

Objectives:

- Understand the challenges in measurement and reproduction of skin
- Clarify the requirements of different users of skin reflectance data
- Review best practices in skin measurement and reproduction
- Agree a method of estimating skin reflectance from RGB image data
- Develop a publicly accessible database of skin images and skin reflectance data

Why Spectral Reflectance?

- ❑ **Physical property**

Independent of illumination

- ❑ **More informative**

True colour simulation and reproduction

Direct connects with skin chromophores

- melanin, haemoglobin

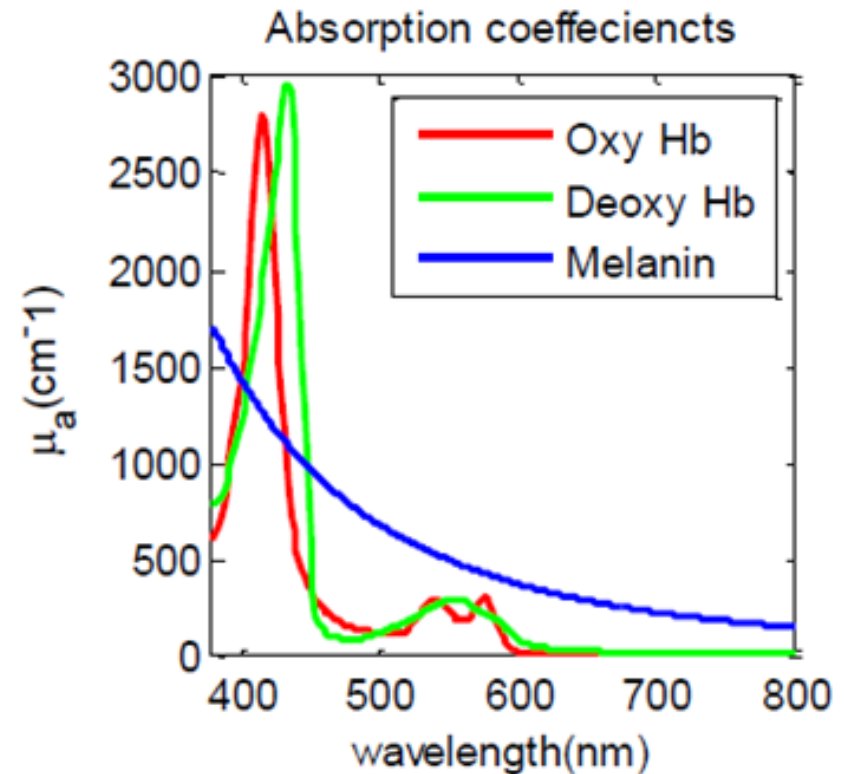
Important measure to medicine

Melanin:

- protects from UV radiation
- responsible for ethnic skin colour differences

Haemoglobin – two dimensions

- Concentration in blood
- Oxygenation saturation



To estimate skin spectral reflectance from camera digital signals

Step 1: Camera profiling

- Camera colour characterisation (camera RGB to CIE XYZ)
- Camera spectral sensitivity function estimation

