) based on an averaging of the values of surrounding pixels a, b, 1, and 1, when the pixel value 1 already has been determined according to means 131 depicted in Figure 6. Takada ¶¶ 159, 165; *see* Reply Br. 3–6.

Consequently, Appellant persuades us that, contrary to the Examiner's assertion, Takada does not teach or suggest making two predictions of the value of the same target pixel using linear interpolations based on horizontal and vertical boundary pixels. Reply Br. 4–5.

b. Shiodera's Deficiencies

The Examiner finds that Shiodera teaches limitation (c) of claim 1. Final Act. 6. In particular, the Examiner asserts:

> A relation between prediction pixels and reference pixels in the 4x4 pixel prediction is the same as that in FIG. 9B. For example, in prediction pixel a, an average pixel value of pixel A referred to in the vertical prediction and pixel I referred to in the horizontal prediction is set as a prediction signal. In prediction pixel b, an average pixel value of reference pixel B in the vertical prediction and reference pixel I in the diagonal-down-right

> prediction is set as a prediction signal. With respect to the other prediction pixels, prediction signals are generated by the same method as described above. *As described above in this paragraph that value of only pixel A and only Pixel B can be averaged to get final prediction value of the target pixel in a prediction block.*

Ans. 7 (emphasis added).

Appellant contends that "Shiodera suffers the same problem as Takada suffers. In [Figure] 12A, pixels (a) and (b) are final prediction values and do not require further averaging of the pixels." Reply Br. 7. Shiodera's Figure 9B is reproduced below.

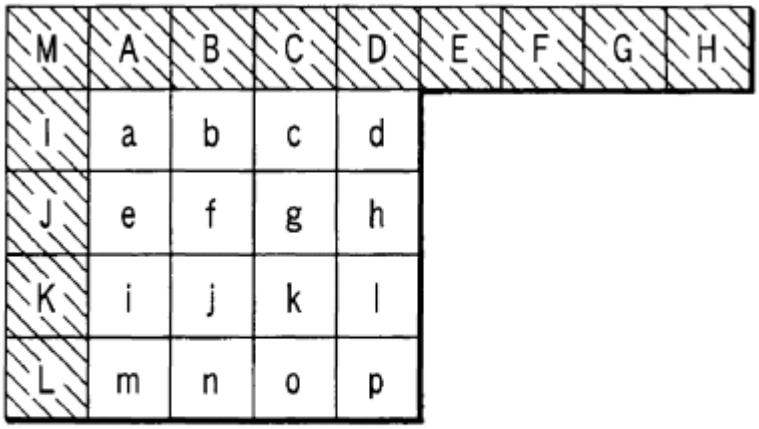


FIG. 9B

Figure 9B "is a diagram showing a relationship between a prediction pixel and a reference pixel in 4x4 pixel prediction." Shiodera ¶ 33. Shiodera explains:

> For example, in prediction pixel a, an average pixel value of pixel A referred to in the vertical prediction and pixel I referred to in the horizontal prediction is set as a prediction signal. In prediction pixel b, an average pixel value of reference pixel B in the vertical prediction and reference pixel I in the diagonal-down-right prediction is set as a prediction signal.

Id. ¶ 153. Thus, Shiodera makes clear that pixels a and b are different pixels, and the predicted value of pixel a is the average of values of pixels A and I, and the predicted value of pixel b is the average of values of pixels B and I. Reply Br. 6–7. Therefore, we are persuaded that, contrary to the Examiner's assertion, Shiodera does not teach or suggest the averaging of the first and second prediction values *of a target pixel* to obtain the "prediction value." *See* Ans. 7.

Consequently, we are persuaded that the Examiner erred in rejecting claim 1, and we do not sustain the obviousness rejection of claim 1.

2. The Remaining Claims

As noted above, Appellant challenges the rejection of independent claims 7, 9, and 15 for the same reasons as claim 1. Appeal Br. 12–13. Each of claims 2, 8, 10, and 16 depends directly from independent claims 1, 7, 9, or 15, respectively. *Id.* at 15–20 (Claims App.). Appellant does not challenge the rejection of the dependent claims separately from its challenge to independent claim 1. *Id.* at 20–22; *see* Reply Br. 5–6. Because we are persuaded the Examiner erred with respect to the obviousness rejection of claim 1, we also are persuaded the Examiner erred with respect to the obviousness rejection of independent claims 7, 9, and 15 and with respect to the rejection of dependent claims 2, 8, 10, and 16. For this reason, we do not sustain the rejection of those claims.

DECISIONS

1. The Examiner erred in rejecting claims 1, 2, 7–10, 15, and 16 as rendered obvious over the combined teachings of Takada and Shiodera.

2. Because the Examiner's objection to claims 3–6 and 11–14 are based on the rejection of their base claims, independent claims 1, 7, 9, and 15; that objection is moot. *See* Final Act. 9–11.
3. Thus, on this record, claims 1–16 are not unpatentable.

CONCLUSION

For the above reasons, we reverse the Examiner's decision rejecting claims 1, 2, 7–10, 15, and 16.

Claims Rejected	35 U.S.C. §	References	Affirmed	Reversed
1, 2, 7–10, 15, 16	103	Takada, Shiodera		1, 2, 7–10, 15, 16

REVERSED