MO810 | UNICAMP (IC)

PROFA. DRA. ESTHER LUNA COLOMBINI

THE CONSTANT GARDENER

GUILHERME CARREIRO
LUÍSA MADEIRA
MATEUS CORADINI

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HISTÓRICO

PROJETO 1

INTEGRAÇÃO COM V-REP
ARQUITETURA BASE
IDENTIFICAÇÃO DE PLANTAS

PROJETO 2

AVOID OBSTACLE COM FUZZY
WALL FOLLOWING HARD CODED
ODOMETRIA IMPRECISA
IDENTIFICAÇÃO DE OBSTÁCULOS

PROJETO FINAL

ODOMETRIA REFINADA
UTILIZAÇÃO DE GRID MÉTRICO
PLANEJAMENTO DE ROTAS
GO TO GOAL COM PID CONTROLLER
APRENDIZADO POR REFORÇO

PROPOSTA INICIAL

- MAPEAR TODAS AS PLANTAS DO AMBIENTE
- VISITAR TODAS AS PLANTAS PERIODICAMENTE

TAREFAS ENVOLVIDAS:

- LOCALIZAÇÃO
- MAPEAMENTO
- EXPLORAÇÃO
- PLANEJAMENTO DE ROTAS
- GO-TO-GOAL

PROPOSTA INICIAL

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TAREFAS ENVOLVIDAS:

- LOCALIZAÇÃO
- ~~MAPEAMENTO~~
- ~~EXPLORAÇÃO~~
- PLANEJAMENTO DE ROTAS
- GO-TO-GOAL

PREMISSAS

LOCALIZAÇÃO:

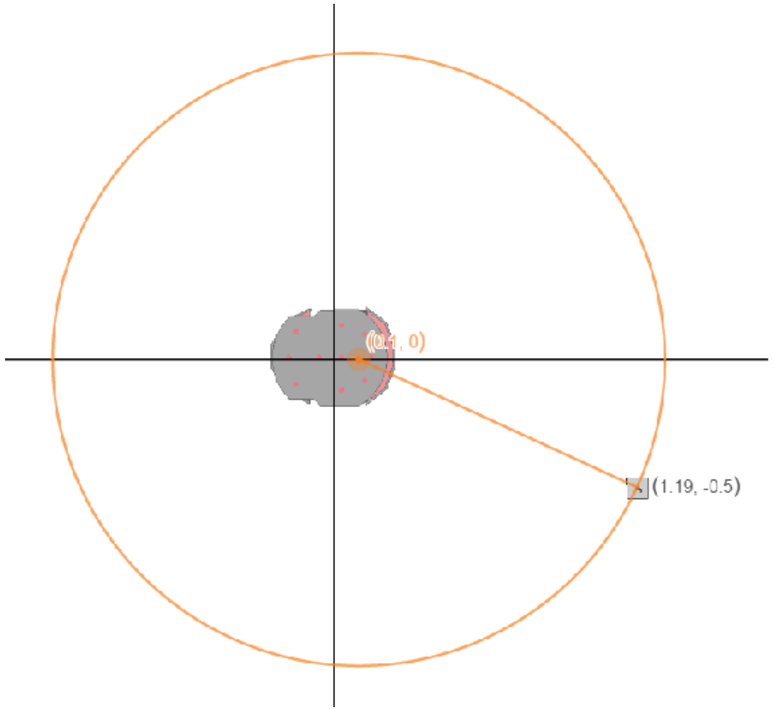
- BASE: SENSORES QUE MEDEM DISTÂNCIA DA BASE (EXEMPLO: STARGAZER)

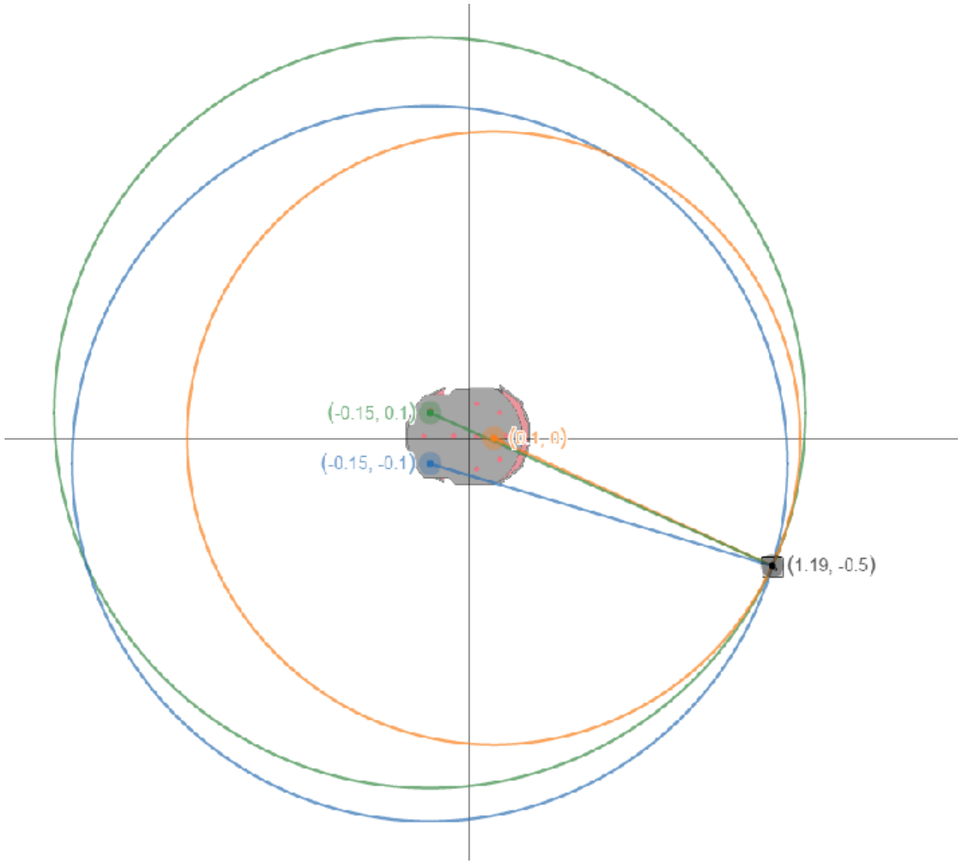
PLANEJAMENTO DE ROTAS:

