Color classification of veal carcasses: Past, present and future

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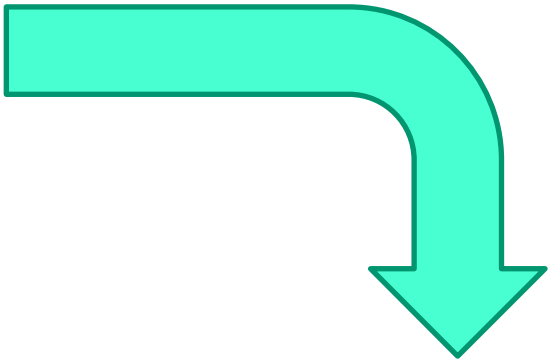
From the farm to the table



Carcass classification

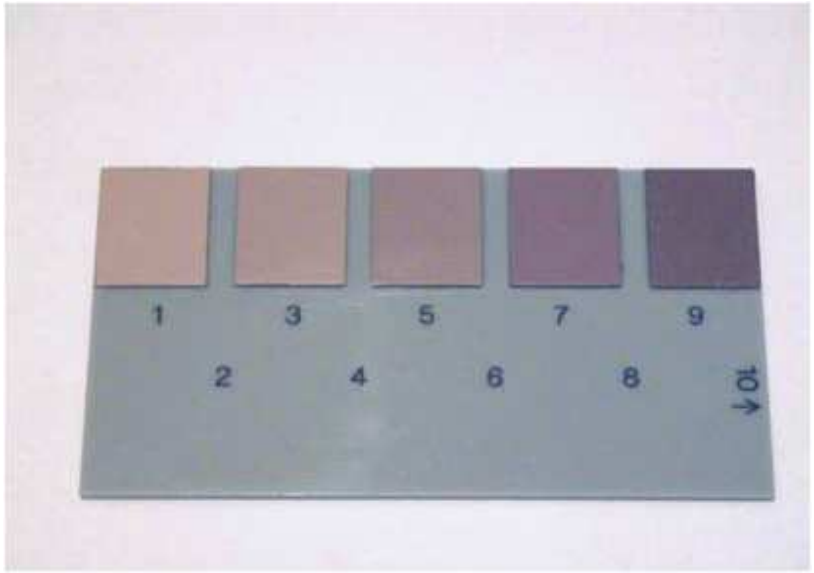
Veal carcasses are classified on

- Fatness (amount of fat tissue)
- Conformation (size and weight)
- Color

Color is an important factor for pricing

The color classification process is reviewed here

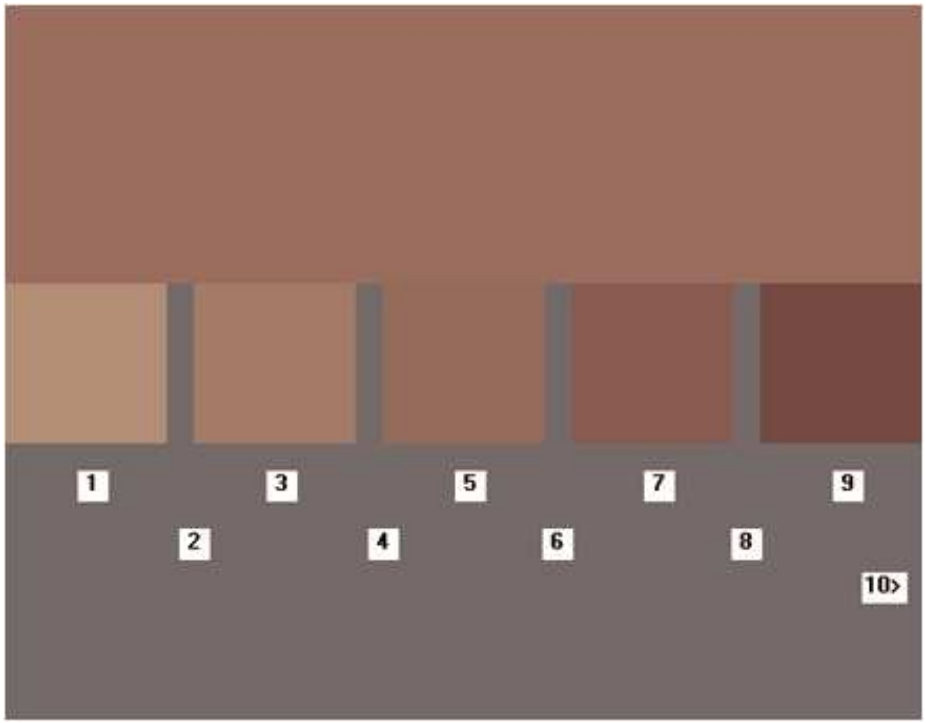
Past: visual classification



- Meat color was visually matched to a 10-point scale
- Scale design based on representative variations in meat color

