On the Quantitative Analysis of Craniofacial Asymmetry in 3D

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SUPPLEMENTARY MATERIALS

A. List of Synthesized Asymmetries

Table I lists the 25 synthesized patterns of asymmetry used in our experiments. The table indicates the *generating patterns*, i.e. the ones that were applied to the symmetrized surface to generate a new (asymmetric) surface, which are not the resulting asymmetry patterns themselves. For example, the first asymmetry pattern on the table is generated by expanding the X-axis of the left face, but the resulting asymmetry pattern is an expansion of the left face together with a shrinking of the right face, with half the magnitude of the generating pattern each. Fig. 1 to 4 illustrate each of the generating patterns, the resulting asymmetry patterns and the asymmetric surfaces without color pattern on them.

Abbreviations from anthropometry are used to indicate facial landmarks, as follows: *acL, acR* = alare crest (Left/Right) (left or right nose corner); *chL, chR* = cheilion (left or right mouth corner); *exL, exR* = exocanthion (left or right outer-eye corner); *li* = labiale inferius (middle point of the lower lip); *ls* = labiale superius (middle point of the upper lip); *n* = nasion (nose root); *pg* = pogonion (chin tip); *prn* = pronasale (nose-tip); *sn* = subnasale.

TABLE I
LIST OF SYNTHESIZED PATTERNS OF ASYMMETRY (SEE TEXT).

Ref number	Description
1	Expand X-axis on left face side
2	Expand Y-axis of left face side (w.r.t. *prn*)
3	Expand Z-axis of left face side (w.r.t. *prn*); equivalent to shifting left face side backwards
4	Module Expansion of left face side, origin = *prn*
5	Module Expansion of left face side, origin = *chR*
6	Module Expansion of left face side, origin = *exR*
7	Module Expansion of left face side, origin = (*exR* + *chR*) / 2
8	Vertical shift-up of left side + expansion of right side
9	Vertical shift-down of left side + expansion of right side
10	Vertical shift-up of left side + negative Z-shift of right side (forward)
11	Horizontal shift of left side of lower face (below *prn*)
12	Horizontal shift of left side of eye-part face (above (*n* + *prn*)/2)
13	Rotation of lower face, below *li*, with linear transition shift starting from *sn*
14	Rotation of upper face, above *n*, sith linear starting shift starting from (*n* + *prn*)/2
15	Displace nose (between *n* and *sn*) to the left
16	Displace mouth (between *sn* and *pg*) to the left
17	Displace eyes (above *prn*/2 + *n*/2) to the left
18	Vertical parabola, i.e. x = f(y), centered at $x = 0$, applied only within $ls < y < n$
19	Vertical parabola, i.e. x = f(y), centered at $x = chL$, applied only within $pg < y < sn$
20	Vertical parabola, i.e. x = f(y), centered at $x = 0$, applied only within $chR < x < chL$ and $pg < y < n$
21	Vertical parabola, i.e. x = f(y), centered at $x = 0$, applied only within $acR < x < acL$ and $y > ls$
22	Vertical parabola, i.e. x = f(y), centered at $x = 0$, applied only within $exR < x < exL$ and $y > prn$
23	Vertical parabola as in #20 + Expand Y-axis of left face side (w.r.t. *prn*)
24	Vertical parabola as in #20 + Expand X-axis of left face side
25	Vertical parabola as in #20 + Expand X-axis of right face side

ACKNOWLEDGMENTS

The authors would like to thank their colleagues in the Face3D Consortium (www.face3d.ac.uk), and financial support from the Wellcome Trust (WT-086901 MA), the Marie Curie IEF program (grant 299605, SP-MORPH) and the UP-Fellows program. This work includes collaboration between Dublin City University and the Royal College of Surgeons in Ireland (RCSI) under the auspices of the 3U Partnership between Dublin City University, Maynooth University and RCSI.

