DEVICES, SYSTEMS, AND METHODS FOR MULTI-PROJECTOR THREE DIMENSIONAL PRINTING

CROSS-REFERENCES

[0001] This utility patent application claims the benefit of priority to U.S. Provisional Patent Application No. 62/826,361, filed on March 29, 2019, entitled METHOD AND SYSTEM FOR METHODOLOGIES AND HARDWARE FOR MULTI-PROJECTOR THREE DIMENSIONAL PRINTING, the contents of which are incorporated herein by reference, in their entirety.

SUMMARY

[0002] Disclosed embodiments relate to devices, systems, and methodologies for three dimensional printing, for example, additive manufacturing, which can include a StereoLithographic Approach (SLA) and/or Digital Light Patterning (DLP) for three dimensional printing.[0002a] According to a first aspect, there is provided a patterning module for an additive manufacturing system as part of an array of patterning modules under common control by a controller that is remote to the array of patterning modules, the patterning module including: a micro-projector configured to project energy for performing energy patterning for additive manufacturing; and a multi-axis micro-positioning system to control positioning of the micro-projector relative to micro-projectors of other patterning modules within the array of patterning modules, wherein the micro-positioning system includes a plurality of actuators operated based on patterning data provided by the remote controller.

[0002b] According to a second aspect, there is provided an additive manufacturing device including:a device controller; and an array of patterning modules under common control of the device controller, wherein the device controller is arranged remote relative to the patterning module array, wherein each of the patterning modules within the array includes: a micro-projector configured to project energy for performing energy patterning for additive manfucturing; and a multi-axis micro-positioning system to control positioning of the micro-projector relative to micro-projectors of other patterning modules of the array of patterning modules, wherein the micro-positioning system includes a plurality of actuators operated based on patterning data provided by the device controller.

[0002c] According to a third aspect, there is provided a method of performing additive manufacturing including: controlling emission of projected energy by an array of a plurality of patterning modules by a device controller that is remote to the patterning module array, wherein each of the patterning modules within the array includes a micro-projector configured to project energy for performing energy patterning; and controlling positioning of the micro-projector relative to micro-projectors included in other patterning modules within the patterning module array using a multi-axis, micro-positioning system, wherein the micro-positioning system includes a plurality of actuators operated based on instructions provided by the remote device controller.

[0003] In accordance with at least some disclosed embodiments, an array of energy patterning (e.g., light patterning) modules may be used in a 3D printing methodology.

[0004] In accordance with at least some disclosed embodiments, each patterning module may include a multi-axis, micro-positioning system operating in conjunction with an energy patterning system including a projector.

[0005] In accordance with at least some disclosed embodiments, the projection system and/or micro-positioner may participate in a feed-back control loop for automated alignment of the energy patterning system to generate a continuous display area.

[0006] In accordance with at least some disclosed embodiments, each patterning module may contain an on-board micro-computer which is responsible for receiving and distributing commands to the energy patterning system and/or the micro-positioning system from a local or remote host. The communication between the micro-computer and the host may be (i) wired or wireless, (ii) encrypted, and (iii) bi-directional.

[0007] In accordance with at least some disclosed embodiments, the micro-computer may receive commands/data which are sent to the patterning module to control energy output (both pattern and intensity) of the projection of the energy patterning system. The micro-positioner may receive commands/data which are used to adjust the location of the patterning module along with the projector within the patterning module.