A New Perspective on Material Classification and Ink Identification

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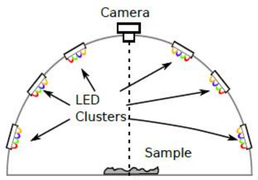
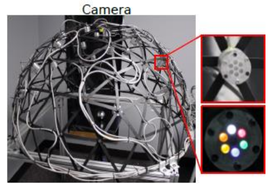
Motivation



Wang et. al [2]

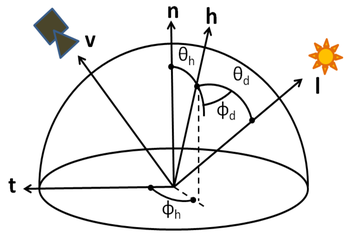


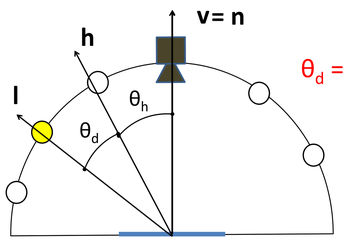
Jinwei and Chao [1]

Most previous methods on material classification use a head-on camera.

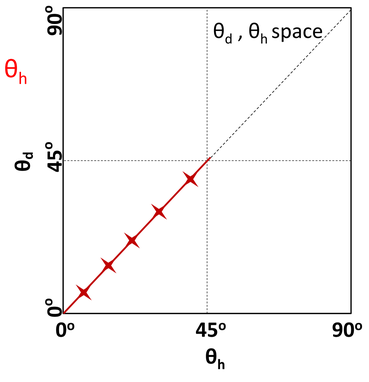
Since, Isotropic BRDFs can be approximated by a 2D BRDF (θ_d, θ_h)

Rusinkiewicz [3]



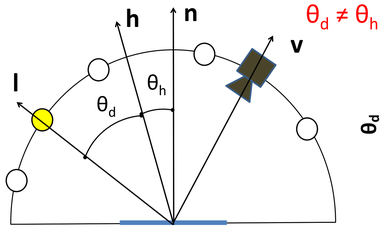


$\theta_d = \theta_h$

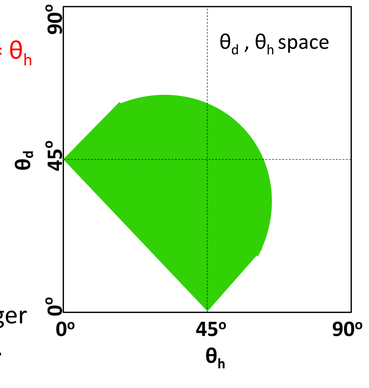


Conventional camera captures only a 1D slice of the 2D BRDF

Our New Perspective



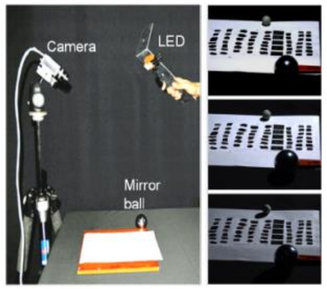
$\theta_d \neq \theta_h$

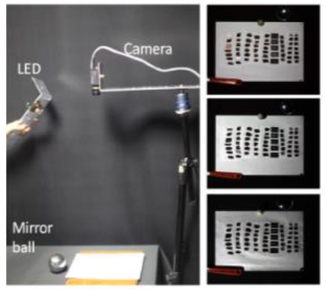


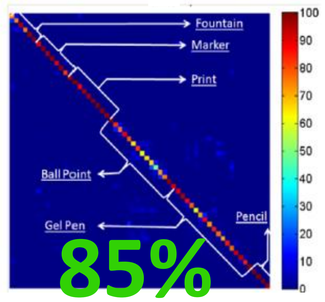
A slanted camera captures a larger portion of the 2D BRDF space.

