Holographic system for high-precision control in selective laser sintering systems

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Methods

Increasing angle
↓
Local increase in strips density

Increase in line density on a local spherical inhomogeneity

Altitude spatial resolution:
\[ \Delta h = 0.036 \times R \]

Surface spatial resolution:
\[ R = \frac{D}{S} \times \frac{1}{\zeta} \]

\( D \) – is diameter of illuminated area
\( S \) - size of image sensor smallest side

\[ \zeta = \frac{2 \times \sin(\alpha)}{\lambda} \]
Experimental setup:
1 – He:Ne laser;
2 – 45° mirror;
3 – beam expander;
4 – beam splitter;
5 – object;
6 – mirror;
7 – CCD camera.

He:Ne laser:
- wavelength - 632.8 nm;
- laser power – 5 mW;
- beam diameter – 1.4 mm;
- spectral line width is less than 5 pm.

Image sensor:
- pixel size – 4.4 μm;
- image sensor size – 1600×1200 pixels;
- the shortest exposure time – 5×10^{-5} s.
Results

Fraction size of the titanium powder - 50 μm

Characteristic size of An Inhomogeneity on a surface – 100 μm

Photo of a part
Hologram of a part

Calculated surface spatial resolution \((R)\) is 23 μm.

Calculated altitude spatial resolution \((\Delta h)\) 1 μm.
Thank you for your attention!

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