CLAIMS

What is claimed is:

1. A steerable catheter assembly comprising:

a catheter with two or more pull wires that flex the catheter;

a control handle coupled to the catheter, the control handle comprising:

a direction control coupled to the two or more pull wires such that adjustment of the direction control adjusts a direction of catheter flex by the two or more pull wires; and

a magnitude control coupled to the two or more pull wires such that adjustment of the magnitude control adjusts the magnitude of catheter flex.

2. The steerable catheter assembly of claim 1, wherein the magnitude control adjusts the magnitude of catheter flex independent of the catheter flex direction.

3. The steerable catheter assembly of any of claims 1-2, wherein the direction control and the magnitude control are selected from the group consisting of levers, knobs, dials, or a device that receives a digital input.

4. The steerable catheter assembly of any of claims 1-3, wherein the control handle comprises a cam member, wherein the magnitude control moves the cam member in an axial direction of the control handle, and wherein the direction control rotates the cam member.

5. The steerable catheter assembly of claim 4 wherein each of the two or more pull wires are coupled to a follower that moves along a cam surface of the cam member.

6. The steerable catheter assembly of any of claims 1-3, wherein the control handle comprises a projection, wherein the magnitude control moves the projection in an axial direction of the control handle, and wherein the direction control rotates the projection.

7. The steerable catheter assembly of claim 6, wherein each of the two or more pull wires are coupled to a gimbal mechanism and movement of the projection positions the gimbal mechanism.

8. The steerable catheter assembly of claim 7 wherein the gimbal mechanism comprises a gimbal ring and a gimbal plate, wherein the gimbal ring is pivotably coupled within a housing of the control handle and the gimbal plate is pivotably coupled within the gimbal ring.

9. The steerable catheter assembly of claim 8, wherein a rolling ball is rotatable coupled to an end of the projection.

10. The steerable catheter assembly of any of claims 8-9, wherein the pull wires are coupled to the gimbal plate, the projection is in contact with the gimbal plate, a position of the projection sets an orientation of the gimbal mechanism, and the orientation of the gimbal mechanism sets positions of the pull wires.

11. The steerable catheter assembly of claim 6, wherein each of the two or more pull wires are coupled to a ball and socket mechanism and movement of the projection positions the ball and socket mechanism.

12. The steerable catheter assembly of claim 11, wherein the projection contacts a socket of the ball and socket mechanism such that a position of the projection sets a position of the socket, and wherein the pull wires are attached to the socket.

13. The steerable catheter assembly of claim 6, wherein each of the two or more pull wires are coupled to a plate that is suspended by a wire and movement of the projection positions the plate.

14. The steerable catheter assembly of claim 13, wherein the projection contacts the suspended plate such that a position of the projection sets a position of the suspended plate, and wherein the pull wires are attached to the suspended plate.

15. The steerable catheter assembly of claim 14, wherein the suspended plate comprises a wire running through a center of the plate, such that the plate is pivotable about its center.

16. The steerable catheter assembly of claim 6, wherein each of the two or more pull wires are coupled to a plate that is supported by a deformable ball and movement of the projection positions the plate.

17. The steerable catheter assembly any of claims 2-16, further comprising a rack and pinon mechanism that transfers motion to the two or more pull wires.

18. The steerable catheter assembly of any of claims 4-5, further comprising a clutch mechanism configured to selectively fix one of the axial position and rotational position of the

cam member while permitting change of the other of the axial or rotational position of the cam member.

19. The steerable catheter assembly of any of claims 6-17, further comprising a clutch mechanism configured to selectively fix one of the axial position and rotational position of the cam member while permitting change of the other of the axial or rotational position of the cam member.

20. The steerable catheter assembly of any of claims 1-19, wherein the control handle independently adjusts a magnitude of radial flex of the catheter and a circumferential angle in which the radial is directed.

21. The steerable catheter assembly of any of claims 1-19, wherein a magnitude of radial flex of the catheter and a circumferential angle in which the radial flex occurs is adjusted without rotating the catheter about a longitudinal axis of the catheter.

22. The steerable catheter assembly of claim 1, wherein the control handle comprises a pair of followers, wherein each follower is coupled to the direction control such that each follower moves in an opposite axial direction in response to the same adjustment of the direction control, and wherein each follower is coupled to at least one pull wire.

23. The steerable catheter assembly of claim 22 further comprising a driver coupled to the pair of followers and the magnitude control such that adjusting the magnitude control moves the driver to equally adjust an axial position of the pair of followers.

24. The steerable catheter assembly of claim 22, wherein the pair of followers are coupled to a dual threaded nut that is rotated by the direction control.

25. The steerable catheter assembly of claim 24 wherein the dual threaded nut includes two sets of opposite threads that engage the followers.

26. The steerable catheter assembly of claim 25 wherein the followers include threads that are opposite from one another, such that a single adjustment of the direction control causes opposite axial movement of the followers.