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% 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)

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```
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;
for i = 1:1:(nx-1)
    a = x(i);
    b = x(i+1);
    c = y(i);
    d = y(i+1);
    phineu = atan2((d-c),(b-a));
    dphi = phineu - phialt;
    Segmentlaenge = sqrt((d-c)*(d-c)+(b-a)*(b-a));
    tau = Segmentlaenge;
    if dphi > 5/4 * pi
        dphi = dphi - 2 * pi;
    elseif dphi < - 5/4 * pi
        dphi = dphi + 2 * pi;
    end
```

```

dphi;
Xn = cos(dphi)*X + sin(dphi)*Y;
Yn = - sin(dphi)*X + cos(dphi)*Y;
X = Xn - Segmentlaenge;
Y = Yn;
subplot(3,1,[1 2])
a = x(i);
b = x(i+1);
c = y(i);
d = y(i+1);
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;
phialt = phineu;
end

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```
lengthoutbound = i;
```

```
phialt/pi*180;
```

```
atan2(Y,X)/pi*180;
```

```
hold on
```

```

x = Aus(:,6);
y = Aus(:,7);
x1 = Aus(1,6) + 6.7;
y1 = Aus(1,7) + 7.45;
nx=length(x(~isnan(x)));
ny=y(~isnan(y));

```

```
hold on
```

```

for i = 1:1:(nx-1)
a = x(i) + 6.7;
b = x(i+1) + 6.7;
c = y(i) + 7.45;

```

```
d = y(i+1) + 7.45;
phineu = atan2((d-c),(b-a));
dphi = phineu - phialt;
Segmentlaenge = sqrt((d-c)*(d-c)+(b-a)*(b-a));
tau = Segmentlaenge;
if dphi > 5/4 * pi
    dphi = dphi - 2 * pi;
elseif dphi < - 5/4 * pi
    dphi = dphi + 2 * pi;
end
dphi;
Xn = cos(dphi)*X + sin(dphi)*Y;
Yn = - sin(dphi)*X + cos(dphi)*Y;
X = Xn - Segmentlaenge;
Y = Yn;
a = x(i) + 6.7;
b = x(i+1) + 6.7;
c = y(i) + 7.45;
d = y(i+1) + 7.45;
subplot(3,1,[1 2])
line([a b], [c,d], 'LineWidth', 2, 'Color', 'green')
axis equal
hold on
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);
Xalt = X;
Yalt = Y;
phialt = phineu;
end
```