

Segmentação de Teto para a Localização de Robôs

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INTRODUÇÃO

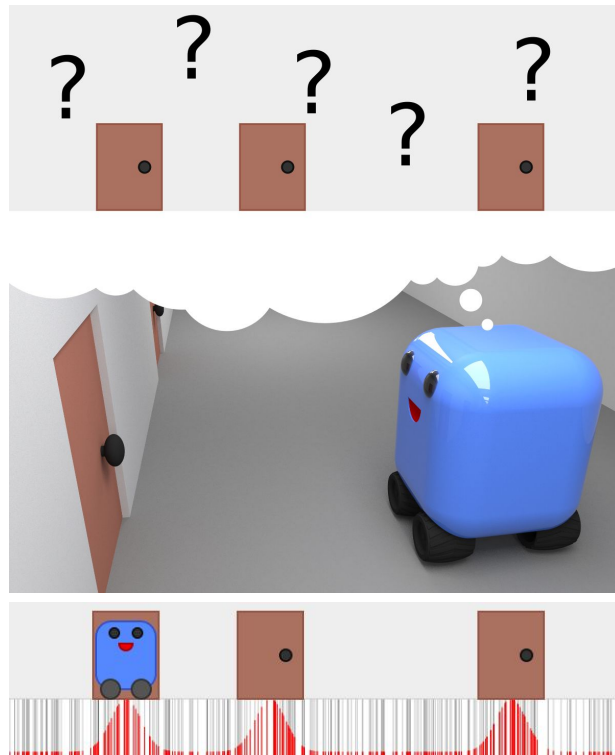
Robótica Móvel

Inteligência Artificial

Aprendizado de Máquina

Segmentação Semântica

Localização de Markov



RECURSOS

Câmera Raspberry Pi-V2

Lente Lensoul LS-WD2

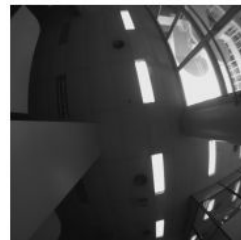
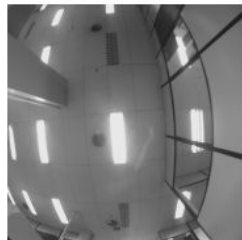
Robô Neato XV-12



DATASET

2000 imagens

7º andar FACIN



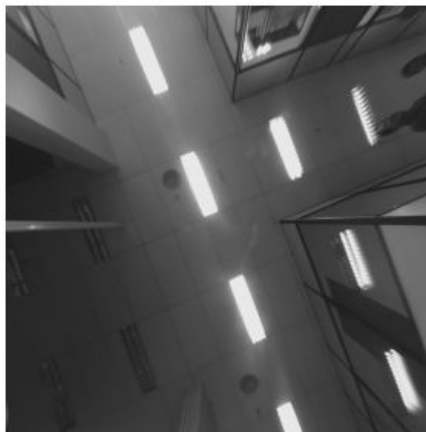
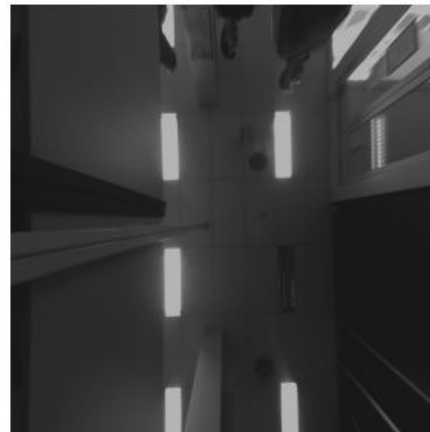
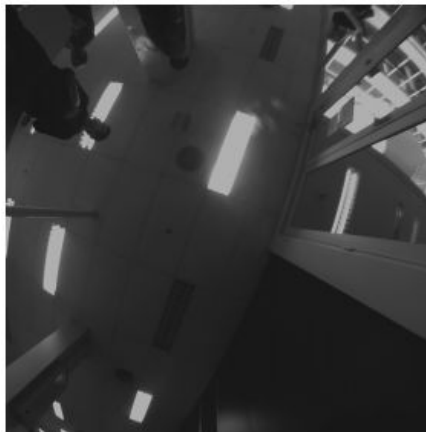
ANOTAÇÃO