Past: visual classification

- Visual task: determine the smallest difference



- Disadvantages: - Subjective
  - Dependent on illumination

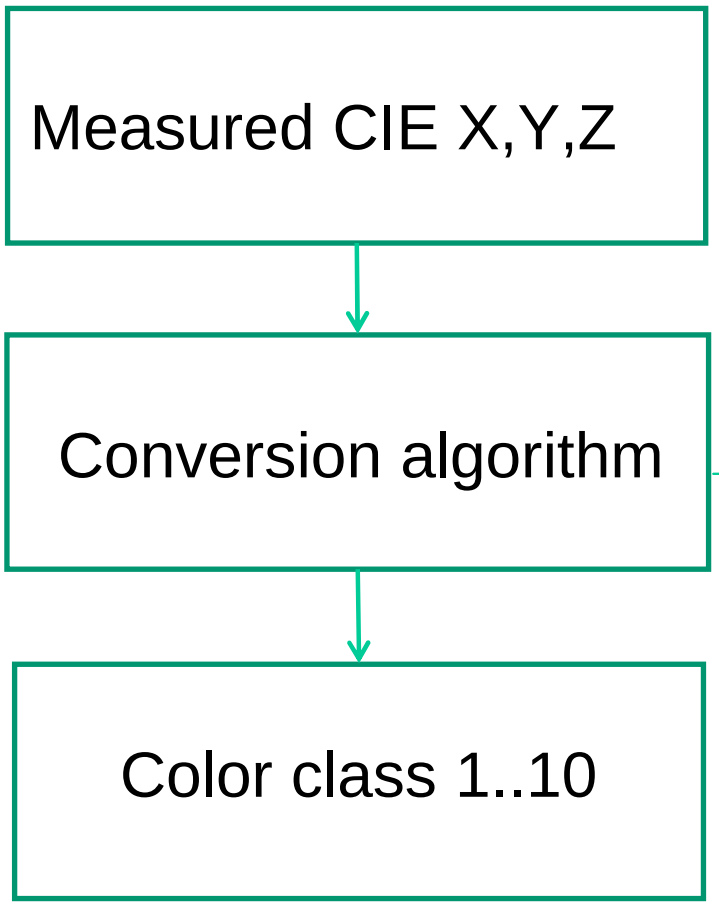
Past: instrumental classification

Certified personnel perform on-line color measurements in the slaughterhouses

Past: instrumental classification

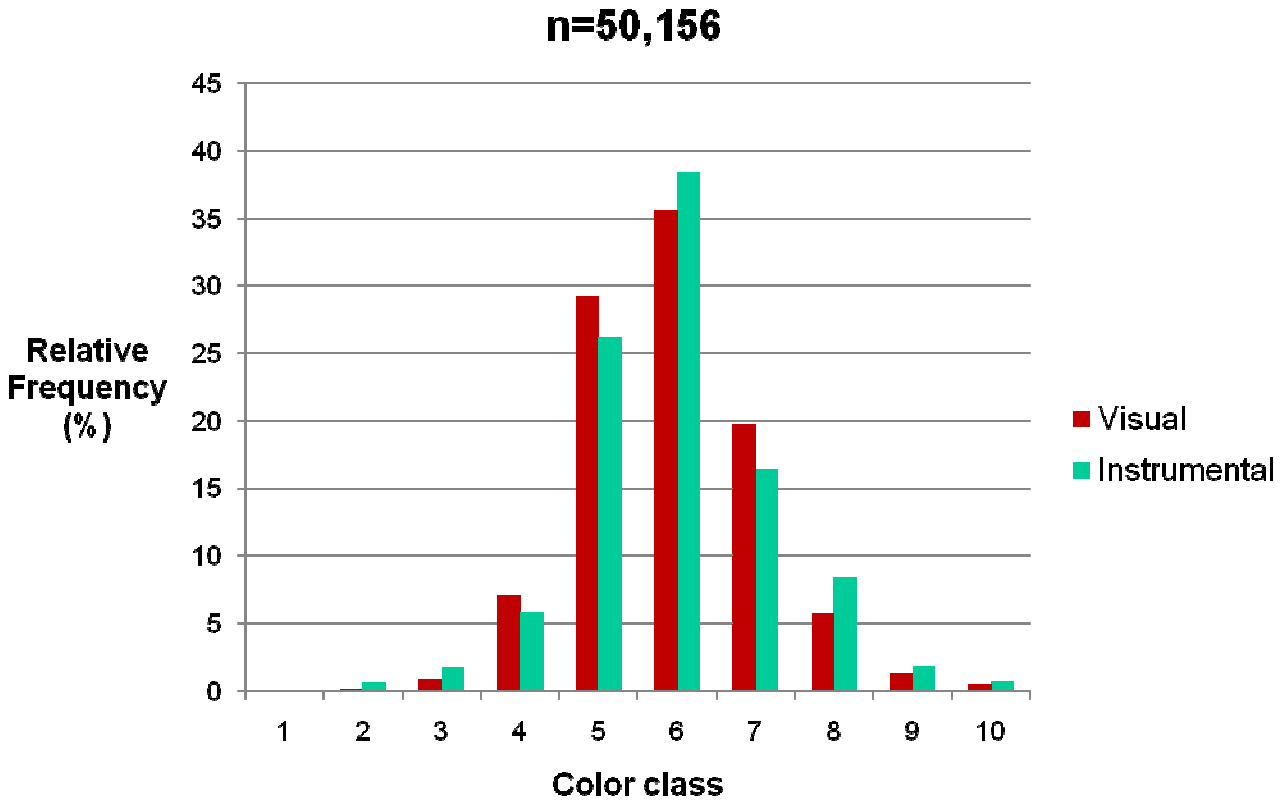
- Handheld Minolta CR300 (tristimulus meter)
- Positioned on the *m. Rectus abdominis (vinkelap)*
- Measurement of CIE X,Y,Z
- 45 min post mortem

Past: instrumental classification



- Algorithm derived from database with both visual and instrumental measurements
- Discriminant analysis: calculates the most likely color class using functions based on measured L* and a* values

