# SC627 Assignment 3 report

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After implementing **Maximum Velocity strategy(MV)** of velocity obstacles algorithm, I encountered following problems and observations.

## 1) Collision  with obstacles

Not able to do maneuver in time to avoid collision

Solution: Increased delay_time t_d so that enough time is available to avoid collision. By the condition $V_{rel} \geq \frac{\vec{PO}}{t_d}$ this increased feasible velocity space. Increased Radius of collision(R) to 0.3m .

Note : Modified Velocity_convert function to account for angles from -pi to pi.

## 2) Due to high velocity change bot Slips at goal and it is drifted a little

Due to high velocity change from 0.15 to 0 when bot is very close to goal. It drifts/slips by which error of final position is large.

Solution : Decreased the search space of velocities(v = 0: 0.05) when the bot is 0.25m or less from goal

## 3) To avoid run-time errors

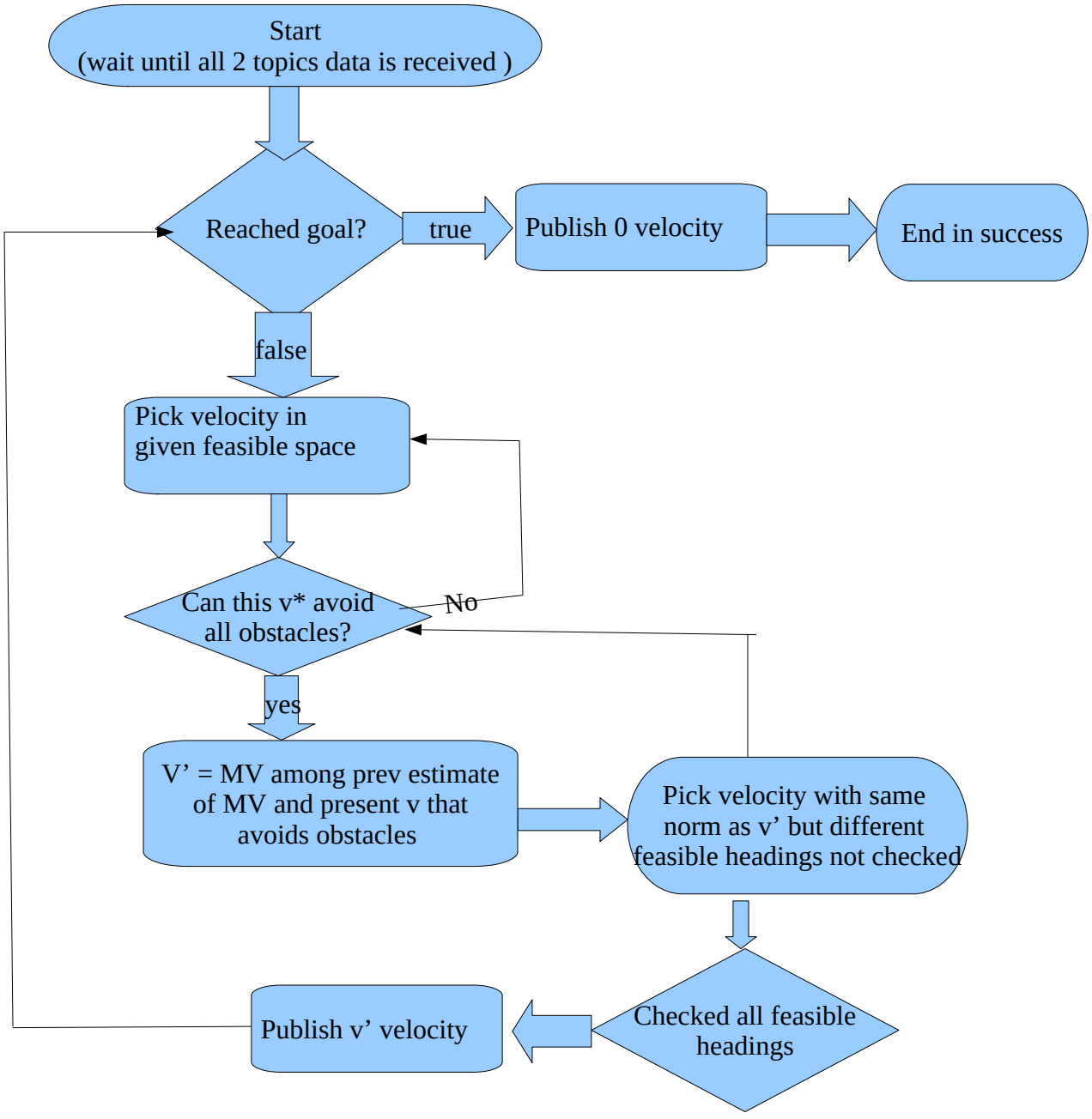
Included conditions so that algorithm starts after data from all topics (/bot_1/odom, /odom_data) are received. One more warning of invalid arcsin argument is not debugged, although algorithm is working fine with this warning.