126 imagens

Treino: 106

Validação: 10

Teste: 10



FCN-VGG19

VGG19 (ImageNet ILSVRC-2014)

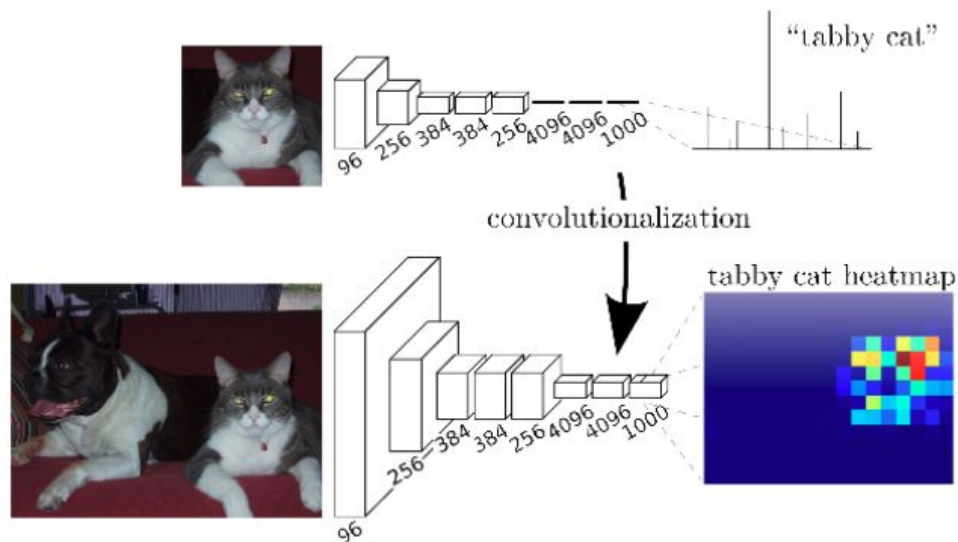
Convolução de stride fracionado
ou Deconvolução