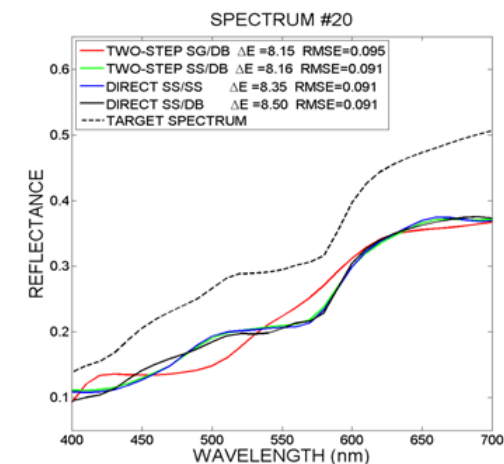
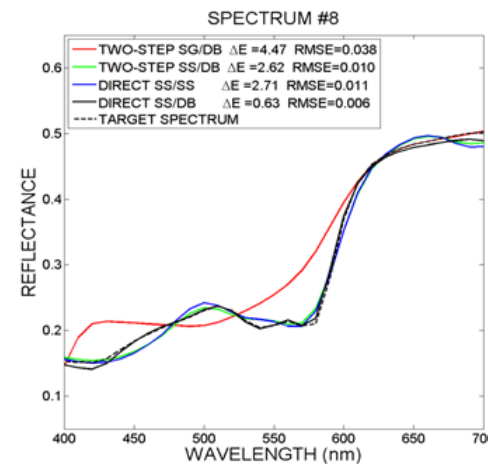
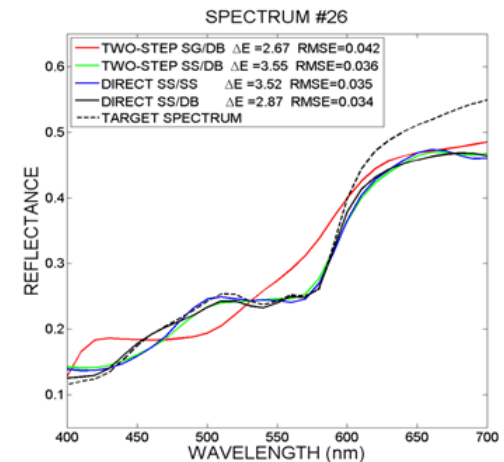
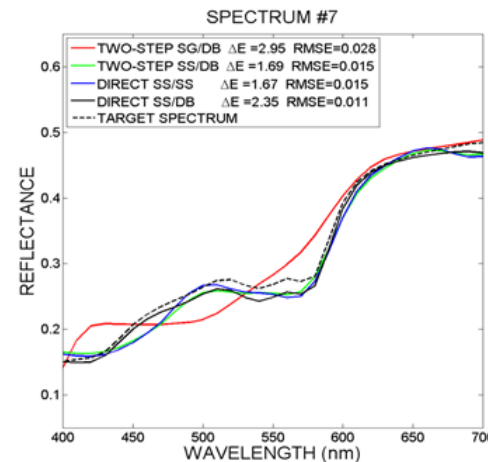
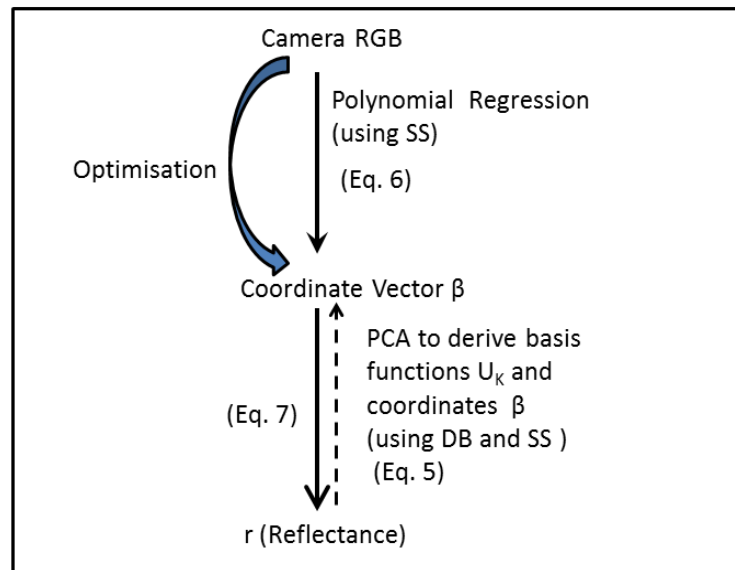
Step 2: Spectral reflectance re-construction

- CIE XYZ to spectral reflectance
- RGB to spectral reflectance with known camera spectral sensitivity

Skin image spectra estimation



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Kaida Xiao, Yuteng Zhu, Changjun Li, David Connah, Julian Yates and Sophie Wuerger (2016), Improved method for skin reflectance reconstruction from camera images, Optics Express, 24, 13, 14934-14950.

Skin spectra database



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	Year	Location	Ethnics Group	Method	Subjects	Body Location
1	2013	China	Chinese	SP	202	9
2	2013	UK	Caucasians	SP	187	9
3	2013	Iraq	Kurdish	SP	145	9
4	2014	Thailand	Thai	SP	426	6
5	2015	Pakistan	South Asian	SP	120	6
6	2013-2014	UK	Chinese, Caucasians, South Asians, African	SP, TSR, Camera	218	10
7	2014	China	Chinese, Caucasians, South Asians	SP, TSR	47	8