- MAPA DE PARADES
- MAPA COM REGÕES DE RISCO

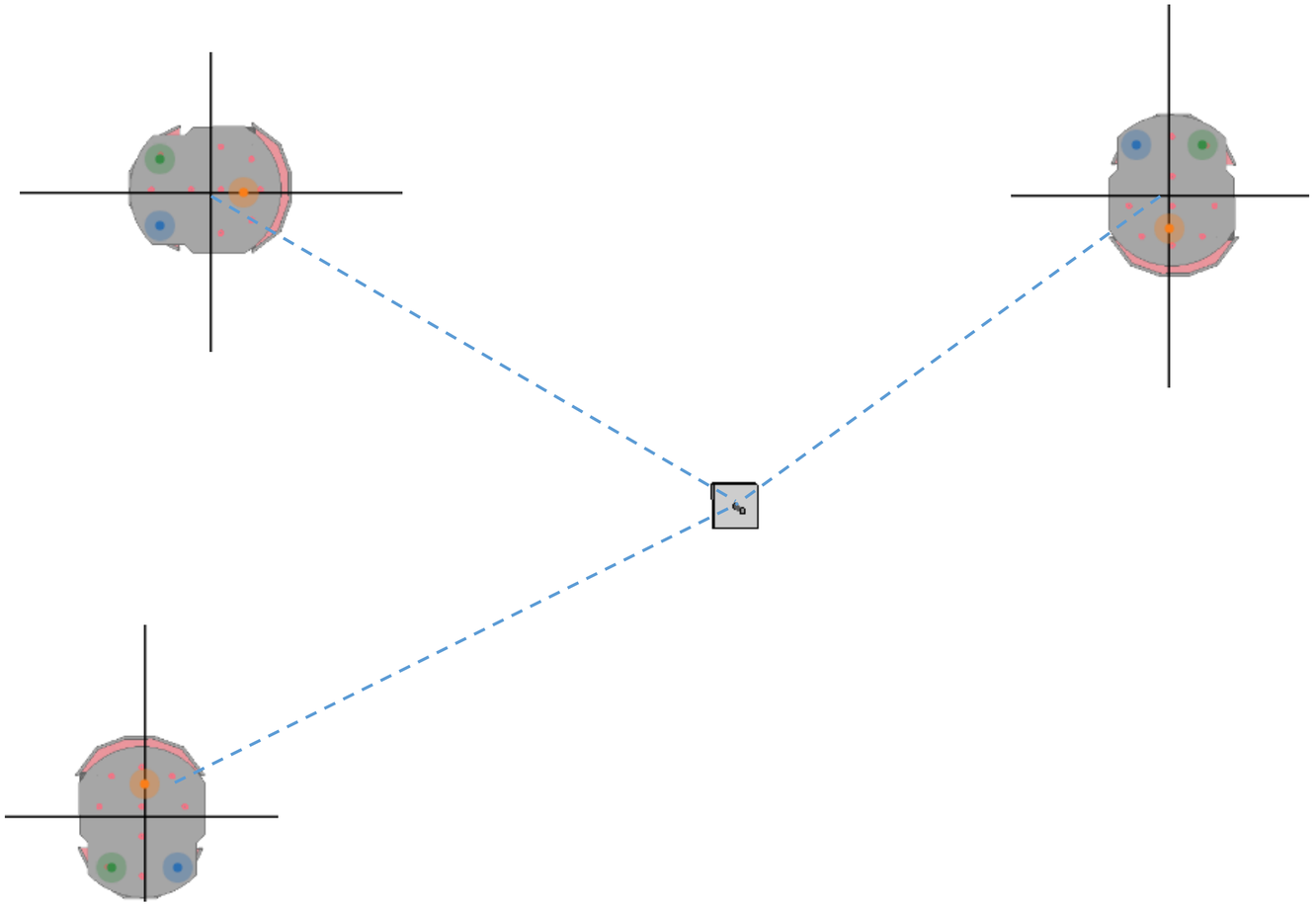
LOCALIZAÇÃO

LOCALIZANDO A BASE





REFERÊNCIA LOCAL



FILTRO DE KALMAN EXTENDIDO

Algorithm 1 Extended Kalman filter $\bar{\mu}_t, \mu_{t-1}, \Sigma_{t-1}, \Sigma_{\Delta t}, z_t$

$$\bar{\Sigma}_t = G_t \Sigma_{t-1} G_t^T + R_t$$
$$K_t = \bar{\Sigma}_t H_t^T (H_t \bar{\Sigma}_t H_t^T + Q_t)^{-1}$$
$$\mu_t = \bar{\mu}_t + K_t (z_t - \hat{z}_t)$$
$$\Sigma_t = (I - K_t H_t) \bar{\Sigma}_t$$
return μ_t, Σ_t