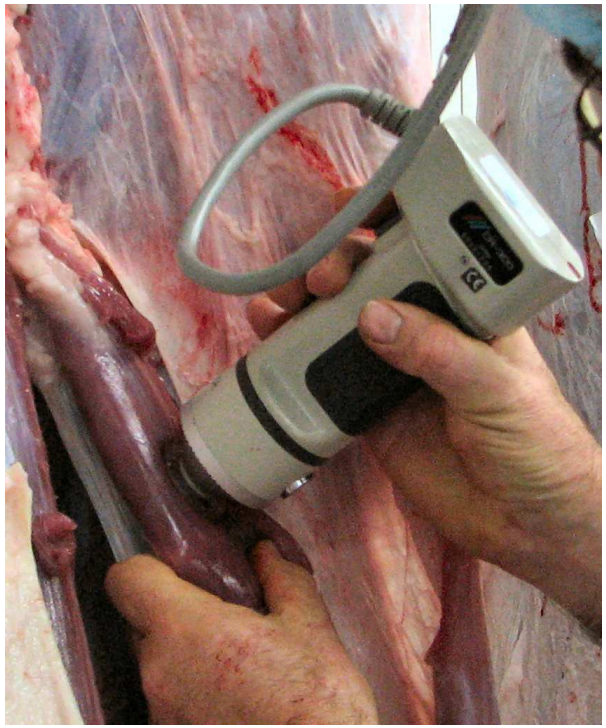
Past: instrumental classification



> 80% within 1 color class difference

Present: update hardware & software

- Tristimulus meters replaced by newer version



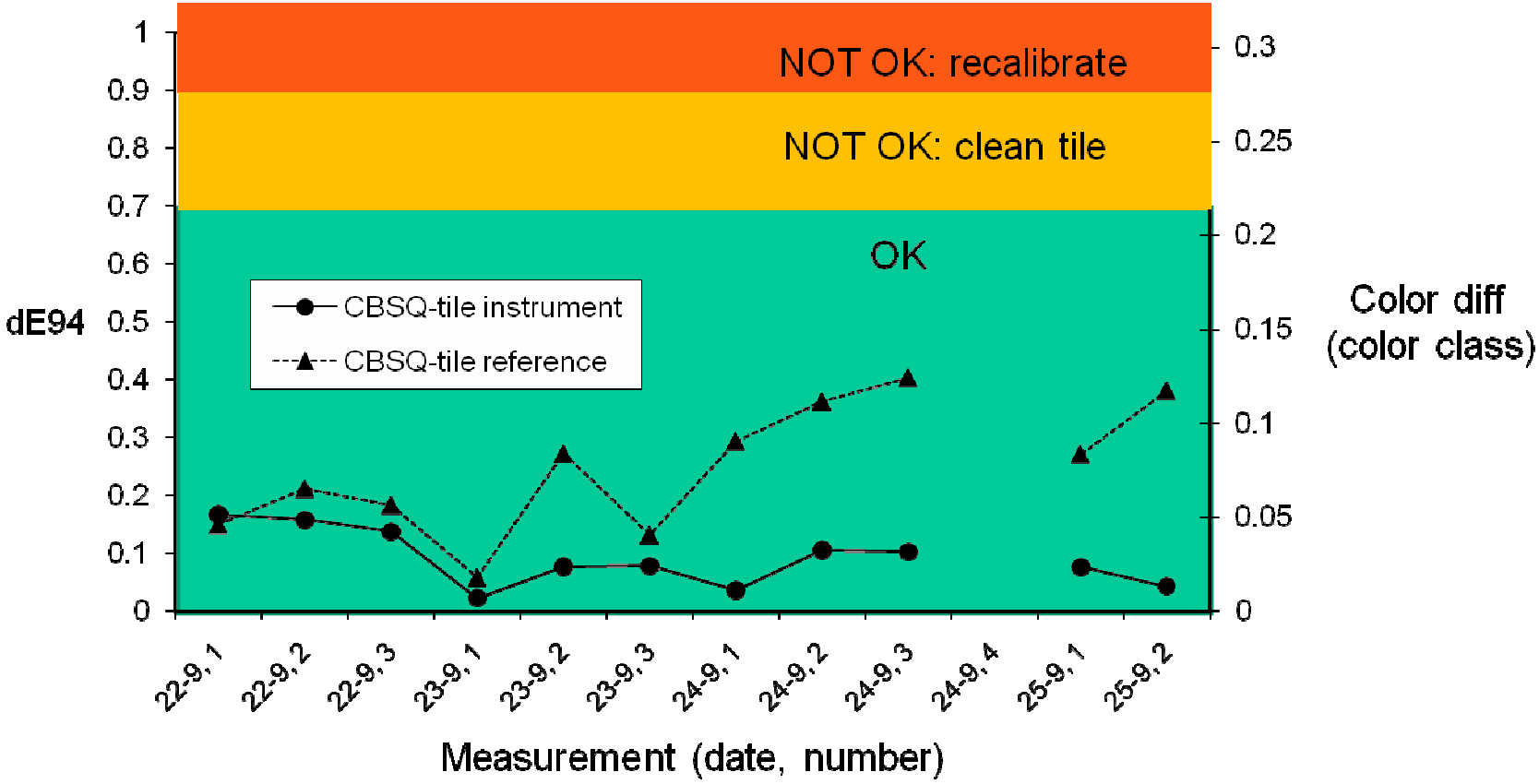