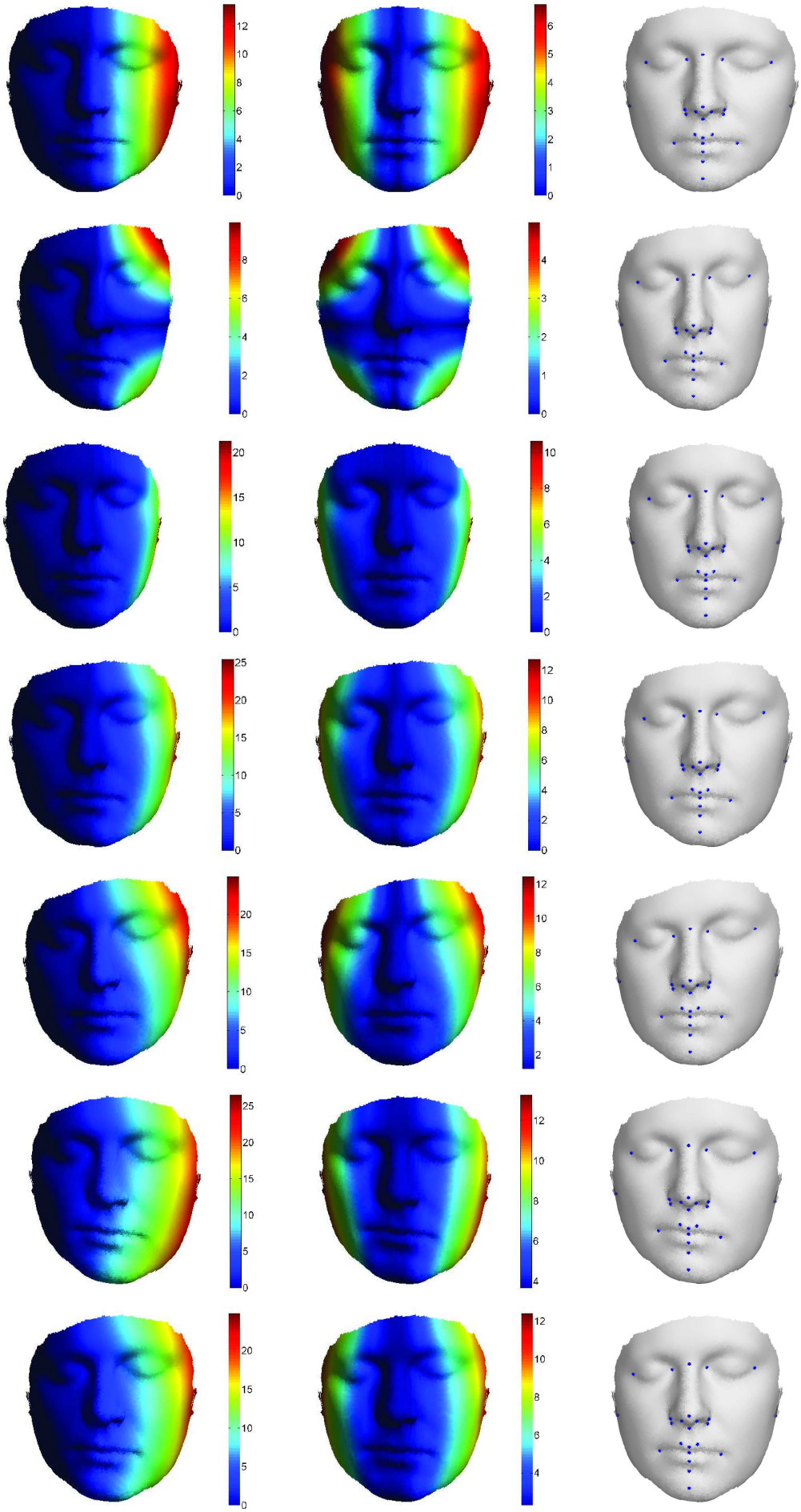

Fig. 1. A face template with (synthetic) asymmetry patterns 1 (top), 2, 3, 4, 5, 6 and 7 (bottom) from Table I. Each row shows the generating pattern color-coded on the surface (left), the resulting asymmetry pattern (middle) and the resulting surface and landmarks without color patterns on it (right). The units of the color-coded scale are mm and the magnitude of the generating pattern is fixed to 20% the size of the original (symmetric) surface in all cases.