ODOMETRIA

LANDMARKS: DIFERENÇA CALCULADO X REAL

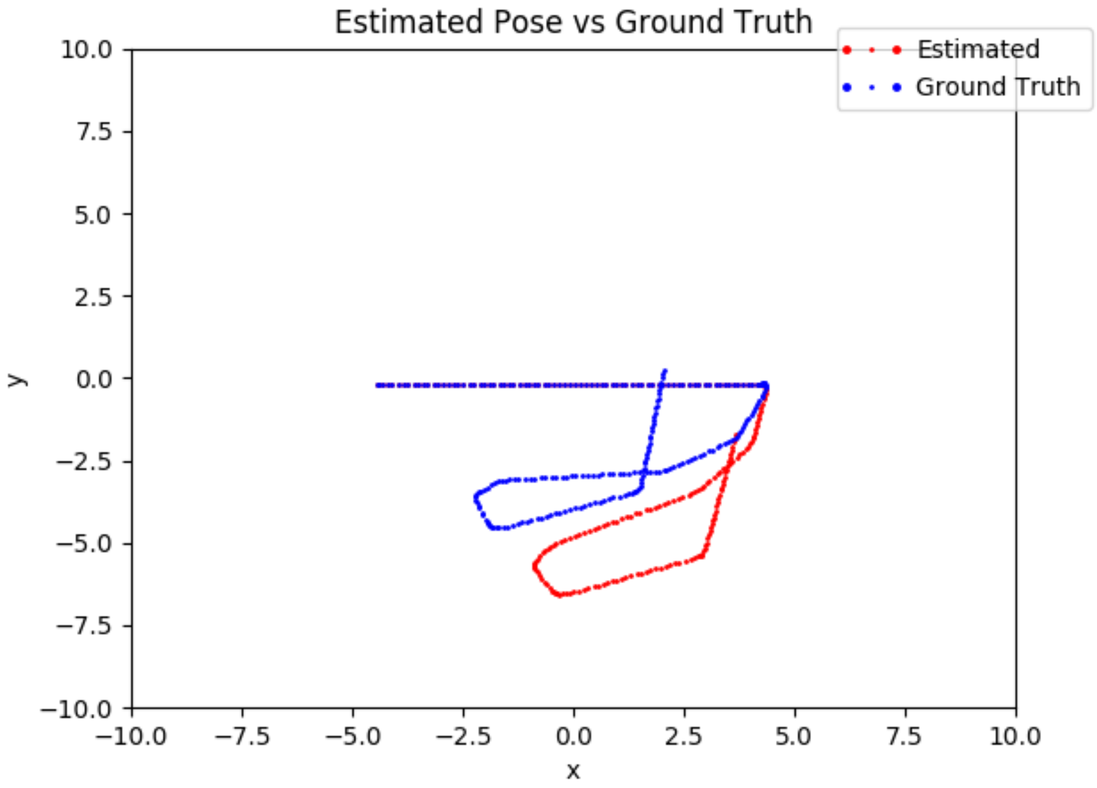
$$z = \begin{bmatrix} L_{range} \\ L_{bearing} \end{bmatrix}$$

$$\hat{z} = \begin{bmatrix} l_{range} \\ l_{bearing} \end{bmatrix}$$

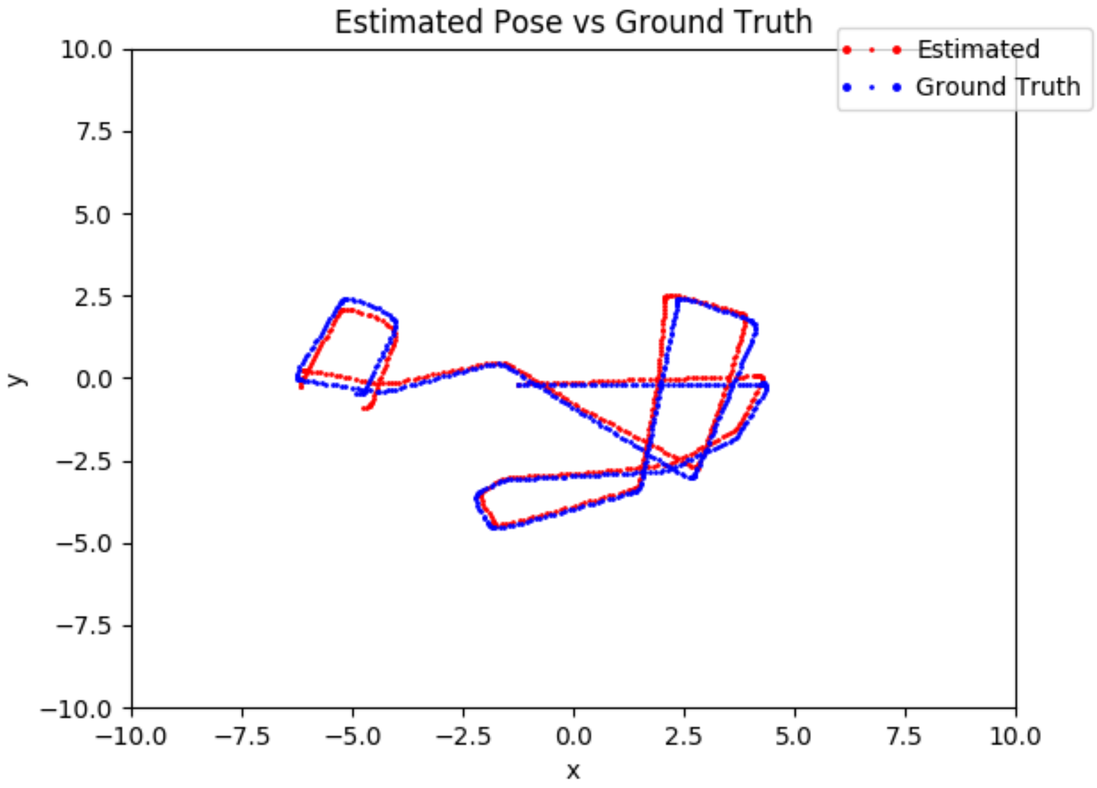
$$p_{range} = \sqrt{(p_x - x_t)^2 + (p_y - y_t)^2}$$

