Claims

1. An endoscopy surgical instrument controller for an endoscopy surgical instrument, the endoscopy surgical instrument comprising

a driving motor;

a following motor;

a joint arrangement;

a pulling tendon that couples the driving motor to the joint arrangement; and

a pushing tendon that couples the following motor to the joint arrangement, wherein the joint arrangement is actuated by the driving motor withdrawing the pulling tendon and the following motor releasing the pushing tendon,

the endoscopy surgical instrument controller comprising:

at least one processor; and

at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the endoscopy surgical instrument controller at least to:

establish a displacement range occurring at the pulling tendon, within which the pulling tendon experiences maximum tension from being withdrawn by the driving motor;

determine whether a command received to actuate the joint arrangement causes the driving motor to withdraw a length of the pulling tendon that falls within the displacement range; and

instruct the following motor to restrict the releasing of the pushing tendon when the command is received, whereby a length of the pushing tendon released by the following motor is less than a length of the pulling tendon withdrawn by the driving motor over the displacement range, so that the tension experienced in the pulling tendon is caused by an extension of the pulling tendon.

2. The endoscopy surgical instrument controller of claim 1, wherein the endoscopy surgical instrument controller is further configured to:

instruct either the driving motor to have the length of the pulling tendon withdrawn or the following motor to have the length of the pushing tendon released be in accordance with a scaling factor to each other during at least a portion of the operation of the driving motor and the following motor.

3. The endoscopy surgical instrument controller of claim 1 or 2, wherein the scaling occurs over the entire displacement range.

4. The endoscopy surgical instrument controller of claim 2, wherein the scaling factor is at unity for at least a portion of the operation of the driving motor and the following motor.

5. The endoscopy surgical instrument controller of any one of the claims 1, 2 and 4, wherein the endoscopy surgical instrument controller is further configured to:

instruct the following motor to prevent release of the pushing tendon after the command is detected.

6. The endoscopy surgical instrument controller of any one of the claims 1, 2, 4 and 5, wherein the endoscopy surgical instrument controller is further configured to:

operate the driving motor and the following motor so that the length of the pulling tendon withdrawn is approximately the same as the length of the pushing tendon released before the command is detected.

7. The endoscopy surgical instrument controller of any one of the claims 1 to 6, wherein the pulling tendon and the pushing tendon of the endoscopy surgical instrument Is a singular piece.

8. The endoscopy surgical instrument controller of any one of the claims 1 to 7, wherein the endoscopy surgical instrument controller is further configured to:

detect for stoppage of the driving motor to establish a point within the displacement range where maximum tension is experienced by the pulling tendon.

9. An endoscopy system comprising:

an endoscopy surgical instrument comprising:

a driving motor;

a following motor;

a joint arrangement;

a pulling tendon that couples the driving motor to the joint arrangement; and

a pushing tendon that couples the following motor to the joint arrangement, wherein the joint arrangement is actuated by the driving motor withdrawing the pulling tendon and the following motor releasing the pushing tendon; and

an endoscopy surgical instrument controller coupled to the endoscopy surgical instrument, the endoscopy surgical instrument controller configured to:

establish a displacement range occurring at the pulling tendon, within which the pulling tendon experiences maximum tension from being withdrawn by the driving motor;

determine whether a command received to actuate the joint arrangement causes the driving motor to withdraw a length of the pulling tendon that falls within the displacement range; and

instruct the following motor to restrict the releasing of the pushing tendon when the command is received, whereby a length of the pushing tendon released by the following motor is less than a length of the pulling tendon withdrawn by the driving motor over the displacement range, so that the tension experienced in the pulling tendon is caused by an extension of the pulling tendon.

10. The endoscopy system of claim 9, wherein the endoscopy surgical instrument controller is further configured to:

instruct either the driving motor to have the length of the pulling tendon withdrawn or the following motor to have the length of the pushing tendon released be in accordance with a scaling factor to each other during at least a portion of the operation of the driving motor and the following motor.

11. The endoscopy system of claim 9 or 10, wherein the scaling occurs over the entire displacement range.

12. The endoscopy system of claim 10, wherein the scaling factor is at unity for at least a portion of the operation of the driving motor and the following motor.

13. The endoscopy system of any one of the claims 9, 10 and 12, wherein the endoscopy surgical instrument controller is further configured to:

instruct the following motor to prevent release of the pushing tendon after the command is detected.

14. The endoscopy system of any one of the claims 9, 10, 12 and 13, wherein the endoscopy system is further configured to:

operate the driving motor and the following motor so that the length of the pulling tendon withdrawn is approximately the same as the length of the pushing tendon released before the command is detected.

15. The endoscopy system of any one of the claims 9 to 14, wherein the pulling tendon and the pushing tendon of the endoscopy surgical instrument is a singular piece.

16. The endoscopy system of any one of the claims 9 to 15, wherein the endoscopy surgical instrument controller is further configured to:

detect for stoppage of the driving motor to establish a point within the displacement range where maximum tension is experienced by the pulling tendon.