Minolta CR300

Minolta CR400

Present: update hardware & software

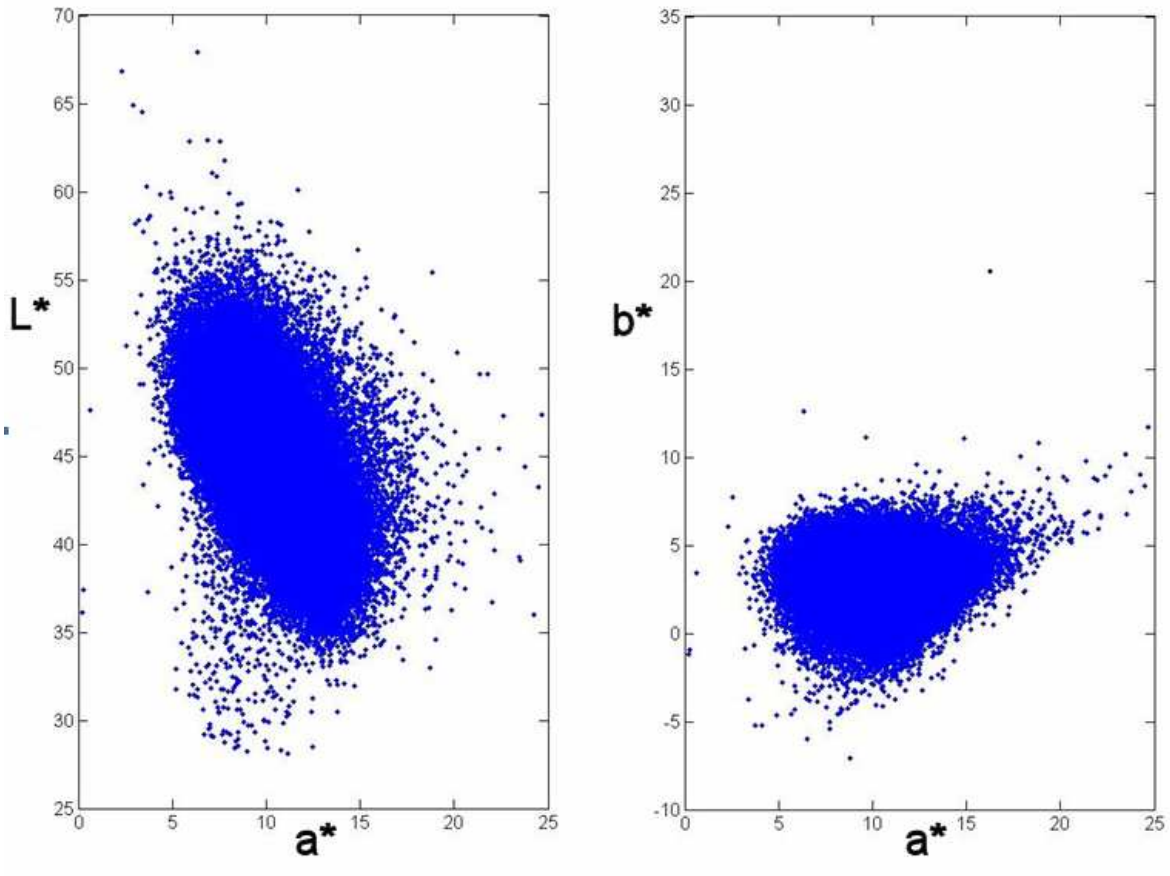
- Improved calibration procedure (user calibration), using additional tile with representative target color

