Laser Guidance Countermeasures - Materials

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Abstract

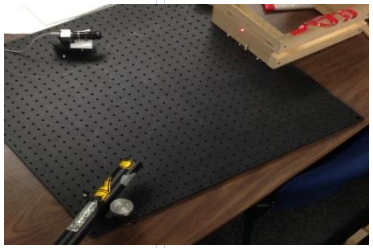
The purpose of this experiment was to analyze the ability of common materials to maximize scattering of laser light.

Background

A laser-guided system's performance decreases when its beam is scattered by a surface. Different surfaces reflect the beam with different intensities and amounts of scattering.

Equipment:

- ThorLab HRP020 HeNe Laser, 632.8 nm, 2.0 mW
- ThorLab CCD camera

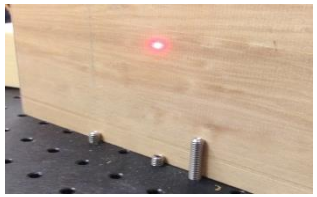


Methods

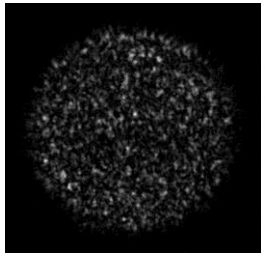
Used MATLAB to run statistic analysis and create contour plots of intensity for images of the laser light on each surface (red is most intense, blue is least).

intensity.m

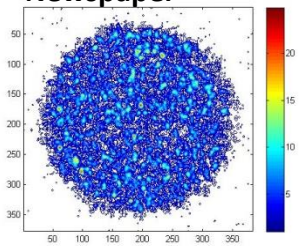
```
clear all
I = imread('newspaper4.jpg');
s1 = double(I./10);
figure(1)
imcontour(s1,20)
I = imread('wood4.jpg');
s2 = double(I./10);
figure(2)
imcontour(s2,20)
I = imread('foam4.jpg');
s3 = double(I./10);
figure(3)
imcontour(s3,20)
I = imread('plastic5.jpg');
s4 = double(I./10);
figure(4)
imcontour(s4,20)
```

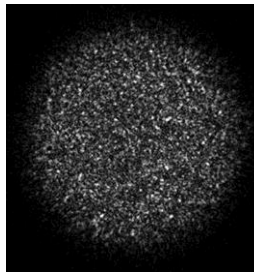


Results

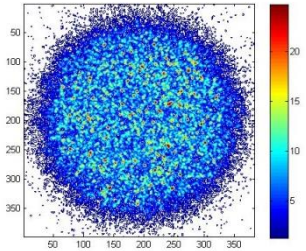


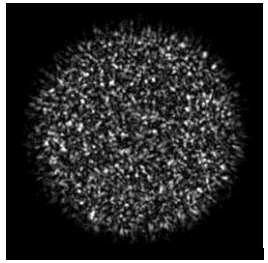
Newspaper



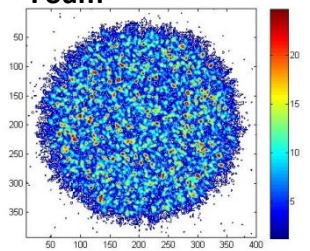


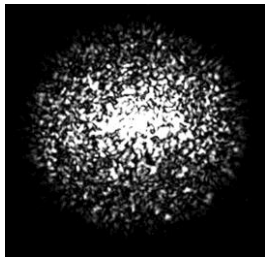
Wood



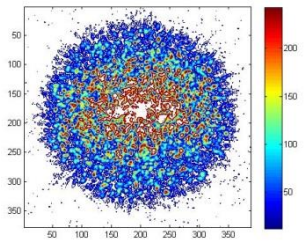


Foam





Plastic



Conclusion

The least intense reflected light comes from the newspaper surface, as indicated by the MATLAB plot. The most scattering occurs with this material, making it the best, readily available countermeasure against laser capabilities.

References

Halliday., Resnick., & Walker. (2011). Fundamentals of Physics (Ninth ed.). Hoboken: Wiley Custom.

Kasap, S. O. (2001). Optoelectronics and photonics: principles and practices. Upper Saddle River, NJ: Prentice Hall.

Silfvast, W. T. (1996). Laser fundamentals. Cambridge [England: Cambridge University Press

Acknowledgements

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MSC Graphics