Motivation:
1. Freedom of movement without need for a defined set of pre-designated paths.
2. Left and right hand motor imagery is utilized to select the desired tasks rather than the conventional approach of one for parsing & one for selection as applied in hex-o-spell design.
3. The design of the interface has been made as simple and intuitive as possible by keeping in mind that the same should be practically realizable. The goal is to make the interface user centered rather than the conventional physically attractive design.

Typical path to traverse:

Start

Obstacle

Obstacle

Figure 1 (Corresponding to positions 1, 3 and 7)

Figure 2 (Corresponding to positions 2, 4 and 5)

Figure 3 (Corresponding to position 6)

Figure 4 (Case where the forward and right paths are blocked)

The default interface is displayed at the start (cf. Figure 1).
Once the wheelchair is driven in the forward direction, it reaches an obstacle and can hardly move forward. Under this circumstance, the command that is likely to come from the user in order of preference is Right, Backward or Forward.

Thus the interface updates itself such that the command Right is given the highest priority since it is most probable that the user will select this command.

Thus the interface will now be displayed as shown in Figure 2.

Similarly, as per other obstacles along the path of the movement of the wheelchair, the GUI gets altered as per real time data to suit the most probable choices that can be expected from the user (cf. Figure 1 - Figure 4).

Multiple Threshold concept:

Two levels of threshold have been considered.

Continuous time-varying signed distance (TSD) in the form of '00', '01' or '10' indicating either of the two classes or no choice is fed as input to the interface depending on the primary thresholds.

If the two intended class outputs are -1 and +1, then the threshold is set at say -0.3 and +0.3 as shown in the Figure above. If the TSD falls below the value of -3, then that particular instantaneous classifier output is considered to belong to class 1 and vice versa.

When the optimum time interval (say 5-6 s) is reached, then at the end of the 6th s interface calculates the strength of both the motor imageries (i.e. both classes) during this interval and the one which reaches the index of difficulty (ID) is selected as the final choice of the user.

Thus index of difficulty is being utilized as a secondary threshold in making a final selection decision.

If the strength of either of the motor imageries fail to reach the ID level, then it is considered as no choice and the pointer moves to the next choice and the cycle is repeated.

Conclusion:
- Shared strategy i.e. Information exchanges between the user interface and the robot manipulator as and when necessary so as to reduce task selection time and become user friendly.
- Being a 2 class paradigm, it is expected that the probability of error occurrence in class identification is minimized along with a quicker traverse between choices.
- Experimentation for subject training & model parameter tuning and for online robot control is currently ongoing.