## * Few Improvements in algorithm

Searched |v| from 0.15 to 0 (at steps of 0.01) and |th(orientation_change)| from -10deg to 10deg (in steps of 1 deg), if  (v*,th*) produced velocity which is avoids all obstacles and also in MV feasible space (i.e. within 45deg heading to goal) then algorithm doesn't search for v<v*, as it wouldn't be MV and out of other feasible (v*,th_i) , velocity with

least goal heading is selected.

# Flow chart of collision_avoidance.py:




➔ Simulation time of the algorithm was 40 to 60 secs. Varies according to the time you start the node

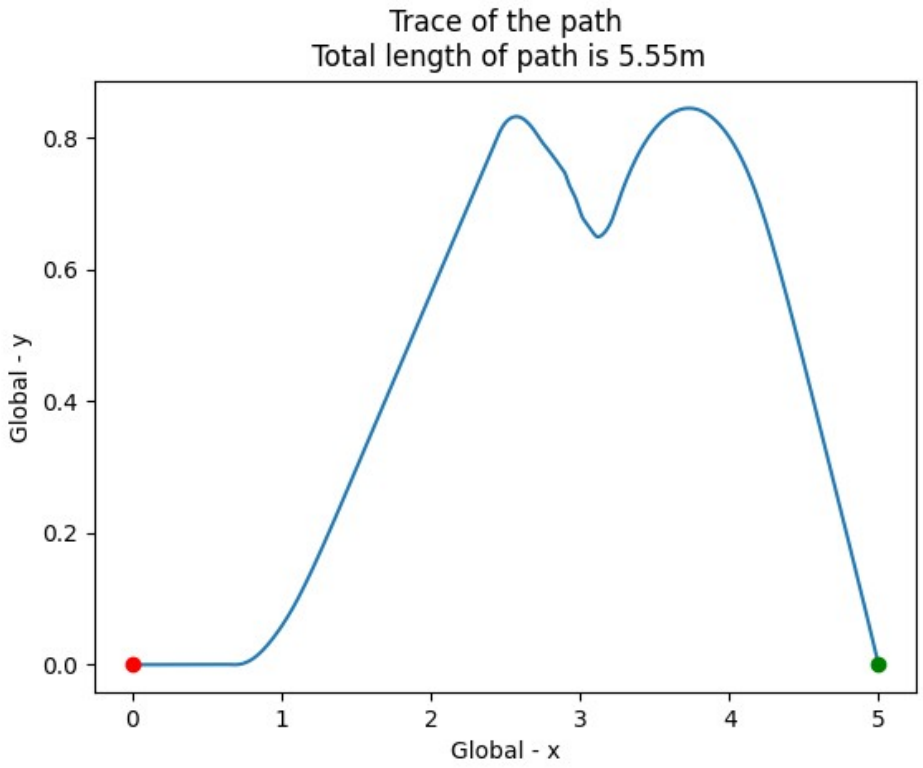



Fig 1: Test 1, Trace of robot

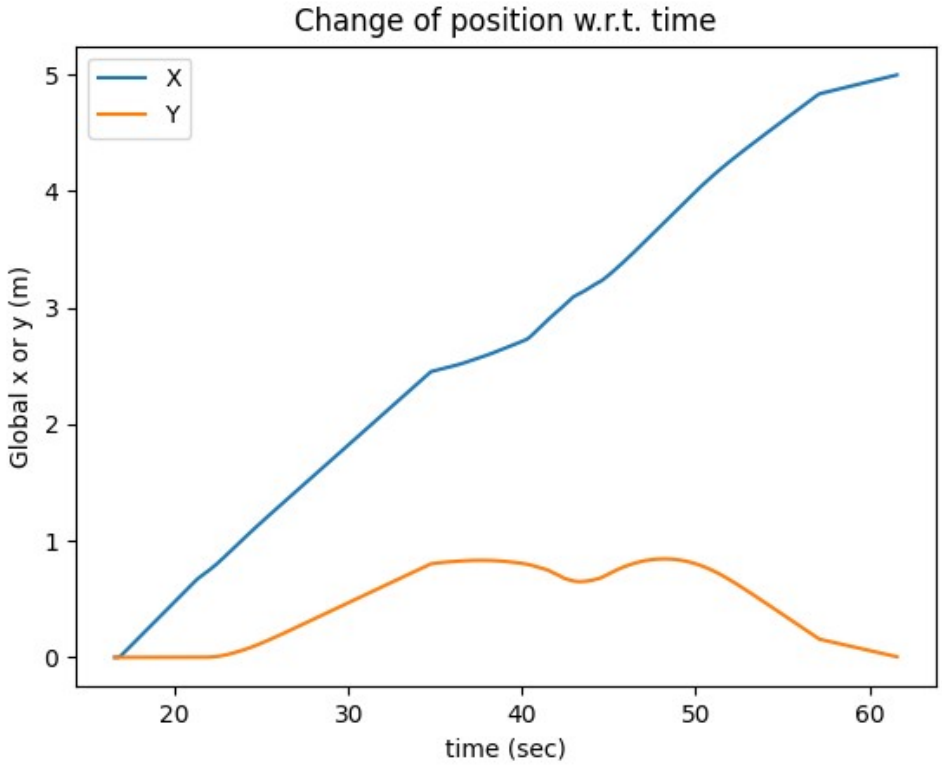



Fig 2: Test 1,  x and y v/s time of robot

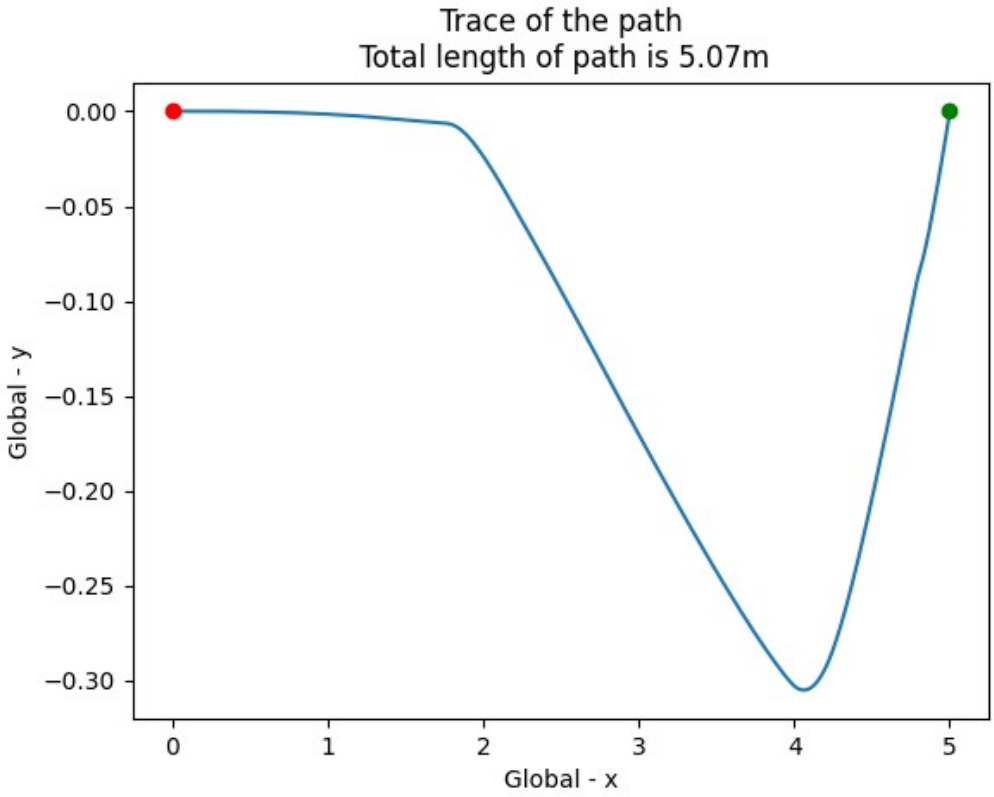



