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Report

Service robotics with drives and Sensors

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To create a model and programing the differential drive robot in coppelia sim.

- Here some steps to create an differential drive robot on coppelia sim.

Step 1: Open Coppelia Sim

Step 2: Open a New scene

Step 3: Create a Cuboid of Dimension L x B x H = 0.2 x 0.1 x 0.01 M

Step 4: Rename cuboid as Robot base

Step 5: Offset the Base in Z axis by 0.035M

Step 6: Create cylinder with dimension X = 0.07 and Z= 0.01

Step 7: Rename the cylinder as right wheel

Step 6: Rotate the right wheel in y axis 90 degrees.

Step 7: Select world frame as reference and set the positional values of wheel

X= 0.06, Y=0.08, Z= 0.035

Step8: Create a revolute joint with the length 0.05

Step9: Rename the Joint as right motor

Step10: Select own frame as reference and rotate the Y axis 90 degree.

Step11: Position the joint at the center of the wheel using object/item shift option

Step12: Copy the right wheel from the Scene hierarchy and paste.

Step13: Rename the Wheel as Left wheel.

Step 14: Select world frame as reference and set the positional

value for left wheel

as X= -0.06, Y= -0.08, Z= 0.035

Step 15: Create a revolute joint with the length 0.05

Step 16: Rename the Joint as left motor

Step 17: Position the joint at the center of the wheel using object/item shift option

Step 18: Create a Sphere of the dimension as X=0.035 and Y = 0.08

Step 19: Rename the Sphere as Castor Wheel.

Step 20: Build parent Child relation

Step 21: Save the model

Step 22: Add Associated Child script

Step 23: Write the Code

After completing those steps and a lua code to the created model.

Lua code to move forward .

```
function sysCall_init()
LM=sim.getObject("./Left_Motor")
RM=sim.getObject("./Right_Motor")
end
function sysCall_actuation()
 sim.setJointTargetVelocity(LM,2)
 sim.setJointTargetVelocity(RM,2)
 End
```

After completing the lua code to move

```
function sysCall_init()
LM=sim.getObject("/Left_Motor")
RM=sim.getObject("/Right_Motor")
end
function sysCall_actuation()
message,data,data2=sim.getSimulatorMessag
e()
print(message,data)
if(message==sim.message_keypress)then
 if(data[1]==2007)then
 sim.setJointTargetVelocity(LM,2)
 sim.setJointTargetVelocity(RM,2)
 end
 if(data[1]==2008)then
 sim.setJointTargetVelocity(LM,-2)
 sim.setJointTargetVelocity(RM,-2)
 end
 if(data[1]==2009)then
```

```
    sim.setJointTargetVelocity(LM,0)
    sim.setJointTargetVelocity(RM,2)
    end
    if(data[1]==2010)then
[10:33 AM, 23/12/2022] Darshan:
    sim.setJointTargetVelocity(LM,2)
    sim.setJointTargetVelocity(RM,0)
    end
    else
    sim.setJointTargetVelocity(LM,0)
    sim.setJointTargetVelocity(RM,0)
    end
end
```

After completing the program to control by keys,nex to build sensors and path to the differential drive robot.

Step 1: Open Coppelia sim

Step 2: Open a New scene and Load the saved Differential Drive model

Step 3: Add Vision sensors

Step 4: Initialize the sensor position to 0. In X, Y and Z axis.

Step 5: Position the sensors in the required place in the robot base.

Step 6: Set the properties of the sensor according to the position of the sensor.

Step 7: Create parent child relation

Step 8: Add a path to the Environment

Step 9: Write the Code for creating the black line in the path

Step 10: Write the code for Line following

Step 11: Simulate the model.

For path:

```
path=require('path_customization')
function
path.shaping(path,pathIsClosed,upVec
tor)
local section={-0.02,0.001,0.02,0.001}
```

```
    local color={0,0,0}
    local options=0
    if pathIsClosed then
    options=options|4
    [10:38 am, 23/12/2022] Darshan: end
    local
    shape=sim.generateShapeFromPath(p
    ath,section,options,upVector)

    sim.setShapeColor(shape,nil,sim.color
    component_ambient_diffuse,color)
    return shape
end
```

For line following:

```
function sysCall_init()
 corout=coroutine.create(coroutineMain)
 lm = sim.getObjectHandle("./Left_Motor")
 rm =
sim.getObjectHandle("./Right_Motor")
 speed = 6
 LS = {0,0,0} --Initializing an array for a
number
 LS[1] = sim.getObjectHandle("LVS")
 LS[2] = sim.getObjectHandle("MVS")
 LS[3] = sim.getObjectHandle("RVS")
end
function sysCall_actuation()
 SR={0,0,0}
 for i=1,3,1 do
 result,data=sim.readVisionSensor(LS[i])
[10:40 am, 23/12/2022] Darshan: if
(result>=0) then
 SR[i]=(data[11]) -- data[11] is the average
of intensity of the image
 end
```

```
    end
    if SR[2]<0.3 then
    sim.setJointTargetVelocity(lm,speed);
    sim.setJointTargetVelocity(rm,speed);
    end
    if SR[1]>0.3 and SR[2]<0.3 then
    sim.setJointTargetVelocity(lm, speed);
    sim.setJointTargetVelocity(rm,0);
    end
    if SR[2]<0.3 and SR[3]>0.3 then
    sim.setJointTargetVelocity(lm,0);
    sim.setJointTargetVelocity(rm,speed);
    end
end
```