$$p_{bearing} = arctan2((p_y - y_t), (p_x - x_t)) - \theta_t$$

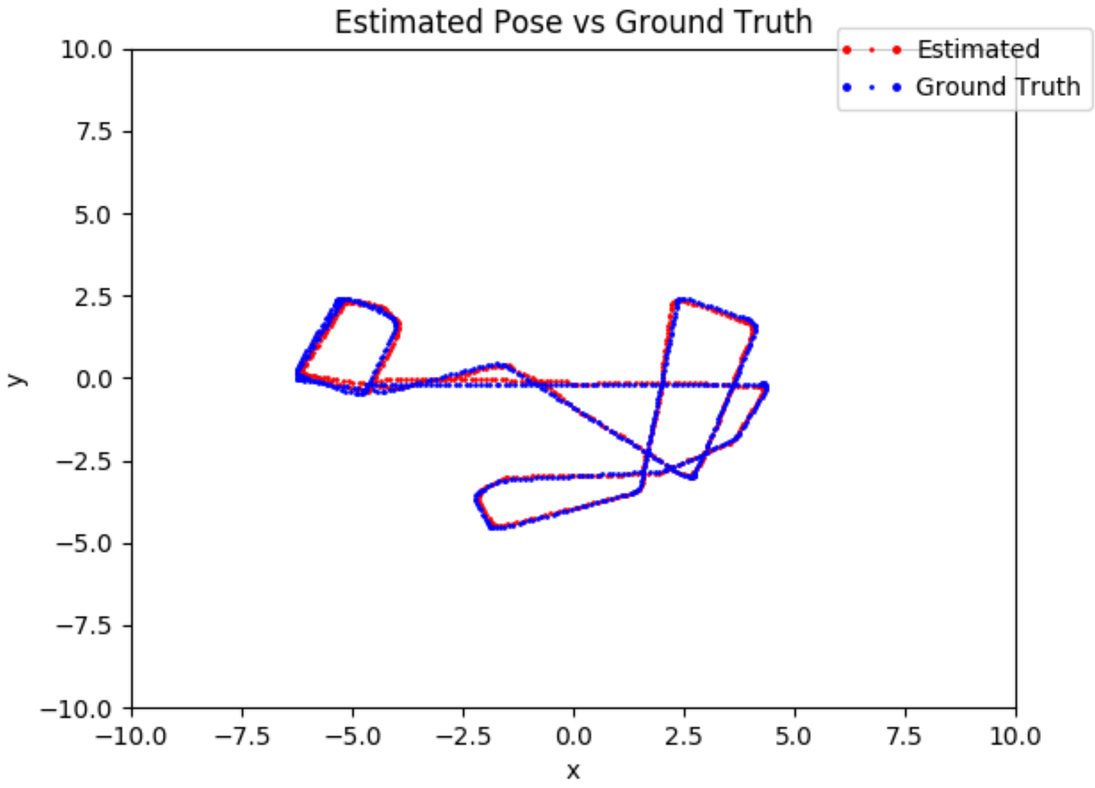
ODOMETRIA


Estimated Pose vs Ground Truth
Estimated
Ground Truth
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
y
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x

