

Report

Service robotics with drives and

Sensors

Submitted by

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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 .**

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| * **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 controlthe 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

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| 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 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 amd 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:**

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| path=require('path\_customization')  function path.shaping(path,pathIsClosed,upVector)  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(path,section,options,upVector)  sim.setShapeColor(shape,nil,sim.colorcomponent\_ambient\_diffuse,color)  return shape  end |

**For line following:**

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| 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 |