Saída: $256 \times 256 \times 2$

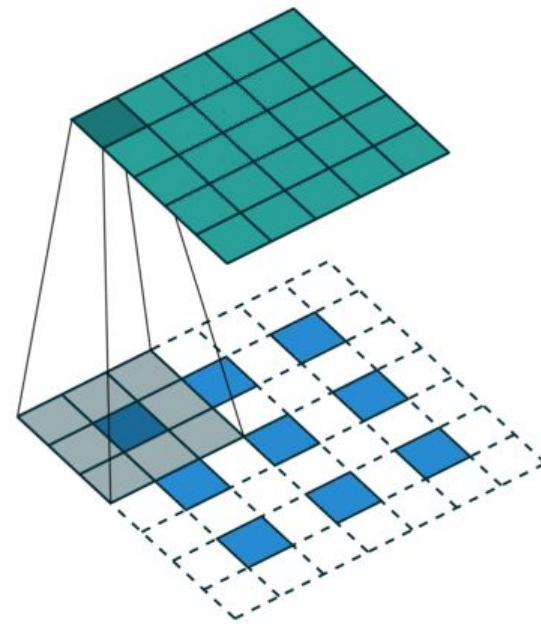
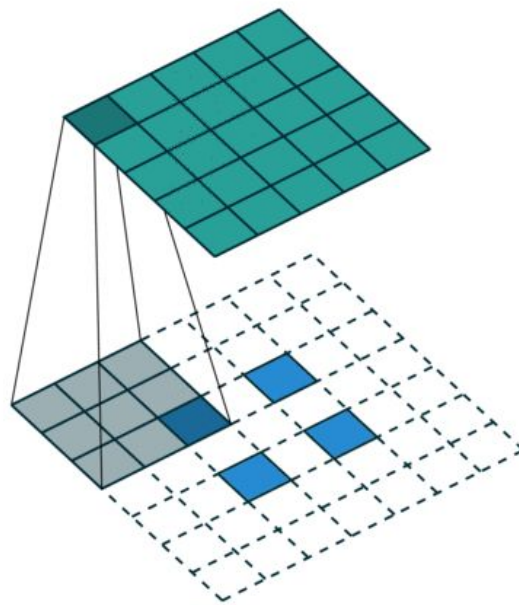
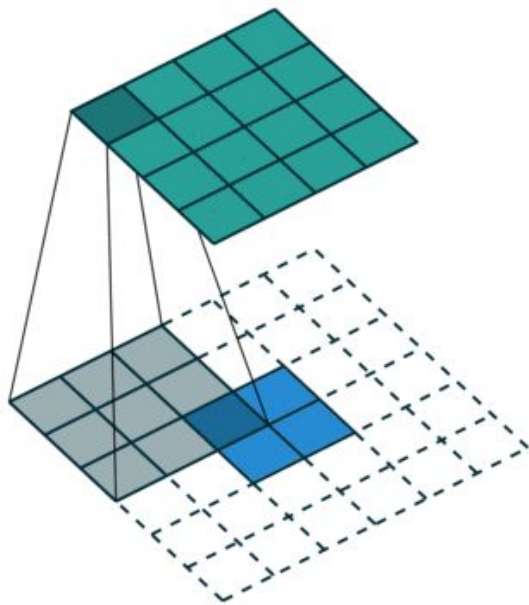
Classificador pixel a pixel

Caffe

Tensorflow



CONVOLUÇÃO TRANSPOSTA



FCN-VGG19

Github

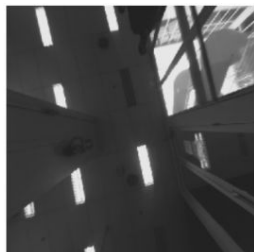
TREINO E VALIDAÇÃO

70 épocas

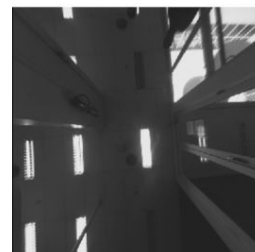
51ª época

```
***** Epochs completed: 51*****  
Step: 2960, Train_loss:0.0281338  
Step: 2970, Train_loss:0.00893782  
Step: 2980, Train_loss:0.0166022  
Step: 2990, Train_loss:0.019159  
Step: 3000, Train_loss:0.0220134  
2017-12-06 21:39:54.279919 --> Validation_loss: 0.223992  
Step: 3010, Train_loss:0.0173228
```

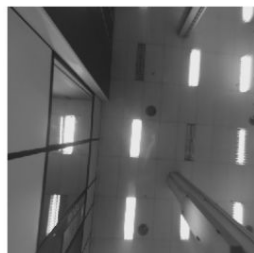
RESULTADOS



(a) Resultado no ambiente de treino 1



(b) Resultado no ambiente de treino 2



(c) Resultado no ambiente de treino 3



(d) Resultado em novo ambiente

Filtro de Partículas

Bayesian Monte Carlo

Generic Particle Filter Algorithm

- **Randomly generate a bunch of particles**

Particles can have position, heading, and/or whatever other state variable you need to estimate. Each has a weight (probability) indicating how likely it matches the actual state of the system. Initialize each with the same weight.

- **Predict next state of the particles**

Move the particles based on how you predict the real system is behaving.