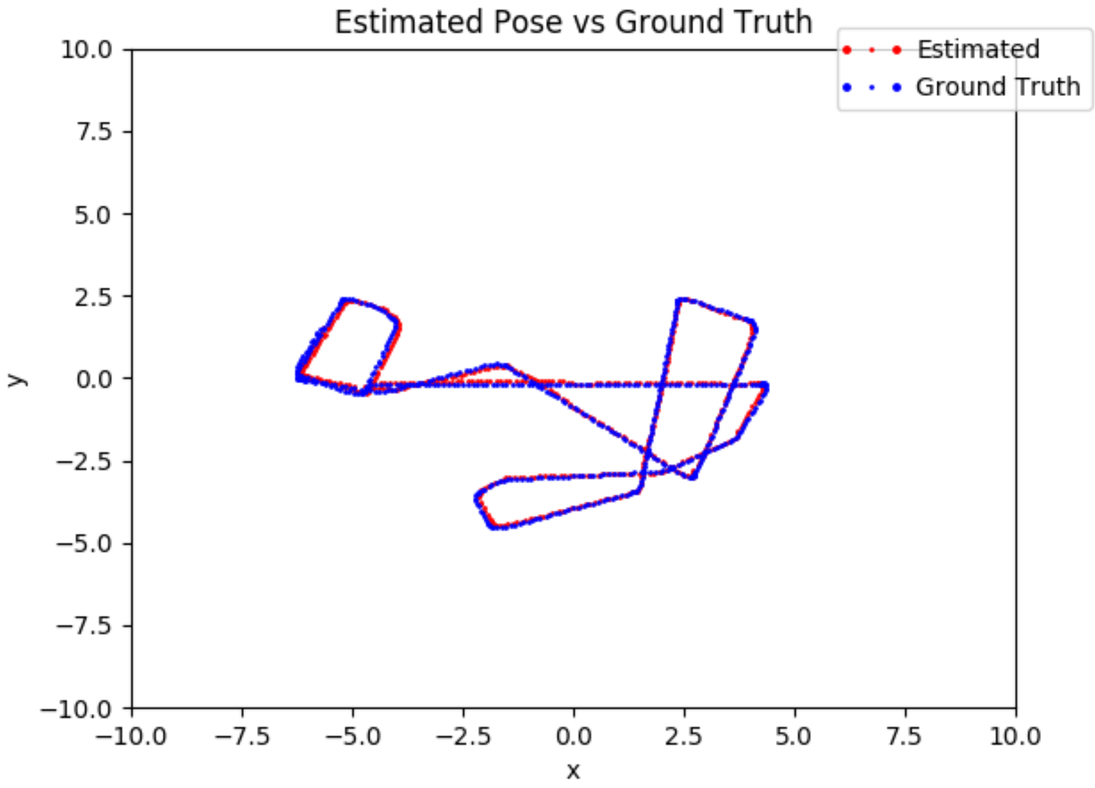
EKF – 1 BASE


Estimated Pose vs Ground Truth
Estimated
Ground Truth
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
y
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x

EKF – 2 BASES

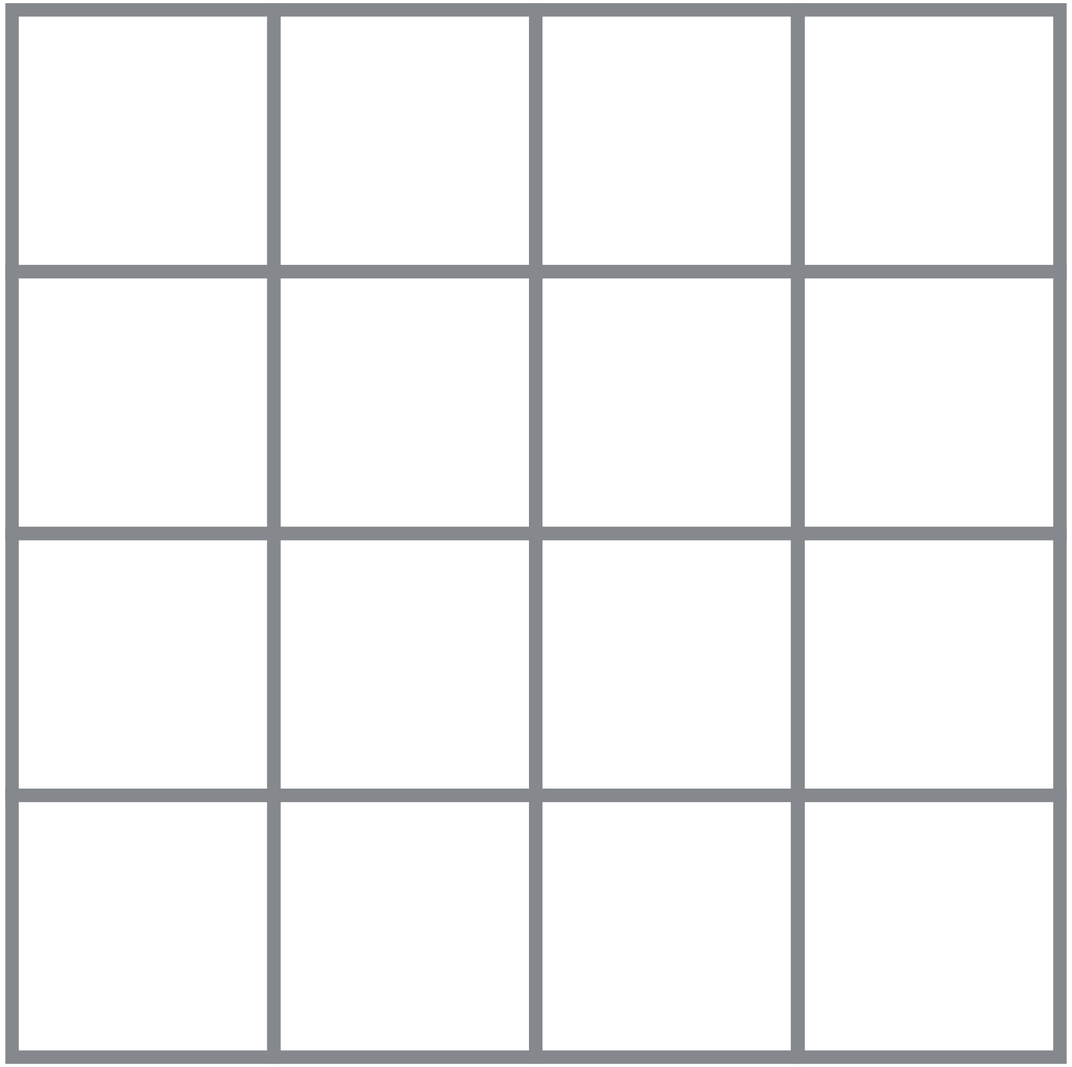

Estimated Pose vs Ground Truth
Estimated
Ground Truth
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
y
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x