Present: update hardware & software



Present: update hardware & software

- New datasets: instrumental only n=113,556
  instrumental + visual n= 11,745

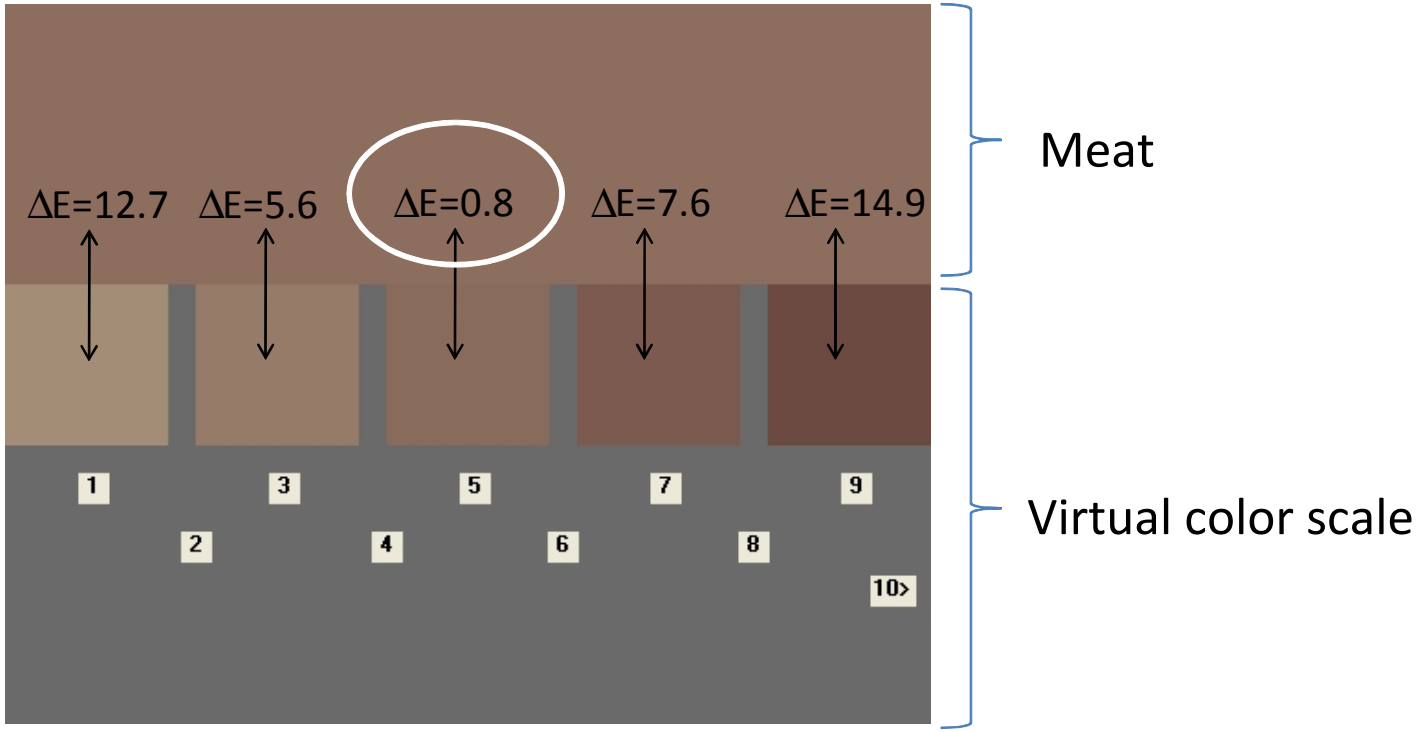


