Pipe length given search space sizes and pipe lengths Search Space with a 30% obstacle ratio. Pipe length obtained by algorithm 600 500 400 300 200 100  $50^{3}$  $75^{3}$  $100^{3}$  $125^{3}$  $150^{3}$  $175^{3}$  $200^{3}$ 100 63 200 125 250 156 300 188 350 219 400 250 150 94 Search space size and 2 pipe lengths