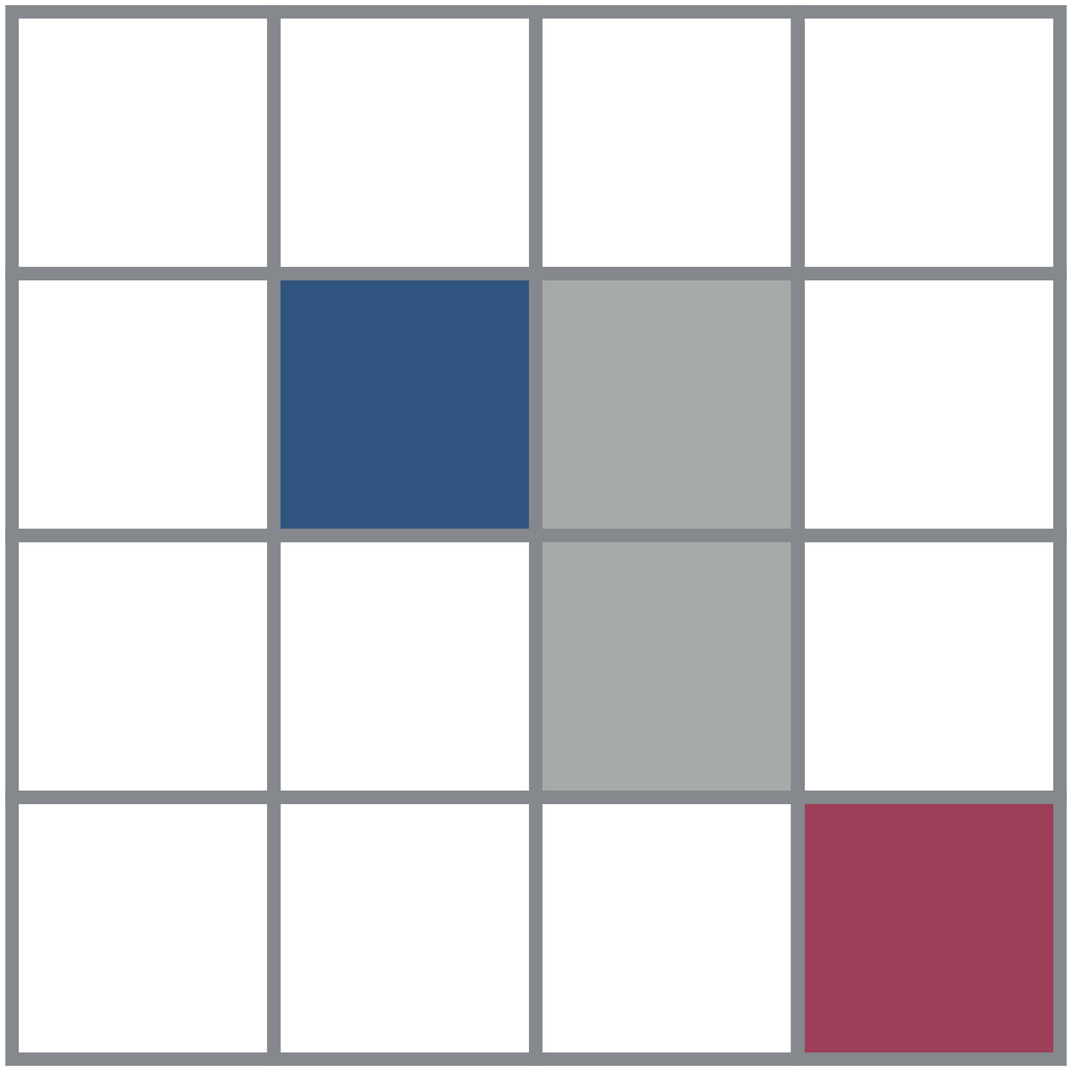
EKF – 3 BASES


Estimated Pose vs Ground Truth
Estimated
Ground Truth
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
y
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x

