3D AGENT BASED AQUATIC SYSTEM

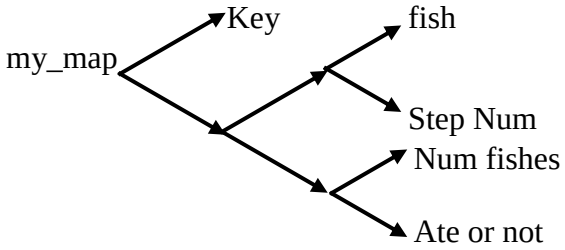
Approach:

Arrangement of the fishes: Three species of fishes floating in the aquatic system to be arranged are:

- minnows
- tuna
- sharks

std::vector is preferable for fast access, easy maintenance, min overhead. But, space consumed = O (N^3) space, where N is the number of grid points along one dimension. So, here I have used std::map. The usage of key for every data point gives fast access to the data associated. This gives me a combination of speed and space O(N).

Map Structure:



Files included:

- main.cpp
- functions.h & functions.h: for the aquatic system
- mapCoordinates.h & mapCoordinates.cpp: for setting the directions of the map
- myrand.h & myrand.cpp: for random values' generation, uses "random" library from C++11

Additional updates: usage of various classes, class inheritance, typedef declaration, C++11 library random, auto used; assert used, try-throw-catch, to get if all the fishes are alive (to continue the system or not)

Conclusions:

For determine initial conditions for (Nshark, Ntuna, Nminnow) such that each of the three species has a non-zero population after 1000 sweeps.
Considering, (Iteration =1000) + (Sweeps = 125), all the fishes show alive at any num of initial count.
Most of the times, one of the fish is dying at ~57th iteration (=> 57x125 steps = ~7k steps)

Pseudo code:

create the system		Create the map	Use Typedef
initiate the system		random alloc of fishes at sites	void initMap()
select fish randomly		Select one of the three fishes from the system (selects non-empty location)	char chooseFish()
For 1000 sweeps => for (auto 1: 1000) //slide 197			
For each sweep => for (auto 1:125) //sweep size L^3			
Check fish status	If Tuna/Shark	Kill the fishes that didn't eat in last 5 trials, provided trials > 5	Void killFish();
Move fish		Gets the site to update after checking the below functions and inserts the fish in the site	Int moveFish ();
	If Minnow	All directions have same probab=>one step any axis	
	If Tuna	Same axis->diagonal=>one step same axis + one step different axis	
	If Shark	Same axis->2steps one axis, 1 step	
Update site status		Based on the arrival site status & attacking site status,	Void updateArrivalSite()
	2Minnow	+3Minnow	
	2Tuna + ate	+Tuna	
	2Shark + ate	+Shark	
	>Tuna + Minn	-Minnows	
	>1Tuna+>1Shark	-1Tuna	
	>1Shark + Minns	-Minnows, in neighboring sites too based on feeding frenzy conditions	