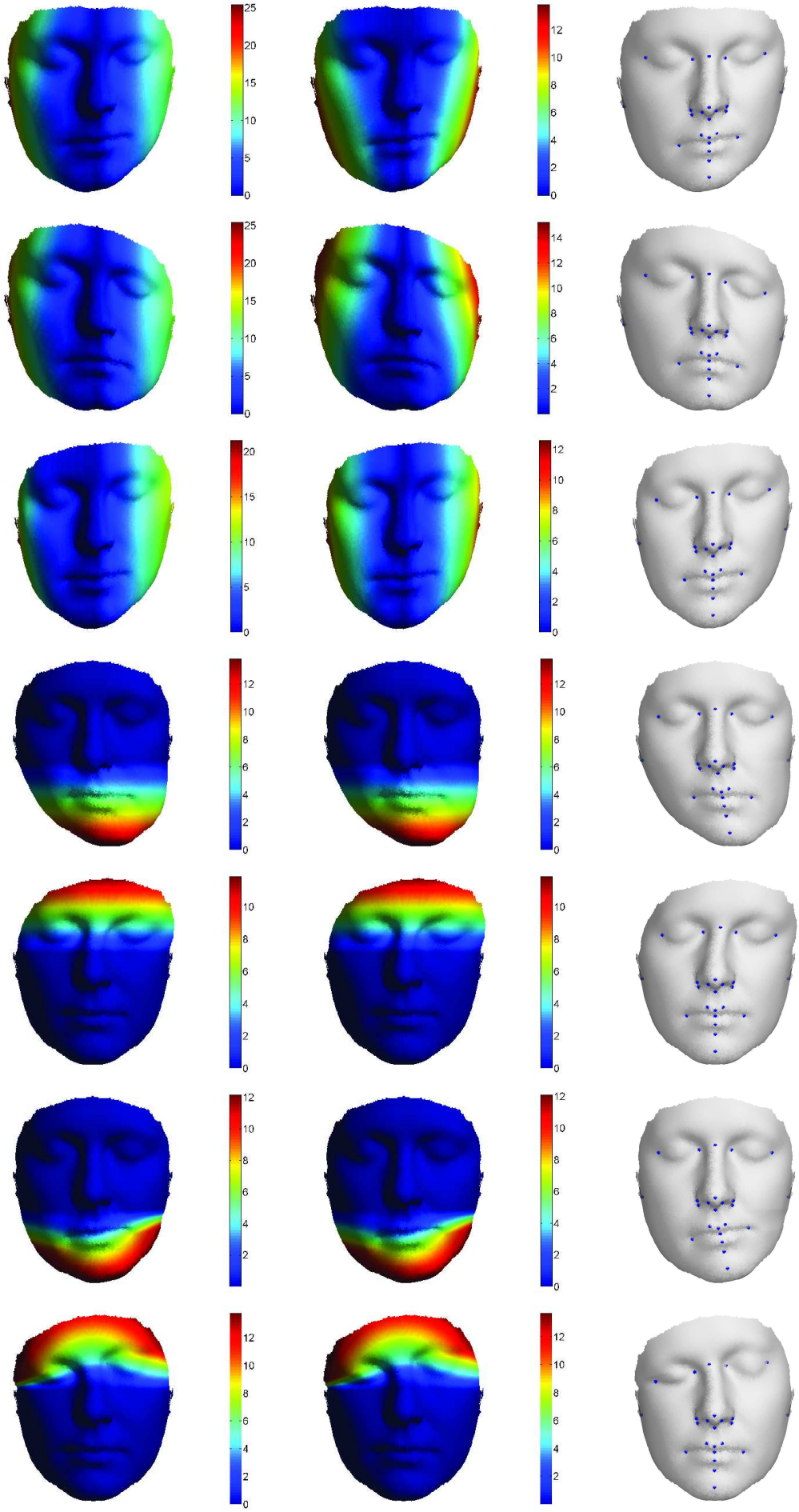

Fig. 2. Idem Fig. 1 for asymmetry patterns 8 (top), 9, 10, 11, 12, 13 and 14 (bottom) from Table I.

