



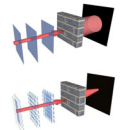
FOCUSING LIGHT THROUGH SCATTERING MEDIUM

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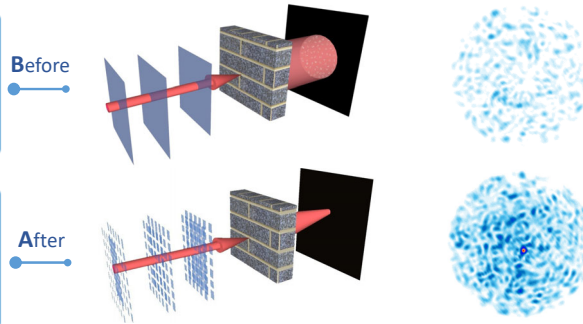
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INTRODUCTION

Plane polarized light passing through a chaotic (scattering) medium forms a speckle pattern at the end.

However, light can be successfully focused through a scattering medium by shaping its wavefront.



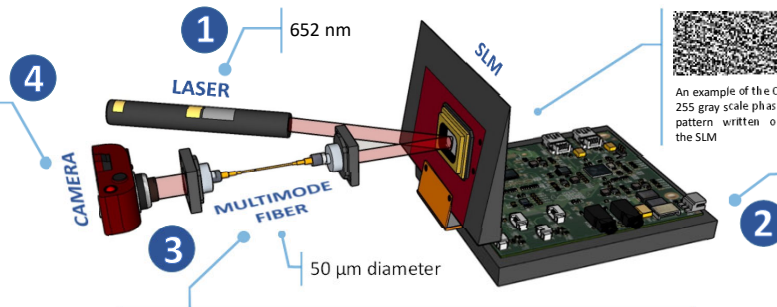
PURPOSE



- We aim to focus light when a multimode fiber is chosen as the scattering medium and a Spatial Light Modulator (SLM) is used as a wavefront synthesizer.
- We also aim to increase both the total intensity and the intensity at the target position at the end of the multimode fiber.

EXPERIMENTAL APPARATUS

- A focused point is obtained on the camera.
- The intensity of the focused point is increased.



- Spatial Light Modulator is a 1280x768 pixel device that has the ability to change the refractive index of each single pixel independently.
- SLM is used to shape the light according to the transmission properties of multimode fiber.

Analogy: A multimode fiber behaves as a scattering medium due to the interference between the many modes it possesses.

Advantage: Scattering to higher angles do not occur, i.e. a multimode fiber has a much more lower loss compared to most of the other scattering medium.

FOR MORE INFO



RESULTS & CONCLUSION

Target at (x = 520, y = 380)

RESULTS

Intensity increased at target:

10.000x

Total intensity increase:

3x

Enhancement:

18x

* For all figures colorbar axis is scaled with respect to the maximum intensity value after wavefront shaping and normalized afterwards.

Target at (x = 410, y = 380)

RESULTS

Intensity increased at target:

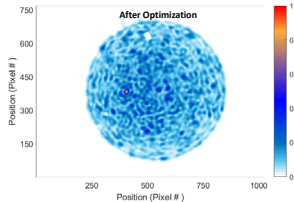
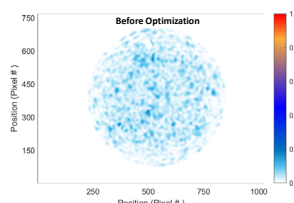
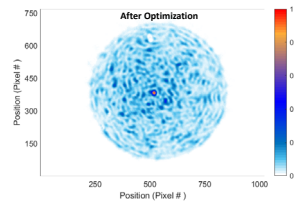
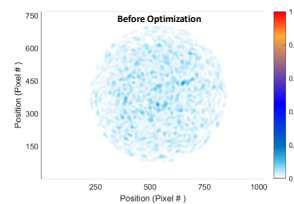
12.000x

Total intensity increase:

3x

Enhancement:

16x



CONCLUSION

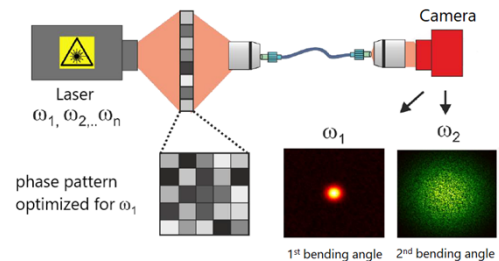


- It is possible to focus light and increase intensity after a multimode fiber by using the wavefront shaping technique.
- We managed to focus light at different positions and increase the intensity at the target positions approximately by 10.000 times.
- This high-resolution imaging method opens the doors to many applications mainly in the biomedical researches such as microendoscopy.

FUTURE PLAN



- We plan to build a spectrometer using wavefront shaping method.
- By bending the multimode fiber in small angles the change in the image will be observed and from the correlations the reaction of image to the bending will be determined using artificial intelligence.



ACKNOWLEDGEMENT

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