THE IMPACT OF SURFACE TEXTURE ON THE VISIBILITY OF INTERFERENCE PATTERN USING MICHELSON INTERFEROMETER

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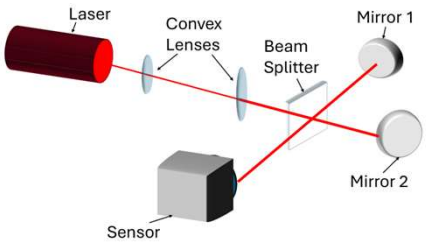
Overview

Surface texture plays a crucial role in determining the **physical and chemical properties** of manufactured parts. In this study, we used the **Michelson interferometer** to investigate surface textures by comparing the **visibility of fringes** with and without placing a **textured surface** in one of the interferometer's arms, using both **simulated and experimental** results. The findings demonstrate that the **Michelson interferometer** offers a **fast and efficient method** for examining the characteristics of textured surfaces.

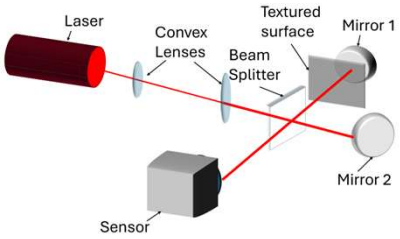
Method

1. **Set up a Michelson Interferometer**, including the **He-Ne** laser, two **convex lenses** to expand and collimate the beam, a **beam splitter** and a **CMOS sensor**, to obtain the fringe pattern.
2. Prepare a **textured surface**: Polish **glass slides** with different **grit sandpapers** and place it in front of one of the mirrors.
3. Record the **Interference pattern**: Record the interference pattern with and without the **textured surface** placed in one of the interferometer arms.
4. Compare the **visibility of the fringe patterns** obtained in step 3.
5. Simulate the **Michelson Interferometry results**: Simulate the Michelson Interferometry result and **compare them with the experimental results**.

Michelson interferometer

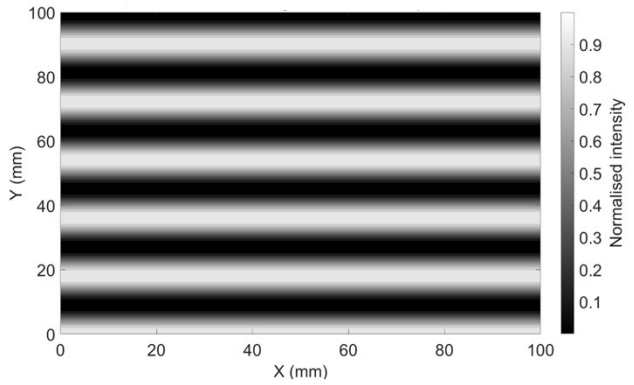


Michelson interferometer with textured surface

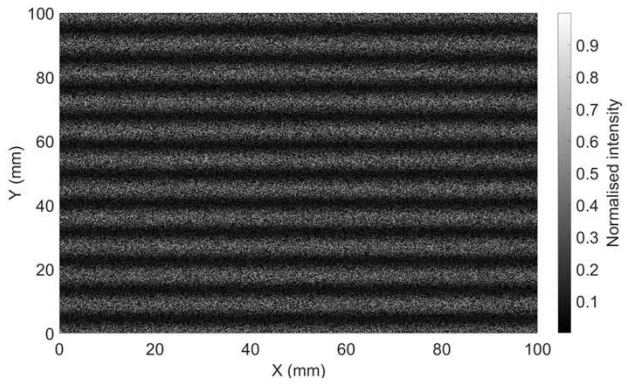


Simulation

Simulated Michelson interferometry fringes.

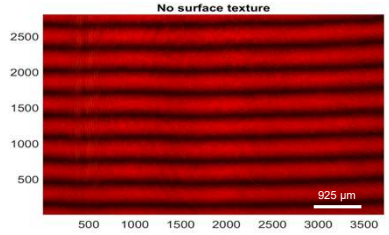


Simulated fringes when a textured surface with a root-mean-square height of 0.58 μm is placed in front of mirror 1.

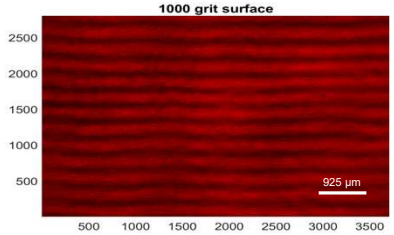


Experimental Results

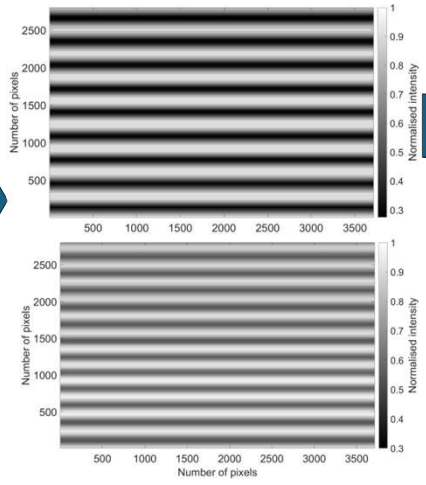
Michelson interference fringes



Michelson interference fringes **with** textured surface



Averaging along the rows to minimise the impact of unwanted patterns due to noise, laser artifacts, etc.



Visibility of fringes is 0.44

Visibility of fringes is 0.29

Conclusion

The results demonstrate that as the **surface texture increases**, the **visibility of the fringes decreases**. This suggests that the **coherence of the light** is reduced as the **texture of the surface** increases.

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