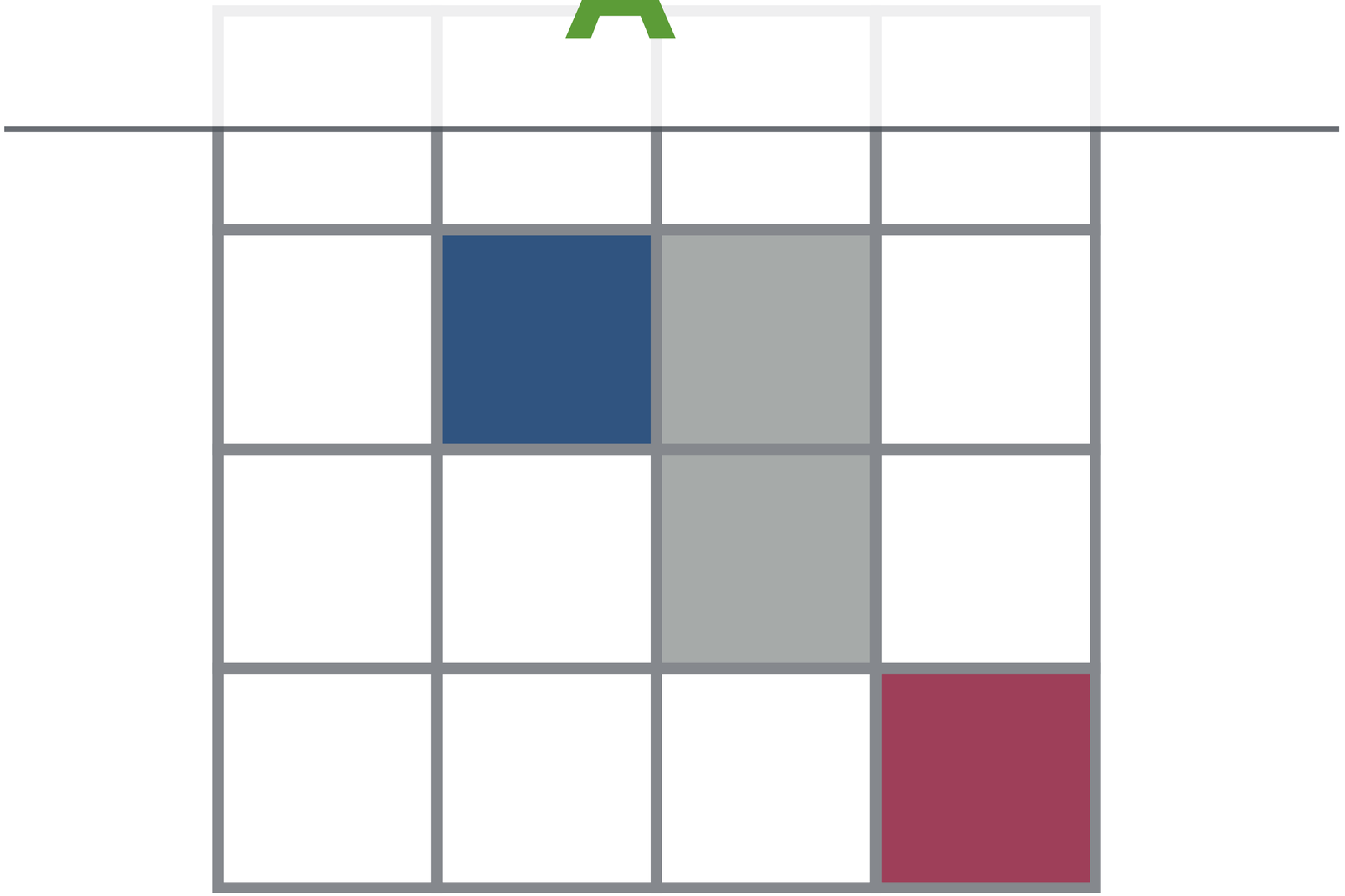
PLANEJAMENTO E EXECUÇÃO DE ROTAS