Fig 3: Test 2, Trace of robot

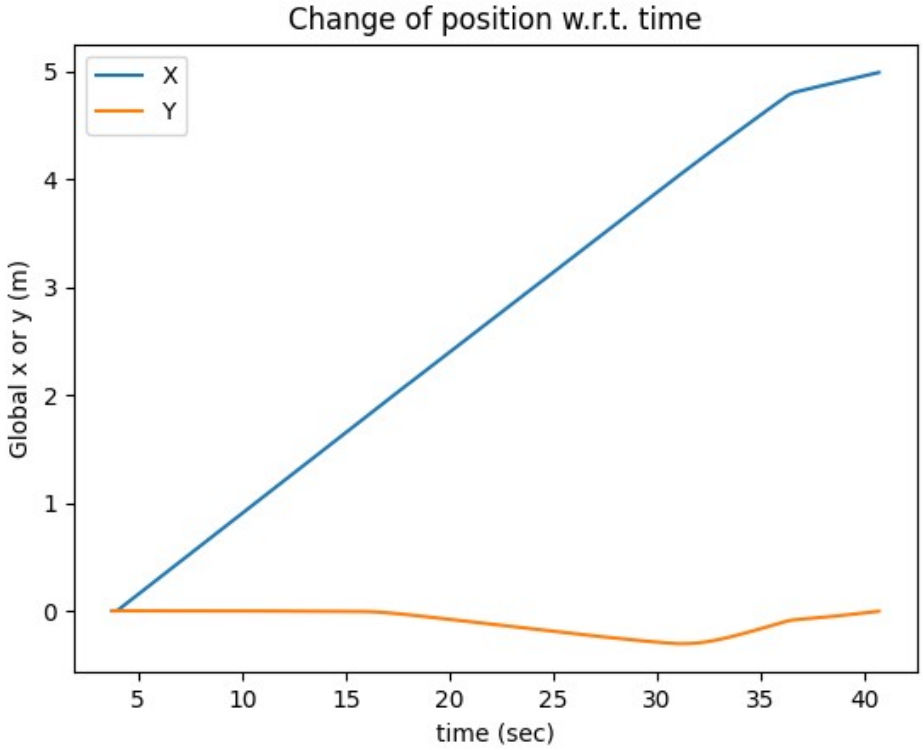



Fig 4: Test 2, x and y v/s time of robot

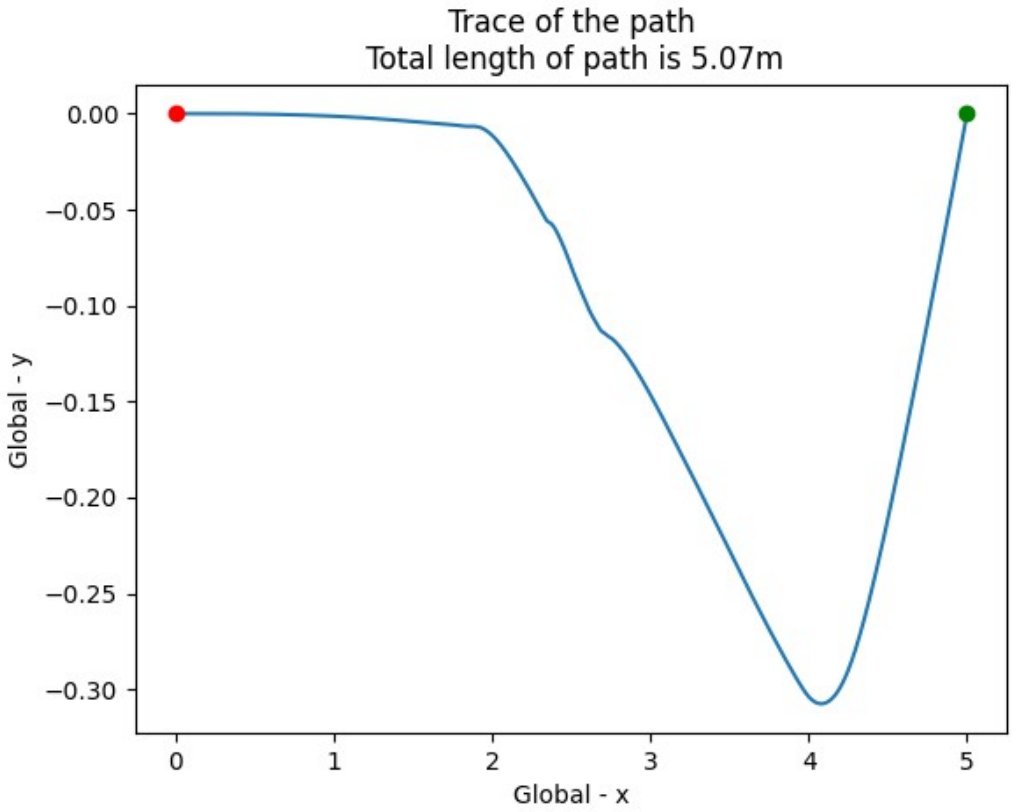



Fig 5: Test 3, Trace of robot

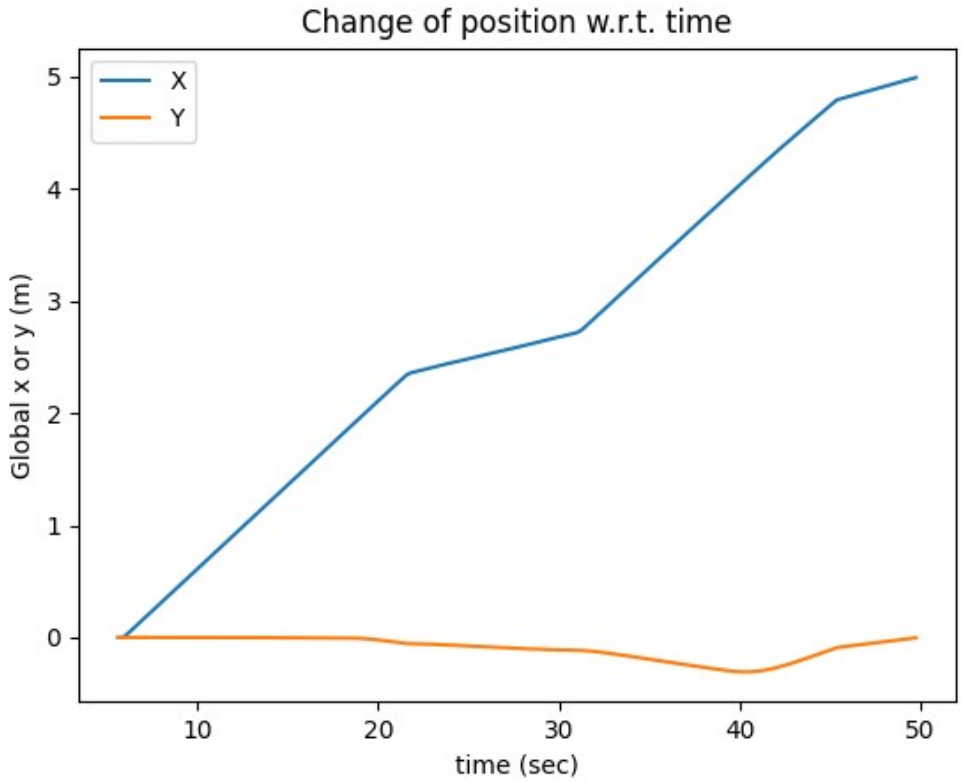



Fig 6: Test 3, x and y v/s time of robot