Technology Commercialization Opportunity

Reflectance Color Target for Magnified Images

Inventors
Jennifer Kruschwitz, M.S., Roy Berns, Ph.D., Rochester Institute of Technology

Background and Technology Description

In macroscopic imaging, painted color targets are often used to calibrate and characterize cameras, scanners, and printers. For image capture under magnification, such as with a loupe or a microscope, determining the color ground truth becomes more challenging. This invention allows the user to determine color ground truth for magnified images and use the data colorimetrically for color rendering in subsequent devices (e.g. displays, printers) or for spectral reflectance reconstruction.

The invention is an array or series of color mirrors, which are created by optical interference coatings, deposited on the first or back surface of a specular micro-structured substrate. The structured surface can be a collection of microlenses or other micron-sized optical elements that have structures with a known specular shape. When illuminated, the color reflected in the *specular highlight* is imaged and used to color calibrate the microscope or magnifying imaging system.

The preferred forms of the invention are an array of color mirrors deposited on a single opaque metal film surface where the microlenses are surfaces with differing lens slopes. The color mirrors would all produce their individual color spectral highlights, therefore allowing a single image to be used for color calibration. Other forms are a series of mirrors imaged sequentially, and the collective images are used for color calibration.

One use for this invention is to be able to color calibrate reflectance microscope imaging systems or imaging systems that capture reflected light under magnification. Compound microscopes are used in the art world for museum archiving of pigments used in paintings, pottery, and textiles created by Master artists. There is currently no reliable way to color calibrate microscopes used in the discipline. Data collected from magnified images of paintings would reveal the spectral reflectance profiles of pigments used and would allow the museum professionals to better color match areas that are being repaired or cleaned.

Another use would be in the medical imaging field, specifically in the areas of Dermatology and Ophthalmology. There is currently no way to color calibrate digital images taken under magnification of human skin or of the human retina. One major use in these fields would be for color calibration of multiple imaging systems used for clinical trials of drugs. Having one color target used by all clinicians allows direct comparison of images from before and after drug use. Without a way to compare the color of all images directly, there is no logical way to know if the drugs used are working in a positive manner.

The future potential of this calibration target is that the spectral reflectance signatures need not only be for the visible wavelength region. The mirrors could be designed with specific reflectance profiles in the infrared or ultraviolet wavelength regions as well. This would create a target that can be

used for cameras or imaging systems used with magnified images that have multiple wavelength sensors (e.g. those with visible or infrared sensors, or both together.)

Keywords: reflectance microscopy, color target, digital image color ground truth, camera sensor calibration

Technology Readiness
The microlens color mirrors have been prototyped and tested using a micro-spectrophotometer.

Idea	**Concept**	Prototype	Alpha Version	Beta Version	Released

The RIT developers will work with licensees to move the design to a commercial product.

Intellectual Property
This technology is the subject of a pending U. S. patent application.

Example of specular highlights from nine color mirrors on cylindrical microlenses at 14x magnification.
The initial development involved imaging the specular highlights of nine color mirrors deposited on cylindrical microlenses.

Target Customers
Microscope camera companies - Dermatological and Ophthalmological research centers - Color target production companies

Opportunity
RIT's Intellectual Property Management Office (IPMO) is interested in working with qualified parties who are interested in the commercialization of this color target.

Contact
Those interested in learning more about this opportunity should contact: **Mr. William E. Bond**, Director of Intellectual Property Management at RIT (585) 475-2986 bill.bond@rit.edu

Please refer to ID 2014-018, 111914