The Metric of Colour Space

The space of colours is a fascinating space. It is a real vector space, but no matter what inner product you put on the space the resulting Euclidean distance does not correspond to human perception of difference between colours.

In 1942 MacAdam performed the first experiments on colour matching and found the MacAdam ellipses which are often interpreted as defining the metric tensor at their centres. An important question is whether it is possible to define colour coordinates such that the Euclidean distance in these coordinates correspond to human perception.

Using cubic splines to represent the colour coordinates and an optimisation approach we find new colour coordinates that make the MacAdam ellipses closer to uniform circles than the existing standards.