Restricted area in CIELAB color space

Present: update hardware & software

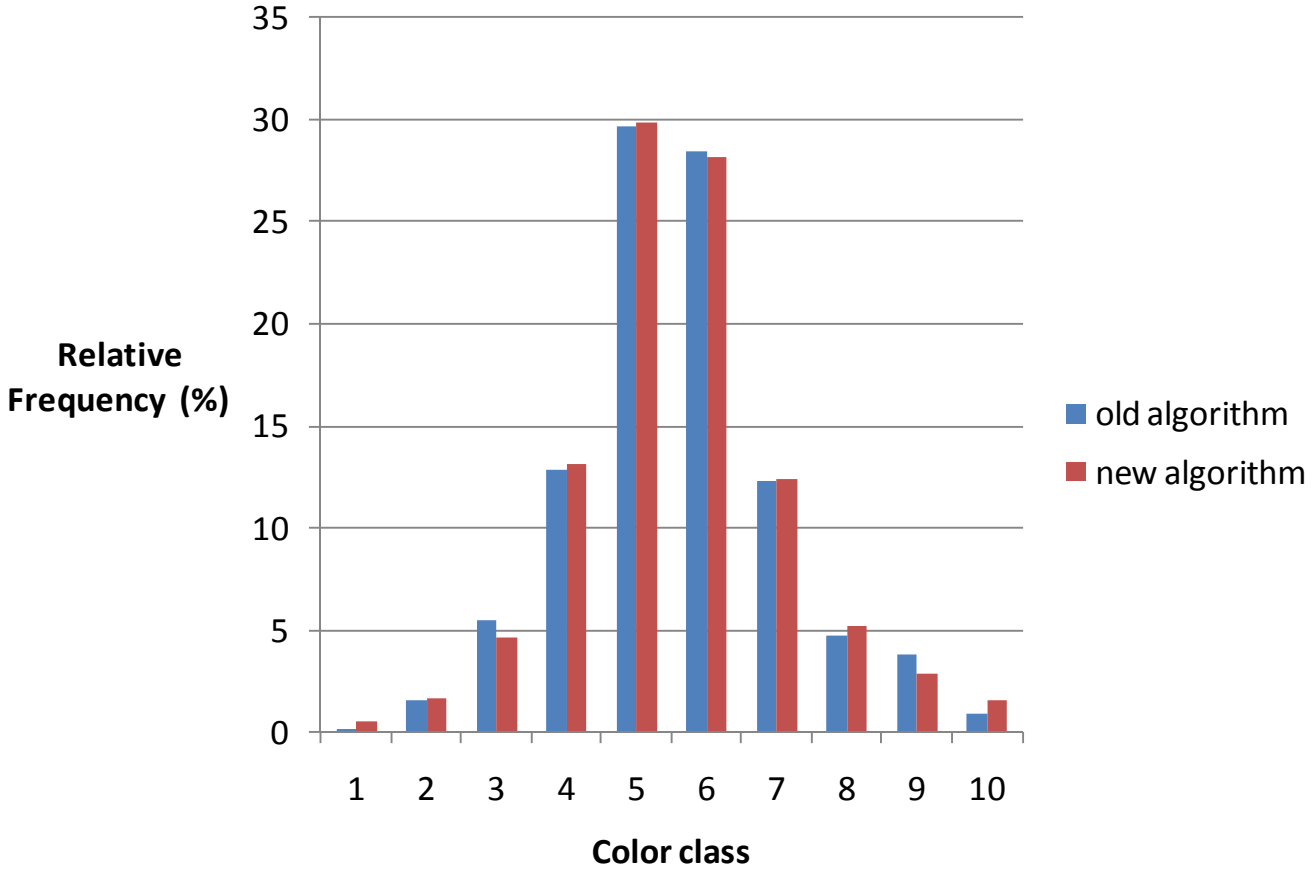
- New algorithm to convert color measurement to a color class, based on ΔE_{94} color difference metric

