

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

```
% With regard to the egocentric coordinates, the error postulated by
% Mueller and Wehner has been implemented during the outbound run
```

```
% COPYRIGHT TOBIAS MERKLE
```

```
% ALL RIGHTS RESERVED
```

```
% THIS PROGRAM MAY NOT BE REPRODUCED, COPIED, OR CHANGED IN WHOLE OR IN PART
% WITHOUT WRITTEN PERMISSION OF THE AUTHOR
```

```
Aus = xlsread('outbound_inbound.xls');
x = Aus(:,1);
y = Aus(:,2);
x1 = Aus(1,1);
y1 = Aus(1,2);
nx=length(x(~isnan(x)));
ny=y(~isnan(y));
```

```
X=0;
Y=0;
```

```
figure(1)
hold on
Xalt = 0;
Yalt = 0;
phialt = 0;
Xn = 0;
Yn= 0;
```

```
lmw = sqrt((x(2)-x(1))^2+(y(2)-y(1))^2);
phimw = atan2(y(2)-y(1),x(2)-x(1));
k = 3*sqrt(3)/(2*pi^3);
subplot(3,1,[1 2])
line([x(1) x(2)], [y(1) y(2)], 'LineWidth', 2, 'Color', 'red')
X = sqrt((x(2)-x(1))^2+(y(2)-y(1))^2);
Y = 0;
subplot(3,1,3)
line([1 2], [Xalt, X], 'LineWidth', 2, 'Color', 'magenta');
line([1 2], [Yalt, Y], 'LineWidth', 2, 'Color', 'blue');
```

```

for i = 3:1:nx
    a = x(i-1);
    b = x(i);
    c = y(i-1);
    d = y(i);
    psi = atan2((d-c),(b-a));
    delta = mod(psi-phimw+pi,2*pi)-pi;
    Segmentlaenge = sqrt((d-c)*(d-c)+(b-a)*(b-a));
    tau = Segmentlaenge;
    phimw = phimw + k * Segmentlaenge*(pi+delta)*(pi-delta)*delta/lmw;
    lmw = lmw + Segmentlaenge*(1-abs(delta)/(pi/2));

```

```

Xalt = X;
Yalt = Y;
X = -lmw*cos(delta);
Y = lmw*sin(delta);

```

```

subplot(3,1,[1 2])
a = x(i-1);
b = x(i);
c = y(i-1);
d = y(i);
line([a b], [c,d], 'LineWidth', 2, 'Color', 'red')
axis equal
subplot(3,1,3)
line([0 700],[0 0], 'LineWidth', 1, 'Color', 'black' )
line([i-1 i], [Xalt, X], 'LineWidth', 2, 'Color', 'magenta');
line([i-1 i], [Yalt, Y], 'LineWidth', 2, 'Color', 'blue');
axis([0 700 -10 10])
set(gca,'XTickLabel',{ })
pause(0.000001)
Xalt = X;
Yalt = Y;
end

```

```
lengthoutbound = i;
```

```

x = Aus(:,6) + 6.7;
y = Aus(:,7) + 7.45;
nx=length(x(~isnan(x)));
ny=y(~isnan(y));

```

```

for i = 2:1:nx
    a = x(i-1);
    b = x(i);

```

```

c = y(i-1);
d = y(i);
subplot(3,1,[1 2])
line([a b], [c,d], 'LineWidth', 2, 'Color', 'green')
axis equal
hold on

```

```

psi = atan2((d-c),(b-a));
delta = mod(psi-phimw+pi,2*pi)-pi;
Segmentlaenge = sqrt((d-c)*(d-c)+(b-a)*(b-a));
phimw = phimw + k * Segmentlaenge*(pi+delta)*(pi-delta)*delta/lmw;
lmw = lmw + Segmentlaenge*(1-abs(delta)/(pi/2));

```

```

Xalt = X;
Yalt = Y;
X = -lmw*cos(delta);
Y = lmw*sin(delta);

```

```

subplot(3,1,3)
line([i - 1 + lengthoutbound, i + lengthoutbound], [Xalt, X], 'LineWidth', 2, 'Color', 'magenta');
line([i - 1 + lengthoutbound, i + lengthoutbound], [Yalt, Y], 'LineWidth', 2, 'Color', 'blue');
pause(0.000001);

```

```

end

```