CLAIMS

What is claimed is:

1. A shared control of goal directed navigation method comprising:

generating a plurality of paths for navigating to a predetermined goal, wherein the plurality of paths are formed into homotopy classes;

predicting one of the plurality of paths as a preferred path in response to computing a probability of various ones of the plurality of paths to the predetermined goal;

using the preferred path as a guide for a shared dynamic window approach (DWA) based local path planning; and

determining a final control command based on a weighted user input, wherein the weighted user input is determined in response to a user input and a weighting factor, the weighting factor corresponding to a measure of crowding of an environment of the preferred path.

2. The method in accordance with Claim 1 wherein generating the plurality of paths for navigating to the predetermined goal comprises using the homotopy classes to restrict a number of the plurality of paths.

3. The method in accordance with Claim 2 wherein generating the plurality of paths for navigating to the predetermined goal further comprises using voronoi diagrams to compute ones of the plurality of paths belonging to each of the homotopy classes.

4. The method in accordance with Claim 2 or Claim 3 wherein computing the probability of various ones of the plurality of paths to the predetermined goal comprises maintaining a probability distribution over the various ones of the plurality of paths in the homotopy classes.

5. The method in accordance with Claim 4 wherein maintaining the probability distribution over the various ones of the plurality of paths in the homotopy classes comprises maintaining the probability distribution over the various ones of the plurality of paths in the homotopy classes using MAXEntIRL.

6. The method in accordance with any of the preceding claims wherein computing the probability of various ones of the plurality of paths to the predetermined goal comprises computing the probability based on a cost function.

7. The method in accordance with any of the preceding claims wherein determining the final control command for the goal directed navigation comprises determining the final control command for the goal directed navigation using inner loop blending.

8. The method in accordance with Claim 7 wherein determining the final control command for the goal directed navigation comprises determining the final control command for the goal directed navigation while calculating a reward for various possible velocities in the shared DWA based local path planning.

9. The method in accordance with any of the preceding claims wherein the weighting factor for the weighted user input is further determined in response to an action which navigates towards the predetermined goal via a homotopy class.

10. A shared control goal directed navigation system comprising:

a user movement control device; and

a shared navigation controller coupled to the user movement control device and generating a plurality of paths for navigating to a predetermined goal, wherein the plurality of paths are formed into homotopy classes, predicting one of the plurality of paths as a preferred path in response to computing a probability of various ones of the plurality of paths to the predetermined goal, using the preferred path as a guide for a shared dynamic window approach (DWA) based local path planning, wherein the shared DWA based local path planning comprises a user input received from the user movement control device, the shared navigation controller further determining a final control command based on a weighted user input, wherein the weighted user input is determined in response to the user input received from the user movement control device and a weighting factor, the weighting factor corresponding to a measure of crowding of an environment of the preferred path.

11. The system in accordance with Claim 10 wherein the shared navigation controller generates the plurality of paths for navigating to the predetermined goal comprises using the homotopy classes to restrict a number of the plurality of paths and using voronoi diagrams to compute ones of the plurality of paths belonging to each of the homotopy classes.

12. The system in accordance with Claim 11 wherein the shared navigation controller computes the probability of various ones of the plurality of paths to the predetermined goal by maintaining a probability distribution over the various ones of the plurality of paths in the homotopy classes.

13. The system in accordance with any of Claims 10 to 12 wherein the shared navigation controller computes the probability of various ones of the plurality of paths to the predetermined goal by computing the probability based on a cost function.

14. The system in accordance with any of Claims 10 to 13 wherein the shared navigation controller determines the final control command for the goal directed navigation using inner loop blending.

15. The system in accordance with any of Claims 10 to 14 wherein the shared navigation controller determines the final control command for the goal directed navigation while calculating a reward for various possible velocities in the shared DWA based local path planning.

16. The system in accordance with any of Claims 10 to 15 wherein the shared navigation controller calculates the weighting factor for the weighted user input further in response to an action which navigates towards the predetermined goal via a homotopy class.

17. The system in accordance with any of Claims 10 to 16 wherein the shared navigation controller is a wheelchair navigation controller.

18. A computer readable medium comprising instructions for a shared navigation controller to perform a method for shared control of goal directed navigation, the instructions causing the shared navigation controller to:

generate a plurality of paths for navigating to a predetermined goal, wherein the plurality of paths are formed into homotopy classes;

predict one of the plurality of paths as a preferred path in response to computing a probability of various ones of the plurality of paths to the predetermined goal;

use the preferred path as a guide for a shared dynamic window approach (DWA) based local path planning, wherein the shared DWA based local path planning comprises a user input; and

determine a final control command based on a weighted user input, wherein the weighted user input is determined in response to the user input and a weighting factor, the weighting factor corresponding to a measure of crowding of an environment of the preferred path.