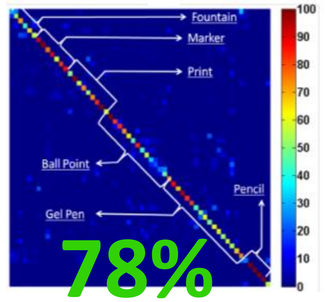
Experiments on Ink Database

Slanted Camera vs. Conventional Camera







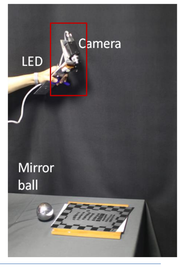


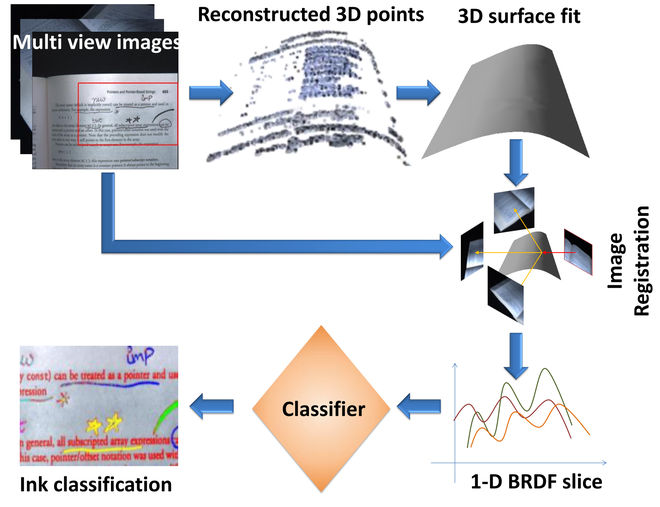
We observe improved classification accuracy !

Application : Ink Identification

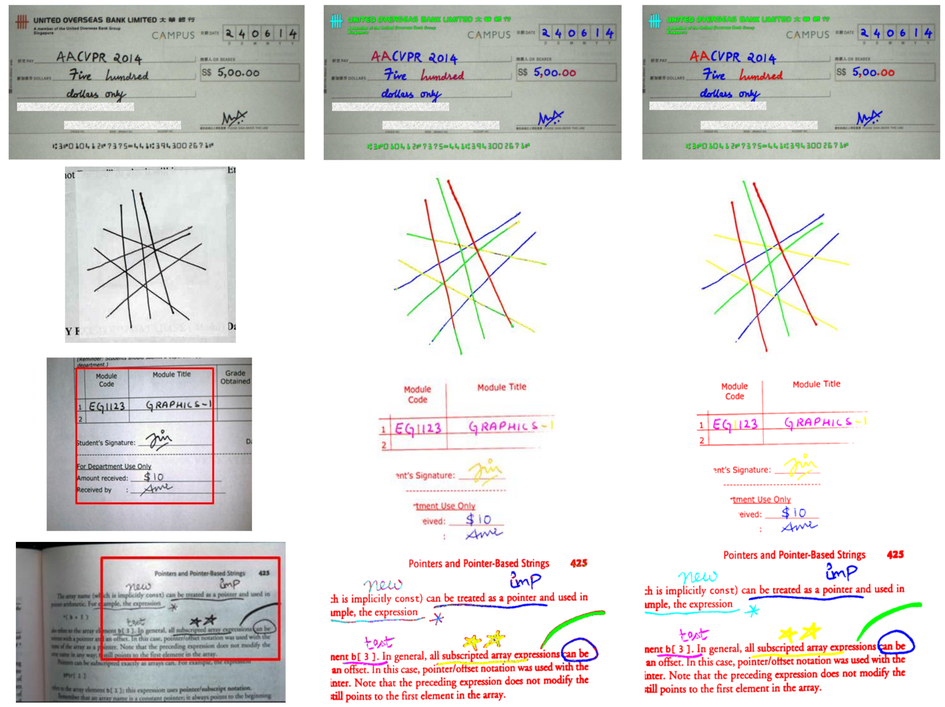
➢ To simplify the setup, we bring the camera and light together

➢Although accuracy is a bit compromised, we capture important discriminative information (retro reflectance, specular highlights)





Results



Conclusions

1. A slanted camera increases the sampling region of the 2D BRDF space.
2. This enhances the performance of BRDF-based material classification.
3. The first work to analyse BRDF for ink identification, an important problem in forensics.
4. A simple handheld camera-flashlight device for data capture.

References

1. G. Jinwei and C. Liu, “Discriminative illumination: Per-pixel classification of raw materials based on optimal projections of spectral BRDF,” in Proc. CVPR, 2012.
2. O. Wang, P. Gunawardane, S. Scher, and J. Davis, “Material classification using BRDF slices,” in Proc. CVPR, pp. 2805 –2811, 2009.
3. S. Rusinkiewicz, “A New Change of Variables for Efficient BRDF Representation,” in *Eurographics Rendering Workshop*, pp. 11 – 22, 1998.

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