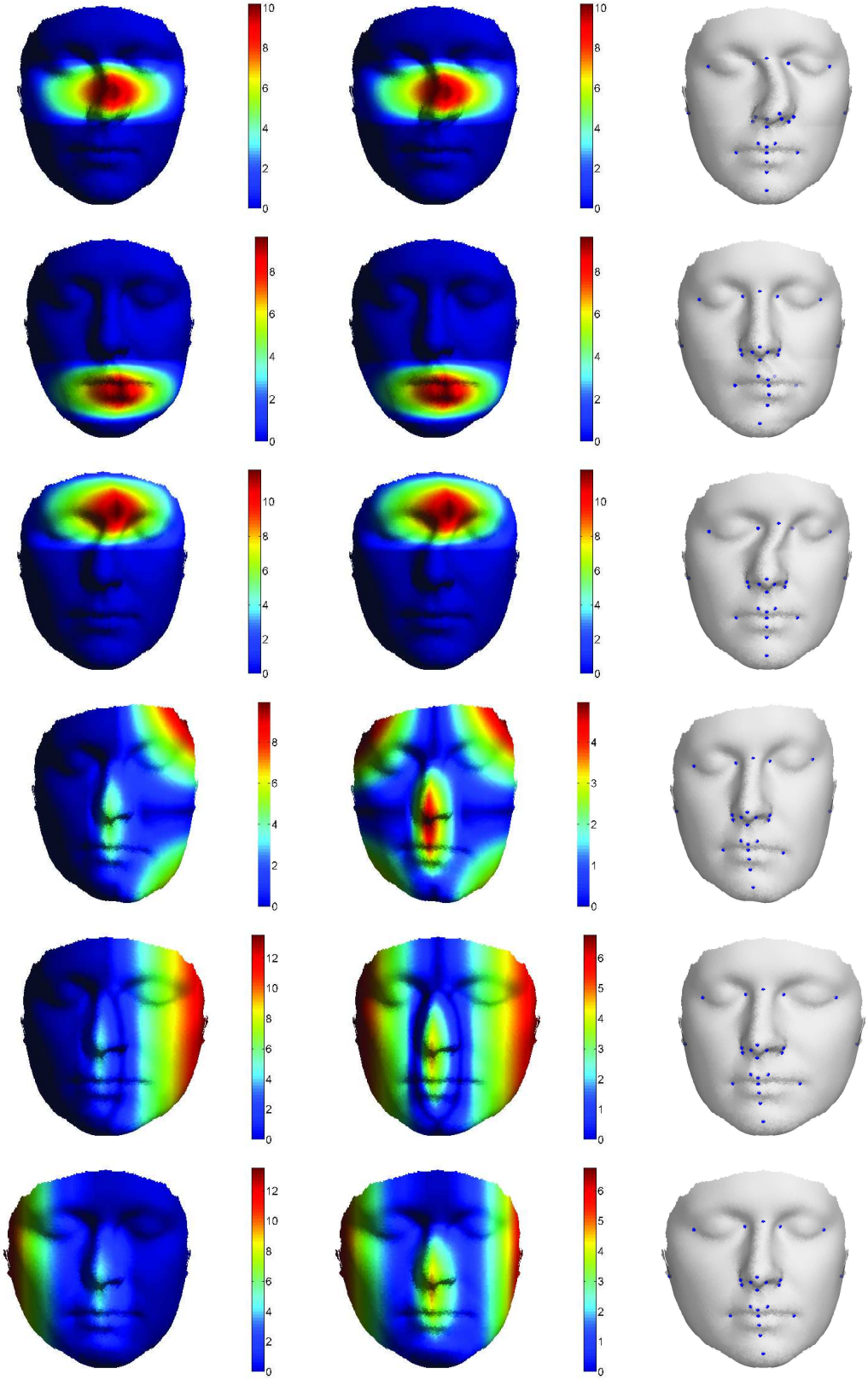

Fig. 3. Idem Fig. 1 for asymmetry patterns 15 (top), 16, 17, 23, 24 and 25 (bottom) from Table I.

