A single random walk simulation by itself is enjoyable and cute but it does not enlighten since each walk is just a single representation of the possibility for the system. It is too unique to be representative of the system. The goal is to repeat the simulation many times over (how many is enough?) and then gather statistics on the set of simulations.

Instead of “tossing a coin”we can use rand from Matlab to generate a pseudo-random variable that is between 0 and 1.

Part 1

Create a simulation which will track the location of a random walker for 1,000 steps

- Use comet to generate a pseudo
- animation of the walker’s position as a function of time (i.e. step #)

Matlab Program:

1. RandDir.m

```
function out = RandDir(N)

% Generate a random vector from the set {+/- e_1, +/- e_2,..., +/- e_N}
% where e_i is the ith basis vector. N should be an integer.

I = round(ceil(2*N*rand));

if rem(I,2) == 1
   sgn = -1;
else
   sgn = 1;
end
out = zeros(N,1);

out(ceil(I/2)) = sgn*1;

end
```

2. Main.m

```
N = 1; % Dimensions
F = @(t,X) zeros(N,1); % Drift
G = @(t,X) eye(N); % diffusion
S = sde(F,G,'startState',zeros(N,1)); % Start at the origin

X = S.simByEuler(1000,'ntrials',1,'Z',@(t,X) RandDir(N));

comet(1:numel(X),X);
plot(1:numel(X),X);
grid on;
```

3. Sample Output: