```
% Matlab routine: simulated outbound and inbound run shown in
% geocentric (above) and egocentric (below) coordinates of the
% egocentric path integration model (II.2)

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tau = .25;
stau = tau^.5;
v0 = 0.2;
c = 1/0.05;
S = 5;  % distance to cover
T = S/v0;

Tom = 1;

% values at the beginning

X = 0;
Y = 0;
x = 0;
y = 0;
phi = 0;
om = 0;

Zeit = 0;
Zeitfaktor = 0;

x1 = 0;
y1 = 0;

om0 = 0;

Xold = 0;
Yold = 0;

xold = 0;
yold = 0;

% outbound run
```

```
for t = 0:v0:T
    X =  cos(om*tau)*Xold + sin(om*tau)*Yold;
    Y = - sin(om*tau)*Xold + cos(om*tau)*Yold;
    phi = phi + tau*om;
    X = X-v0*tau;

    x = cos(phi)*X - sin(phi)*Y;
    y = sin(phi)*X + cos(phi)*Y;

    om = om + tau*(om0-om)/Tom + stau*normrnd(0,1,1,1);

    subplot(3,1,[1 2])
    line([xold x], [yold y], 'LineWidth', 2, 'Color', 'red')
    axis equal
    subplot(3,1,3)
    line([0 50],[0 0],'LineWidth', 1, 'Color', 'black' )
    line([t t+v0], [Xold X],  'LineWidth', 2, 'Color', 'magenta');
    line([t t+v0], [Yold Y],  'LineWidth', 2, 'Color', 'blue');
    axis([0 50 -6 6])
    set(gca,'XTickLabel',{})
    pause(0.005)

    xold = x;
    yold = y;
    Xold = X;
    Yold = Y;
end

Xoutbound = Xold;
Youtbound = Yold;

Zeitfaktor = Zeit;

% reorientation
while X<0 | abs(Y)>0.5
    om = sign(Y)*1;
    X =   cos(om*tau)*Xold + sin(om*tau)*Yold;
    Y = - sin(om*tau)*Xold + cos(om*tau)*Yold;
    phi = phi + tau*om;

    x = cos(phi)*X - sin(phi)*Y;
    y = sin(phi)*X + cos(phi)*Y;

    xold = x;
```

```
    yold = y;
    Xold = X;
    Yold = Y;
end

subplot(3,1,3)
line([t t + 1], [Xoutbound X],  'LineWidth', 2, 'Color', 'magenta');
line([t t + 1], [Youtbound Y],  'LineWidth', 2, 'Color', 'blue');
t = t + 1;

% homing
while X > 2 | abs(Y) > 2

    om0 = c*Y;
    om = om + tau*(om0-om)/Tom + stau*normrnd(0,1,1,1);

    X =   cos(om*tau)*Xold + sin(om*tau)*Yold;
    Y = - sin(om*tau)*Xold + cos(om*tau)*Yold;
    phi = phi + tau*om;

    X = X - v0*tau;

    x = cos(phi)*X - sin(phi)*Y;
    y = sin(phi)*X + cos(phi)*Y;

    subplot(3,1,[1 2])
    line([xold x], [yold y], 'LineWidth', 2, 'Color', 'green')
    axis equal
    subplot(3,1,3)
    line([0 50],[0 0],'LineWidth', 1, 'Color', 'black' )
    line([t t+0.25], [Xold X],  'LineWidth', 2, 'Color', 'magenta');
    line([t t+0.25], [Yold Y],  'LineWidth', 2, 'Color', 'blue');
    axis([0 50 -6 6])
    set(gca,'XTickLabel',{})
    pause(0.000001)

    xold = x;
    yold = y;
    Xold = X;
    Yold = Y;

    t = t + 0.25;
end
```

```
while X > 0 | abs(Y) > 0

   om0 = c*Y;
   om = om + tau*(om0-om)/Tom + stau*normrnd(0,0,1,1);

   X =   cos(om*tau)*Xold + sin(om*tau)*Yold;
   Y = - sin(om*tau)*Xold + cos(om*tau)*Yold;
   phi = phi + tau*om;

   X = X - v0*tau;

   x = cos(phi)*X - sin(phi)*Y;
   y = sin(phi)*X + cos(phi)*Y;

   subplot(3,1,[1 2])
   line([xold x], [yold y], 'LineWidth', 2, 'Color', 'green')
   axis equal
   subplot(3,1,3)
   line([0 50],[0 0],'LineWidth', 1, 'Color', 'black' )
   line([t t+0.25], [Xold X],  'LineWidth', 2, 'Color', 'magenta');
   line([t t+0.25], [Yold Y],  'LineWidth', 2, 'Color', 'blue');
   axis([0 50 -6 6])
   set(gca,'XTickLabel',{})
   pause(0.000001)

   xold = x;
   yold = y;
   Xold = X;
   Yold = Y;

   t = t + 0.25;

   if X < 0.05
      om = 0
      v0 = X
      X =   cos(om*tau)*Xold + sin(om*tau)*Yold;
      Y = - sin(om*tau)*Xold + cos(om*tau)*Yold;
      phi = phi + tau*om;

      X = X - v0;

      x = cos(phi)*X - sin(phi)*Y;
      y = sin(phi)*X + cos(phi)*Y;

      subplot(3,1,[1 2])
```

```
    line([xold x], [yold y], 'LineWidth', 2, 'Color', 'green')
    axis equal
    subplot(3,1,3)
    line([0 50],[0 0],'LineWidth', 1, 'Color', 'black' )
    line([t t+0.25], [Xold X],  'LineWidth', 2, 'Color', 'magenta');
    line([t t+0.25], [Yold Y],  'LineWidth', 2, 'Color', 'blue');
    axis([0 50 -6 6])
    set(gca,'XTickLabel',{})
    pause(0.000001)
    break
  end

end
```