

- 41 -

Claims

1. A spectral imaging system comprising:
a spatial encoder comprising a first light encoding device comprising a first
5 mask for spatial encoding, the first mask being configured with one or more encoding
patterns;
a spectral encoder comprising:
a dispersion arrangement for splitting spatially encoded light from the
first light encoding device into a plurality of components; and
10 a second light encoding device comprising a second mask for spectral
encoding of the plurality of components, the second mask having one or more
encoding patterns; and
at least one single-pixel photodetector positioned to measure light that is
encoded by the masks;
15 wherein the spatial encoder is operable to spatially encode light by generating
a sequence of different patterns or partial patterns of the one or more encoding patterns
of the first mask; and
wherein the spectral encoder is operable to spectrally encode light by relative
movement between the dispersion arrangement and the second mask.
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2. A spectral imaging system according to claim 1, wherein the spatial encoder
comprises a window structure comprising at least one aperture that is positionable in
line with the first light encoding device to selectively expose at least part of the one or
more encoding patterns of the first mask, and wherein the first mask is movable relative
25 to the at least one aperture in oscillatory fashion.
3. A spectral imaging system according to claim 2, wherein the at least one
aperture is also positionable in line with the second light encoding device to selectively
expose at least part of the one or more encoding patterns of the second mask, and
30 wherein the second mask is movable relative to the at least one aperture in oscillatory
fashion.
4. A spectral imaging system according to claim 1, wherein the first mask is a
dynamic mask that is operable to generate said sequence of different patterns.
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- 42 -

5. A spectral imaging system according to claim 4, wherein the dynamic mask comprises a MEMS programmable slit or a digital micromirror device.
6. A spectral imaging system according to any one of claims 1 to 5, wherein the
5 dispersion arrangement comprises an optical band-pass filter and a diffraction grating, and wherein the diffraction grating is configured for oscillatory rotation.
7. A spectral imaging system according to any one of claims 1 to 6, wherein the
10 dispersion arrangement comprises an optical band-pass filter and a fixed-position diffraction grating that is optically coupled to a scanning mirror that is configured for oscillatory rotation.
8. A spectral imaging system according to any one of claims 1 to 7, comprising
15 a plurality of single-pixel photodetectors, wherein at least one mask comprises a plurality of zones, respective zones being associated with respective ones of the plurality of single-pixel photodetectors.
9. A light encoding device for generating an encoding pattern for an imaging
20 process, the light encoding device including:
one or more oscillators; and
a mask coupled to the one or more oscillators, the mask having one or more patterns each comprising opaque and transparent sections;
wherein the one or more oscillators are operable to move the mask across an
aperture to selectively expose at least part of said one or more patterns through the
25 aperture to thereby generate the encoding pattern.
10. The light encoding device of claim 9, wherein a first oscillator of the one or
more oscillators is coupled to a second oscillator of the one or more oscillators by an
auxiliary mass.
11. The light encoding device of claim 9 or claim 10, configured to receive a driving
30 force in a direction substantially parallel to an oscillation direction of at least one of the one or more oscillators, and/or in a direction substantially perpendicular to an oscillation direction of at least one of the one or more oscillators.

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- 43 -

12. The light encoding device of any one of claims 9 to 11, comprising a plurality of patterns.

13. The light encoding device of claim 12, wherein the mask is a Hadamard mask.

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14. A light encoding device according to any one of claims 9 to 13, wherein the one or more oscillators are coupled to one or more respective support structures.

15. A light encoding device according to claim 14, wherein at least one of the support structures is fixed.

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16. A light encoding device according to any one of claims 9 to 15, wherein at least one of the oscillators is coupled to a gimbal, the gimbal being coupled to a gimbal suspension oscillator.

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17. A light encoding device according to any one of claims 9 to 16, wherein the mask is coupled to at least one oscillator configured to oscillate in a first direction, and at least one oscillator configured to oscillate in a second direction that is orthogonal to the first direction.

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18. A light encoding device according to any one of claims 9 to 17, wherein the light encoding device is a substantially planar structure.

19. An imaging system, comprising:

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one or more light encoding devices according to any one of claims 9 to 18;

a window structure comprising at least one aperture that is positionable in line with the one or more light encoding devices to selectively expose at least part of the one or more patterns of the mask or masks, the window structure also being positionable in line with an object or a light source;

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one or more actuators to cause relative movement between the mask or masks and the at least one aperture; and

at least one single-pixel photodetector positioned to measure light from the object or the light source that is encoded by, and transmitted through, the mask or masks.

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- 44 -

20. An imaging system according to claim 19, comprising one or more position sensors to monitor a position of the mask, or respective positions of the masks.

5 21. A spectral imaging system according to any one of claims 1 to 8, wherein the first light encoding device is a light encoding device according to any one of claims 9 to 18, and/or wherein the second light encoding device is a light encoding device according to any one of claims 9 to 18.

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