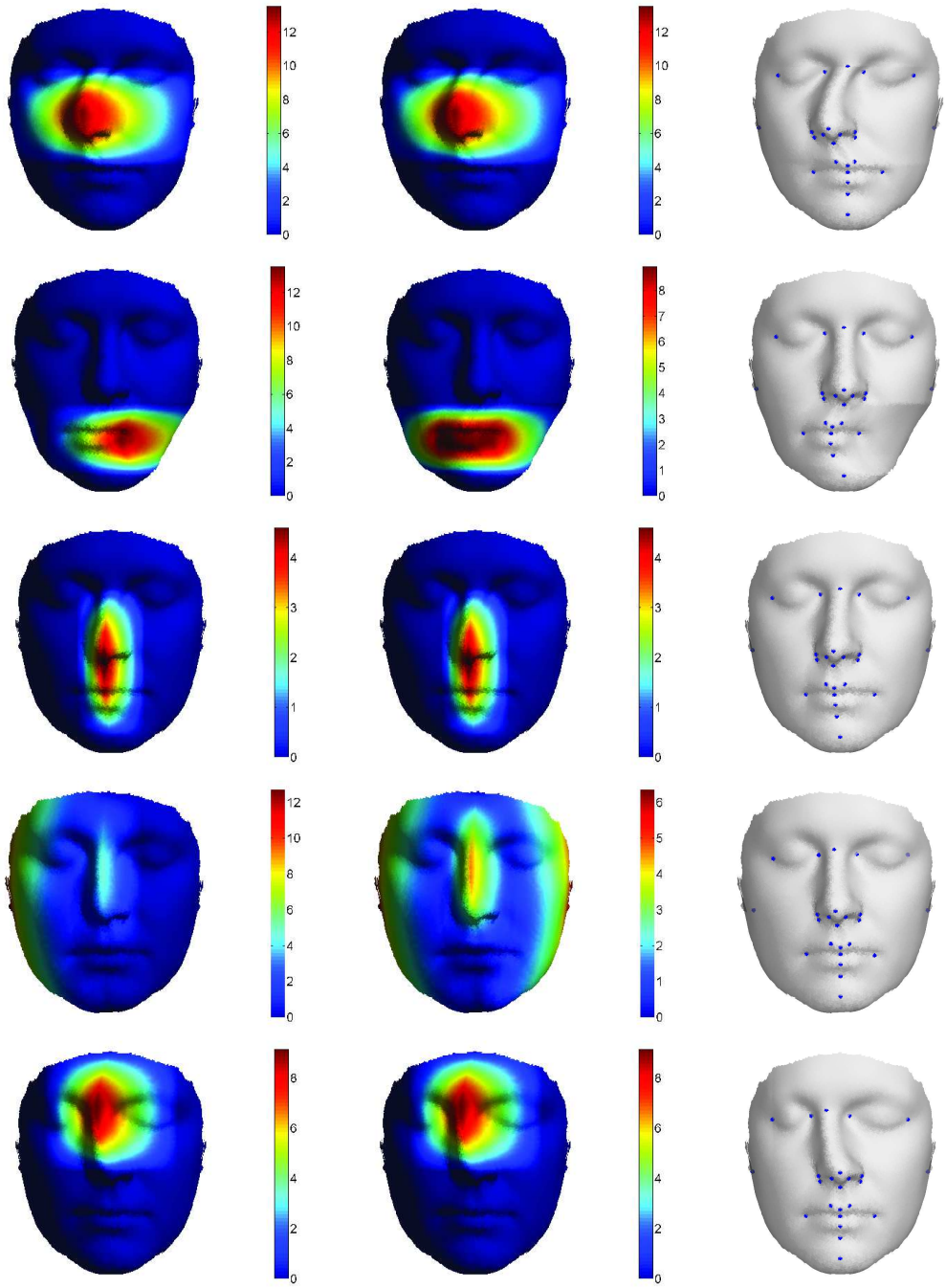

Fig. 4. Idem Fig. 1 for asymmetry patterns 18 (top), 19, 20, 21 and 22 (bottom) from Table I.