CLAIMS

1. A method comprising:

controlling, by a computing device, based on a target height of a layer to be deposited on a component by directed energy deposition, an energy source directed at the component to advance an energy beam along a first path to form an advancing molten pool on the component;

controlling by the computing device, based on the target height of the layer, a material delivery device to deliver a material to the advancing molten pool,

wherein the material combines with the advancing molten pool to form a first raised track having an actual height, wherein the layer comprises the first raised track, wherein a deposited region of the component comprises the layer, and wherein the actual height affects a resultant microstructure within the deposited region;

characterized by:

controlling, by the computing device, a cooling rate within the deposited region by controlling the material delivery device and the energy source, wherein the cooling rate regulates the resultant microstructure, wherein controlling the cooling rate further comprises:

controlling a hatch spacing between the first raised track and a second raised track, wherein the layer comprises the second raised track, wherein controlling the hatch spacing affects at least one of a molten pool temperature, a subsurface temperature of a subsurface region of the component within the deposited region, or a surface temperature of a surface region of the component within the deposited region.

2. The method of claim 1, wherein controlling the cooling rate further comprises controlling a pause time between a time at which the first raised track is formed and a time at which the second raised track is formed,

wherein controlling the pause time affects at least one of the molten pool temperature, the subsurface temperature of the subsurface region of the component within

the deposited region, or the surface temperature of the surface region of the component within the deposited region.

3. The method of claim 1 or 2, further comprising controlling, by the computing device, at least one of an average beam power, a peak beam power density, a beam heat input, a ratio of a molten pool depth to the nominal height, or a material flux of the material.

4. The method of any of the preceding claims, wherein the first track at least partially overlaps the second track.

5. The method of any of the preceding claims, wherein the first track substantially overlaps the second track.

6. The method of any of the preceding claims, wherein forming the first track comprises advancing the energy beam along a first direction, and wherein forming the second track comprises advancing the energy beam along a second direction opposite the first direction.

7. The method of any of the preceding claims, wherein the energy beam comprises a laser beam or an electron beam.

8. A system comprising:
an energy source;
a material delivery device; and
characterised by:
a computing device, wherein the computing device is configured to:
control, based on a target height of a layer to be deposited on a component by directed energy deposition, the energy source directed at the

component to advance an energy beam along a first path to form an advancing molten pool on the component, and

control, based on the target height of the layer, a material delivery device to deliver a material to the advancing molten pool,

wherein the material combines with the advancing molten pool to form a first raised track having an actual height, wherein the layer comprises the first raised track,

wherein a deposited region of the component comprises the layer, and wherein the actual height regulates a resultant microstructure within the deposited region, control a cooling rate within the deposited region by controlling the material delivery device and the energy source, wherein the cooling rate regulates the resultant microstructure, wherein the computing device is configured to control the cooling rate by:

controlling a hatch spacing between the first raised track and a second raised track, wherein the layer comprises the second raised track, wherein controlling the hatch spacing affects at least one of a molten pool temperature, a subsurface temperature of a subsurface region of the component within the deposited region, or a surface temperature of a surface region of the component within the deposited region.

9. The system of claim 8, wherein the computing device is further configured to control the cooling rate by controlling a pause time between a time at which the first raised track is formed and a time at which the second raised track is formed, and

wherein controlling the pause time affects at least one of the molten pool temperature, the subsurface temperature of the subsurface region of the component within the deposited region, or the surface temperature of a surface region of the component within the deposited region.

10. The system of claim 8 or 9, wherein the computing device is further configured to control at least one of an average beam power, a peak beam power density, a beam heat input, a ratio of a molten pool depth to the nominal height, or a material flux of the material.

11. A computer readable storage medium comprising instructions that, when executed, cause at least one processor to:

control, based on a target height of a layer to be deposited on a component by directed energy deposition, an energy source directed at the component to advance an energy beam along a first path to form an advancing molten pool on the component,

control, based on the target height of the layer, a material delivery device to deliver a material to the advancing molten pool,

wherein the material combines with the advancing molten pool to form a first raised track having an actual height, wherein the layer comprises the first raised track, wherein a deposited region of the component comprises the layer, and wherein the actual height affects a resultant microstructure within the deposited region, and characterized in that the instructions, when executed, cause the at least one processor to:

control a cooling rate within the deposited region by controlling the material delivery device and the energy source, wherein the cooling rate regulates the resultant microstructure, wherein the instructions, when executed, cause the at least one processor to control the cooling rate by:

controlling a hatch spacing between the first raised track and the second raised track, wherein the layer comprises the second raised track, wherein controlling the hatch spacing affects at least one of a molten pool temperature, a subsurface temperature of a subsurface region of the component within the deposited region, or a surface temperature of a surface region of the component within the deposited region.

12. The computer readable storage medium of 11, further comprising instructions that, when executed, cause the at least one processor to control the cooling rate by

controlling a pause time between a time at which the first raised track is formed and a time at which a second raised track is formed,

wherein controlling the pause time regulates at least one of the molten pool temperature, the subsurface temperature of the subsurface region of the component

within the deposited region, or the surface temperature of the surface region of the component within the deposited region.