- Finds minimum color distance to new, virtual color scale



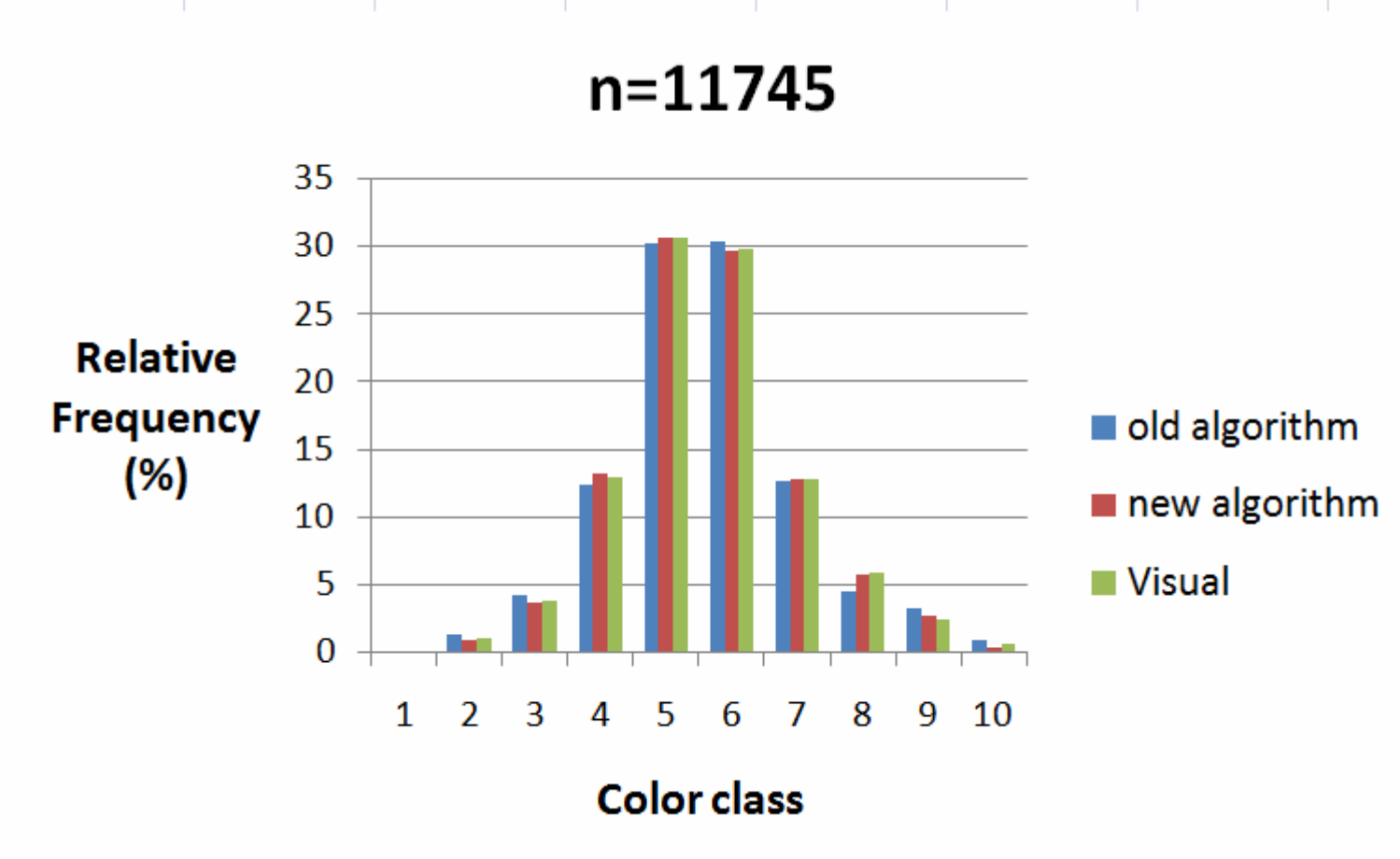
Present: update hardware & software

- New algorithm is attuned to historical databases



Present: update hardware & software

- Good agreement with visual data



Main advantages ΔE-based method

1. Works similiar to visual classification: it determines the smallest difference to reference colors
2. Easy to explain and comprehend
3. Does not require complex statistical analysis
4. Less sensitive to small variations in color measurements
5. ΔE is an international / industrial standard

Future perspective

- LED illumination in color measurement equipment: longer life-time, less calibration efforts
- Operational research: local factors (temperature, humidity, animal stress, etc) affecting the color measurement?
- Camera based, non-contact color measurement

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