CLAIMS

1. A method for controlling a multi-axis machine tool configured to process a workpiece using a tool, the multi-axis machine tool comprising a rotary actuator configured to impart relative movement between the tool and the workpiece about a first axis, a first linear actuator configured to impart relative movement between the tool and the workpiece along a second axis, a second linear actuator configured to impart relative movement between the tool and the workpiece along a third axis, and a third linear actuator configured to impart relative movement between the tool and the workpiece along at least one selected from the group consisting of the second axis and the third axis, wherein the third linear actuator is configured to impart relative movement between the tool and the workpiece at a bandwidth that is higher than a bandwidth with which relative movement between the tool and the workpiece can be imparted by the first linear actuator or the second linear actuator, the method comprising:

receiving a preliminary rotary actuator command, the preliminary rotary actuator command having frequency content exceeding a bandwidth of the rotary actuator;

generating a processed rotary actuator command based, at least in part, on the preliminary rotary actuator command, the processed rotary actuator command having frequency content within a bandwidth of the rotary actuator;

generating a first linear actuator command, a second linear actuator command and a third linear actuator command based, at least in part, on the processed rotary actuator command;

outputting the processed rotary actuator command to the rotary actuator;

outputting the first linear actuator command to the first linear actuator;

outputting the second linear actuator command to the second linear actuator; and

outputting the third linear actuator command to the third linear actuator.

2. The method of claim 1, wherein the second axis is orthogonal to the first axis.

3. The method of claim 1, wherein generating the processed rotary actuator command comprises filtering the preliminary rotary actuator command.

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4. The method of claim 1, wherein generating the first linear actuator command and the second linear actuator command comprises:

generating a set of intermediate linear actuator commands based on the preliminary rotary actuator command and at least one preliminary linear actuator command; and

processing the set of intermediate linear actuator commands based, at least in part, on the processed rotary actuator command.

5. The method of claim 1, further comprising processing the workpiece with the tool while imparting relative movement about the first axis.

6. The method of claim 5, wherein processing the workpiece with the tool comprises directing laser light to the workpiece.

7. A controller for controlling a multi-axis machine tool configured to process a workpiece using a tool, the multi-axis machine tool comprising a rotary actuator configured to impart relative movement between the tool and the workpiece about a first axis, a first linear actuator responsive to a first linear actuator command to impart relative movement between the tool and the workpiece along a second axis, a second linear actuator responsive to a second linear actuator command to impart relative movement between the tool and the workpiece along a third axis, and a third linear actuator responsive to a third linear actuator command to impart relative movement between the tool and the workpiece along at least one selected from the group consisting of the second axis and the third axis, wherein the third linear actuator is configured to impart relative movement between the tool and the workpiece at a bandwidth that is higher than a bandwidth with which relative movement between the tool and the workpiece can be imparted by the first linear actuator or the second linear actuator, the controller comprising:

at least one processor and computer memory accessible to the at least one processor, the computer memory having instructions stored thereon which, when executed by the at least one processor, cause the controller to:

generate a processed rotary actuator command based, at least in part, on a preliminary rotary actuator command having frequency content exceeding a bandwidth of the

rotary actuator, the processed rotary actuator command having frequency content within a bandwidth of the rotary actuator;

generate the first linear actuator command, the second linear actuator command and the third linear actuator command based, at least in part, on the processed rotary actuator command;

output the processed rotary actuator command, the first linear actuator command, the second linear actuator command and the third linear actuator command.

8. A multi-axis machine tool, comprising:

a tool configured to process a workpiece;

a first rotary actuator configured to impart relative movement between the tool and the workpiece about a rotary axis extending along a first axis;

a first linear actuator configured to impart relative movement between the tool and the workpiece along a linear axis extending along a second axis;

a second linear actuator configured to impart relative movement between the tool and the workpiece along a linear axis extending along a third axis;

a third linear actuator configured to impart relative movement between the tool and the workpiece along at least one selected from the group consisting of the first axis, the second axis and the third axis, wherein the third linear actuator is configured to impart relative movement between the tool and the workpiece at a bandwidth that is higher than a bandwidth with which relative movement between the tool and the workpiece can be imparted by the first linear actuator or the second linear actuator; and

a controller operatively coupled to the first rotary actuator, the first linear actuator and the second linear actuator, the controller configured to:

generate a processed rotary actuator command based, at least in part, on a preliminary rotary actuator command having frequency content exceeding a bandwidth of the first rotary actuator, the processed rotary actuator command having frequency content within a bandwidth of the first rotary actuator;

generate a first linear actuator command and a second linear actuator command based, at least in part, on the processed rotary actuator command;

output the processed rotary actuator command to the first rotary actuator;

output the first linear actuator command to the first linear actuator; and

output the second linear actuator command to the second linear actuator.

9. The multi-axis machine tool of claim 8, further comprising a second rotary actuator configured to impart relative movement between the tool and the workpiece about the first axis, wherein a bandwidth of the second rotary actuator is higher than a bandwidth of the first rotary actuator.

10. The multi-axis machine tool of claim 8, further comprising a laser source and the tool includes a focused beam of laser light.

11. The multi-axis machine tool of claim 8, wherein the tool includes a waterjet.

12. The multi-axis machine tool of claim 8, wherein the third linear actuator includes a mirror.

13. The multi-axis machine tool of claim 8, wherein the third linear actuator includes a lens.

14. The multi-axis machine tool of claim 8, wherein the third linear actuator includes an acousto-optic deflector (AOD) system.

15. The multi-axis machine tool of claim 8, wherein the third linear actuator is further configured to impart relative movement between the tool and the workpiece along the first axis.

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