- **Update**

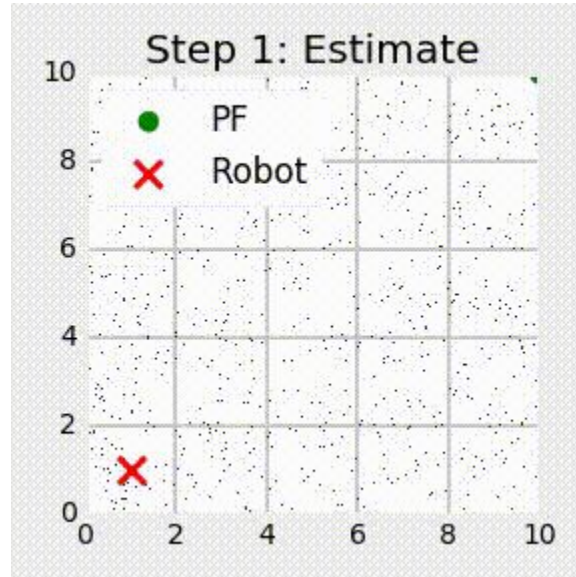
Update the weighting of the particles based on the measurement. Particles that closely match the measurements are weighted higher than particles which don't match the measurements very well.

- **Resample**

Discard highly improbable particle and replace them with copies of the more probable particles.

Filtro de Partículas

Estimate
Predict
Resample
Estimate
...



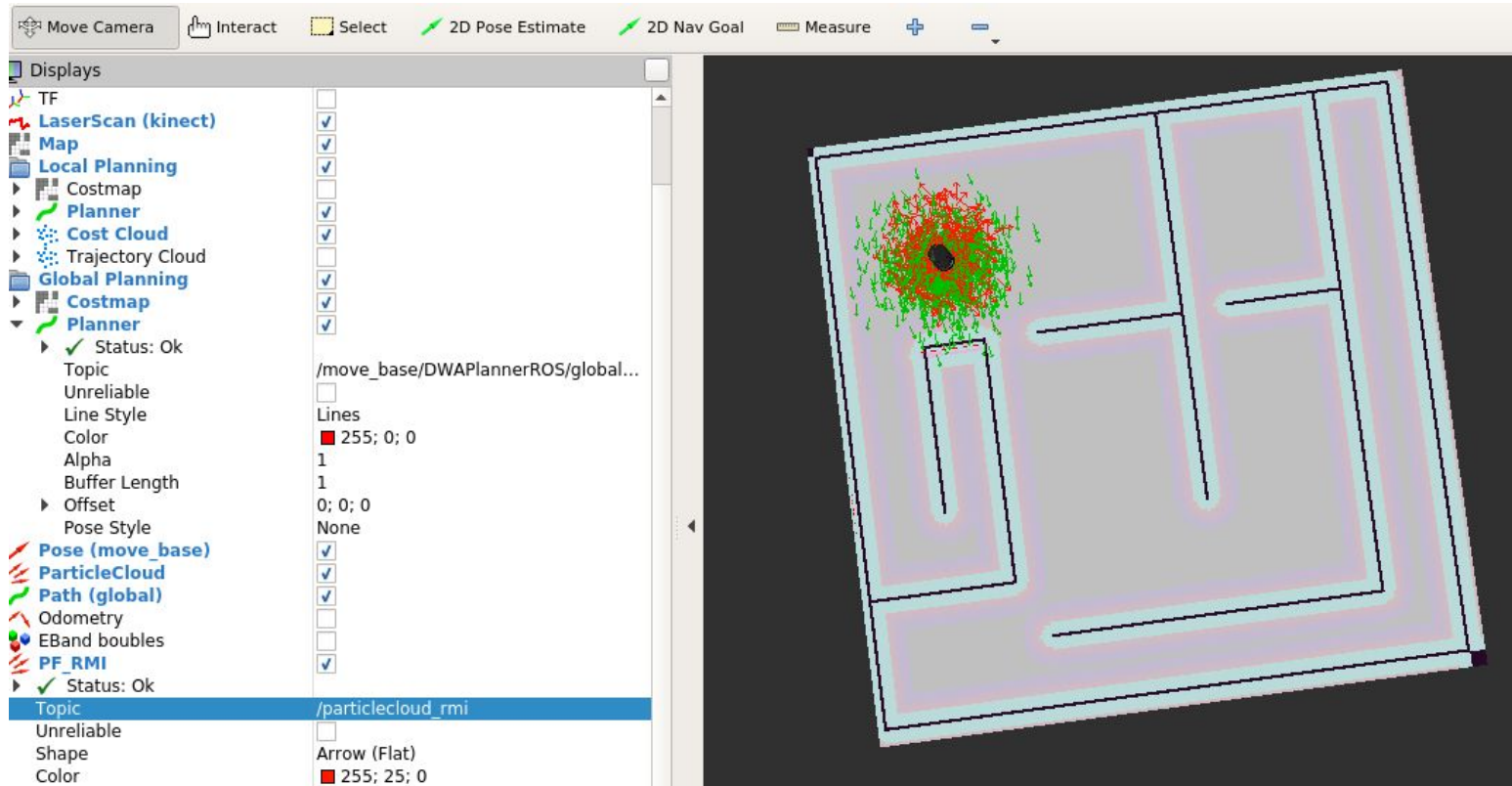
Filtro de Partículas - Código

```
def __init__(self):  
    self.initialized = False  
    rospy.init_node('RMI_pf')  
  
    self.base_frame = "base_link"  
    self.map_frame = "map"  
    self.odom_frame = "odom"  
    self.scan_topic = "scan"  
  
    self.n_particles = 300
```

