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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  $L \times B \times H = 0.2 \times 0.1 \times 0.01$  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 forward,then create a lua code to control the robot use keyboard.

Step 1: Open Coppelia sim

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

Step 3: Add an Associated child script

Step 4: Write the code for Keyboard control

Step 5: Simulate the Model

```
function sysCall_init()
LM=sim.getObject("/Left_Motor")
RM=sim.getObject("/Right_Motor")
end
function sysCall_actuation()
message,data,data2=sim.getSimulatorMessage()
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 a.m., 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, next 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

```

```
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
```