AGV Kinematics:

V=r/2\*(vr+vl)

ω =(r/l)\*(vr-vl)

X0t+1=X0t + Vt \* dt \* CosΘ0(t)

Y0t+1=Y0t + Vt \* dt \* SinΘ0(t)

Θ0(t+1)= Θ0(t) + ωt \* dt

Trolley1:

Θ1’= V/d1 \* sin(Θ0-Θ1 )

Θ1= Θ1+Θ1’

If heading towards origin:

X1=X0 +d1 \* Cos(Θ1)

Y1 =Y0+d1 \* Sin(Θ1)

If heading opposite the origin:

X1=X0 -d1 \* Cos(Θ1)

Y1 =Y0-d1 \* Sin(Θ1)

Trolley 2:

Θ2’=V/d2 \* cos(Θ0 -Θ1)\* sin(Θ1- Θ2)

Θ2= Θ2 +Θ2’

If heading towards origin:

X2=X1 +d2 \* Cos(Θ2)

Y2 =Y1+d2 \* Sin(Θ2)

If heading opposite the origin:

X2=X1-d2 \* Cos(Θ2)

Y2 =Y1-d2 \* Sin(Θ2)

Trolley 3:

Θ3’=V/d3 \*(cos(Θ1 – Θ2)+ cos(Θ0 - Θ1))\*sin(Θ2-Θ3)

Θ3= Θ3+ Θ3’

If heading towards origin:

X3=X2 +d3 \* Cos(Θ3)

Y3 =Y2+d3 \* Sin(Θ3)

If heading opposite the origin:

X3=X2 -d3 \* Cos(Θ3)

Y3 =Y2-d3 \* Sin(Θ3)

Trolley 4:

Θ4’=V/d4 \*(cos(Θ2 – Θ3)+cos(Θ1 – Θ2)+ cos(Θ0 - Θ1))\*sin(Θ3-Θ4)

Θ4= Θ4+ Θ4’

If heading towards origin:

X4=X3 +d4 \* Cos(Θ4)

Y4 =Y3+d4 \* Sin(Θ4)

If heading opposite the origin:

X4=X3 –d4 \* Cos(Θ4)

Y4 =Y3-d4 \* Sin(Θ4)