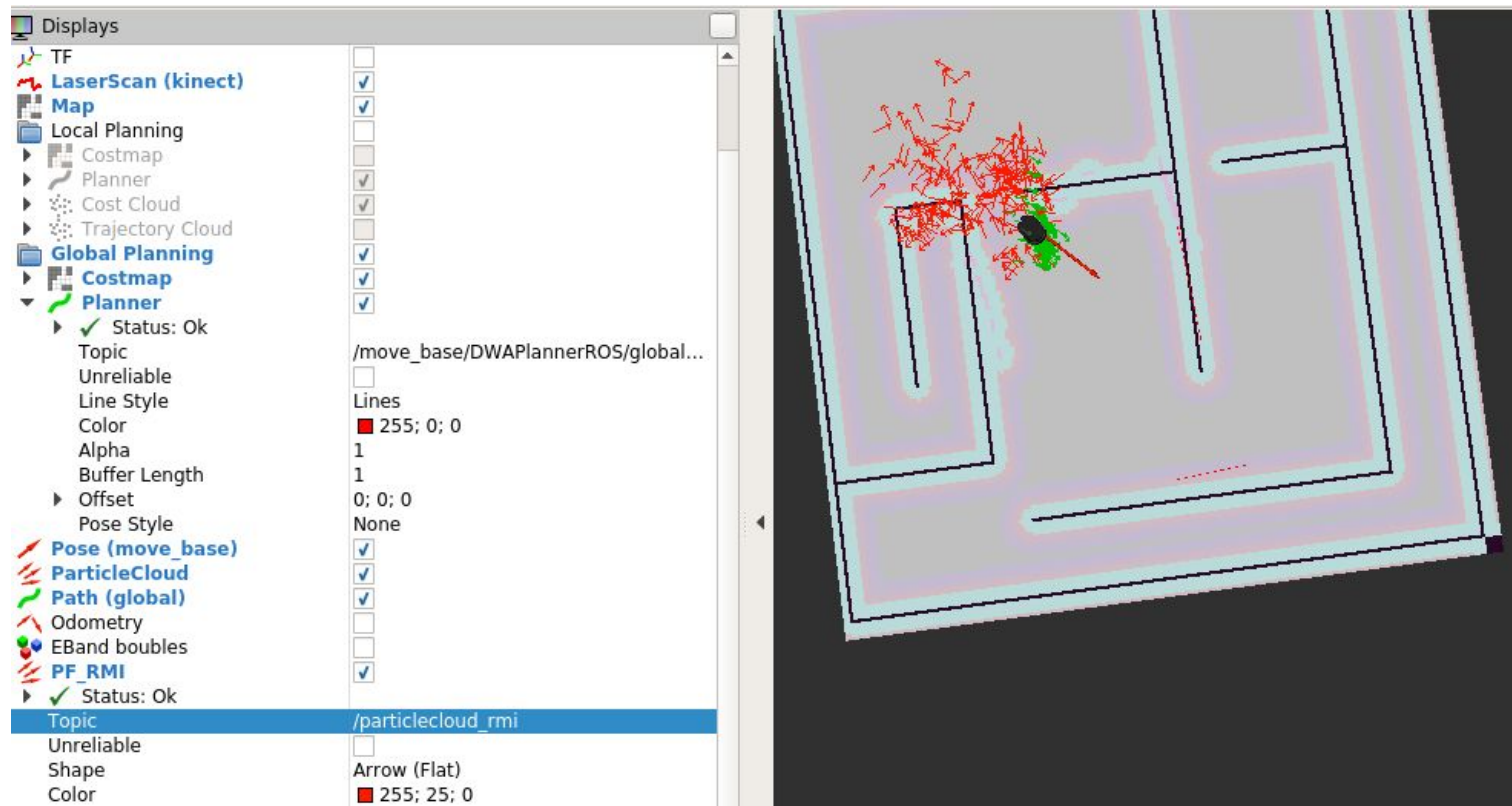
Filtro de Partículas - Código

```
self.pose_listener = rospy.Subscriber("initialpose",  
    PoseWithCovarianceStamped,  
    self.update_initial_pose)  
# rospy.Subscriber(self.odom_frame, Odometry, self.odometryCb)  
self.laser_subscriber = rospy.Subscriber(self.scan_topic, LaserScan, self.scan_received)  
  
self.particle_pub = rospy.Publisher("particlecloud_rmi", PoseArray, queue_size=10)  
self.marker_pub = rospy.Publisher("arraymarker", MarkerArray, queue_size=10)  
# enable listening for and broadcasting coordinate transforms  
self.tf_listener = TransformListener()  
self.tf_broadcaster = TransformBroadcaster()
```

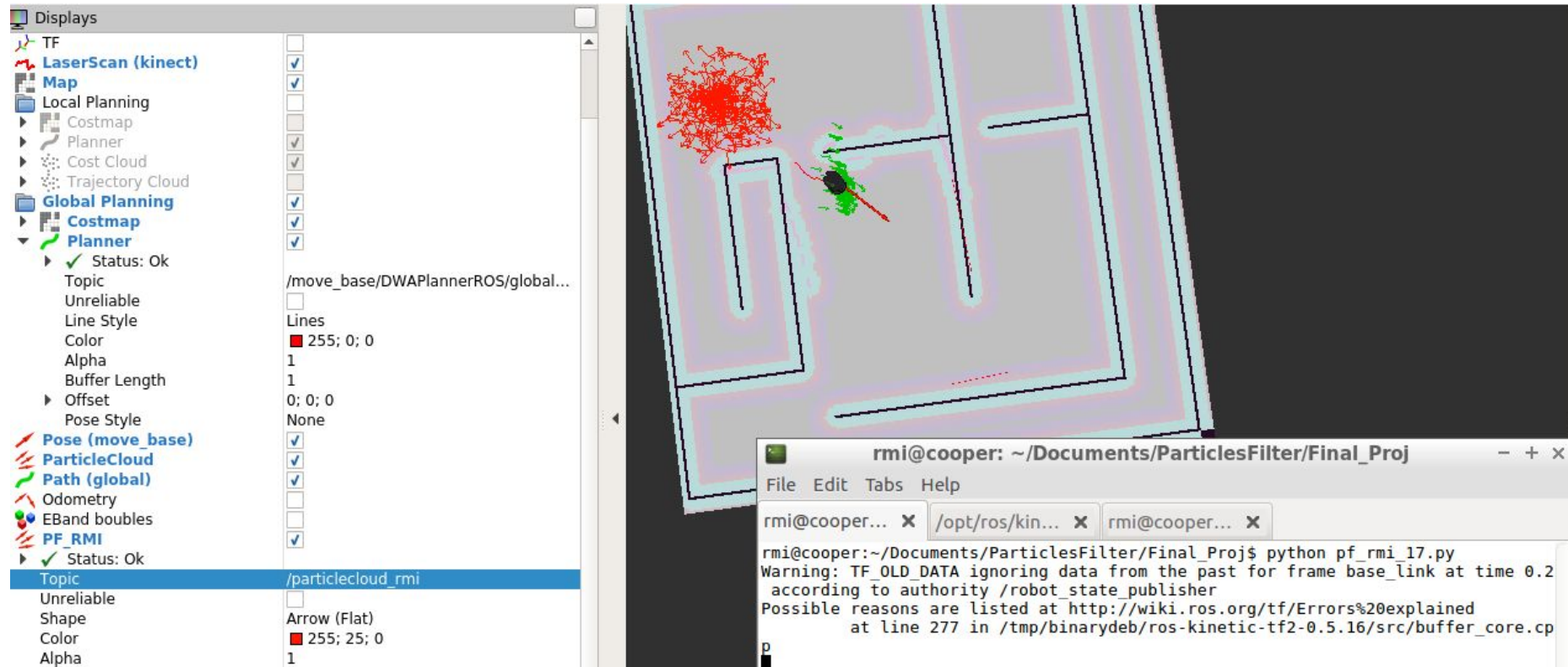
Filtro de Partículas - Resultado



Filtro de Partículas - Resultado



Filtro de Partículas - Problema



The screenshot displays the ROS (Robot Operating System) interface, specifically the 'Displays' panel on the left and a terminal window on the right.

Displays Panel:

- TF:** ☐
- LaserScan (kinect):** ☒
- Map:** ☒
- Local Planning:**
 - Costmap:** ☐
 - Planner:** ☒
 - Cost Cloud:** ☒
 - Trajectory Cloud:** ☒
- Global Planning:**
 - Costmap:** ☒
 - Planner:** ☒
 - Status:** ☒ Status: Ok
 - Topic: /move_base/DWAPlanerROS/global...
 - Unreliable: ☐
 - Line Style: Lines
 - Color: ☒ 255; 0; 0
 - Alpha: 1
 - Buffer Length: 1
 - Offset: 0; 0; 0
 - Pose Style: None
- Pose (move_base):** ☒
- ParticleCloud:** ☒
- Path (global):** ☒
- Odometry:** ☐
- EBand boubles:** ☐
- PF_RMI:** ☒
- Status:** ☒ Status: Ok
 - Topic: /particlecloud_rmi
 - Unreliable: ☐
 - Shape: Arrow (Flat)
 - Color: ☒ 255; 25; 0
 - Alpha: 1

Terminal Window:

rmi@cooper: ~/Documents/ParticlesFilter/Final_Proj

```
File Edit Tabs Help

rmi@cooper... x /opt/ros/kin... x rmi@cooper... x

rmi@cooper:~/Documents/ParticlesFilter/Final_Proj$ python pf_rmi_17.py
Warning: TF_OLD_DATA ignoring data from the past for frame base_link at time 0.2
according to authority /robot_state_publisher
Possible reasons are listed at http://wiki.ros.org/tf/Errors%20explained
at line 277 in /tmp/binarydeb/ros-kinetic-tf2-0.5.16/src/buffer_core.cp
p
```

The main display area shows a 2D maze environment. A red cluster of points represents the initial particle cloud. A green arrow indicates the robot's current position and orientation. The environment is defined by black lines on a gray background.

CONCLUSÃO E PROJETOS FUTUROS

Novo Dataset

Arquitetura mais simples

Filtro de partículas mais otimizado
e com um resample mais eficiente

DIFICULDADES

Implementação FCN.TensorFlow

Implementação Filtro de Partículas

Ruído ODOM

Resample