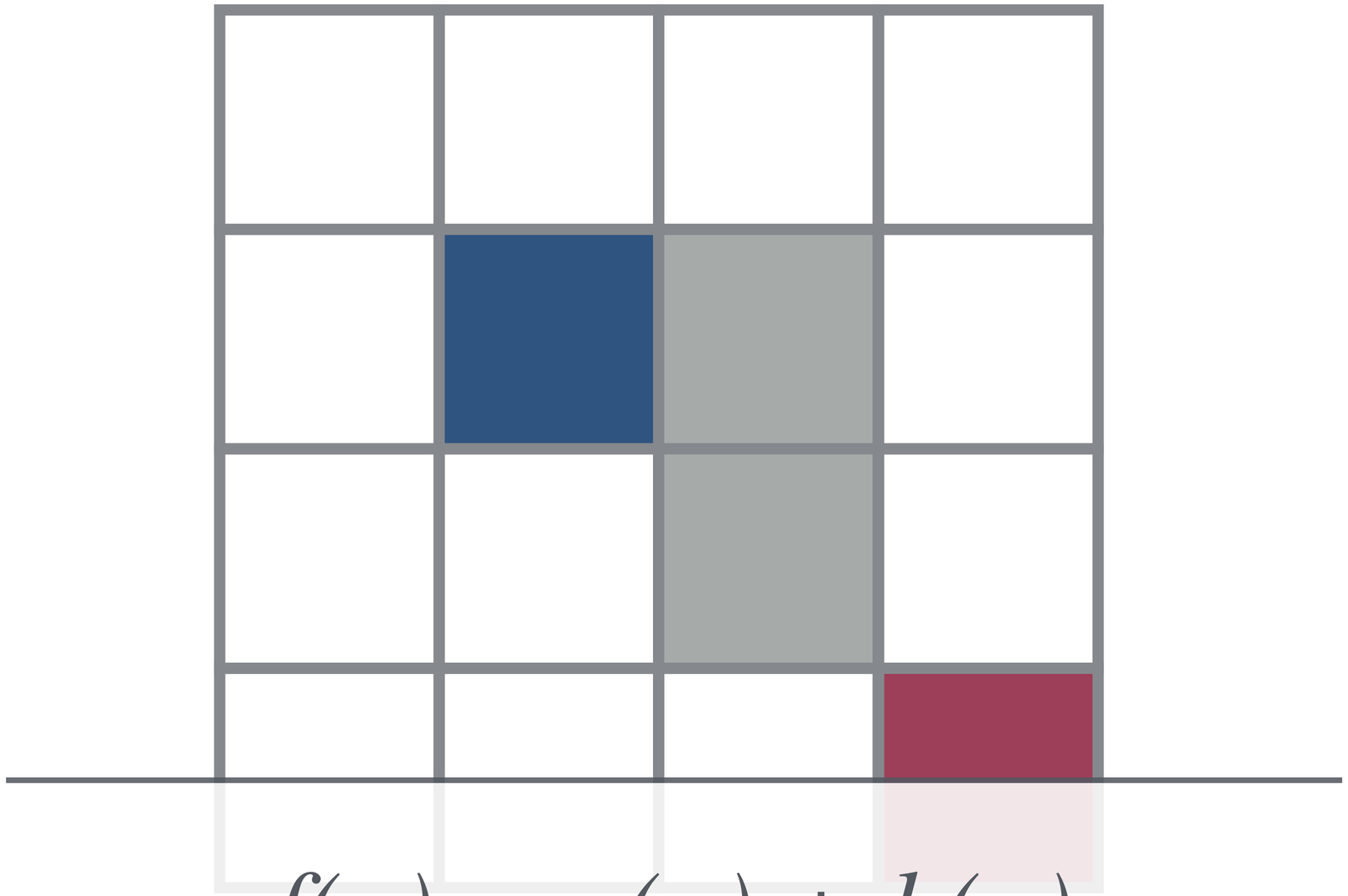
PLANEJAMENTO



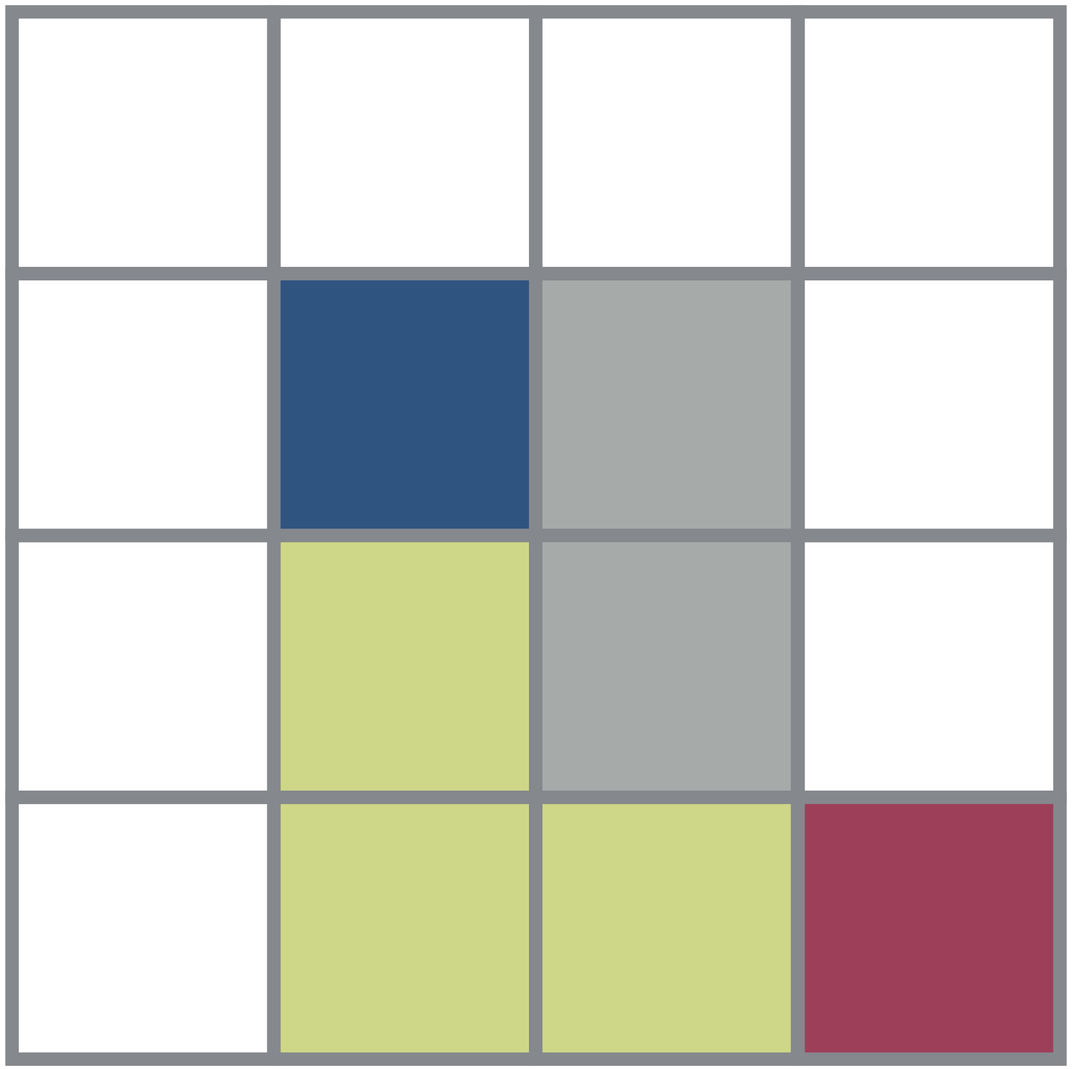


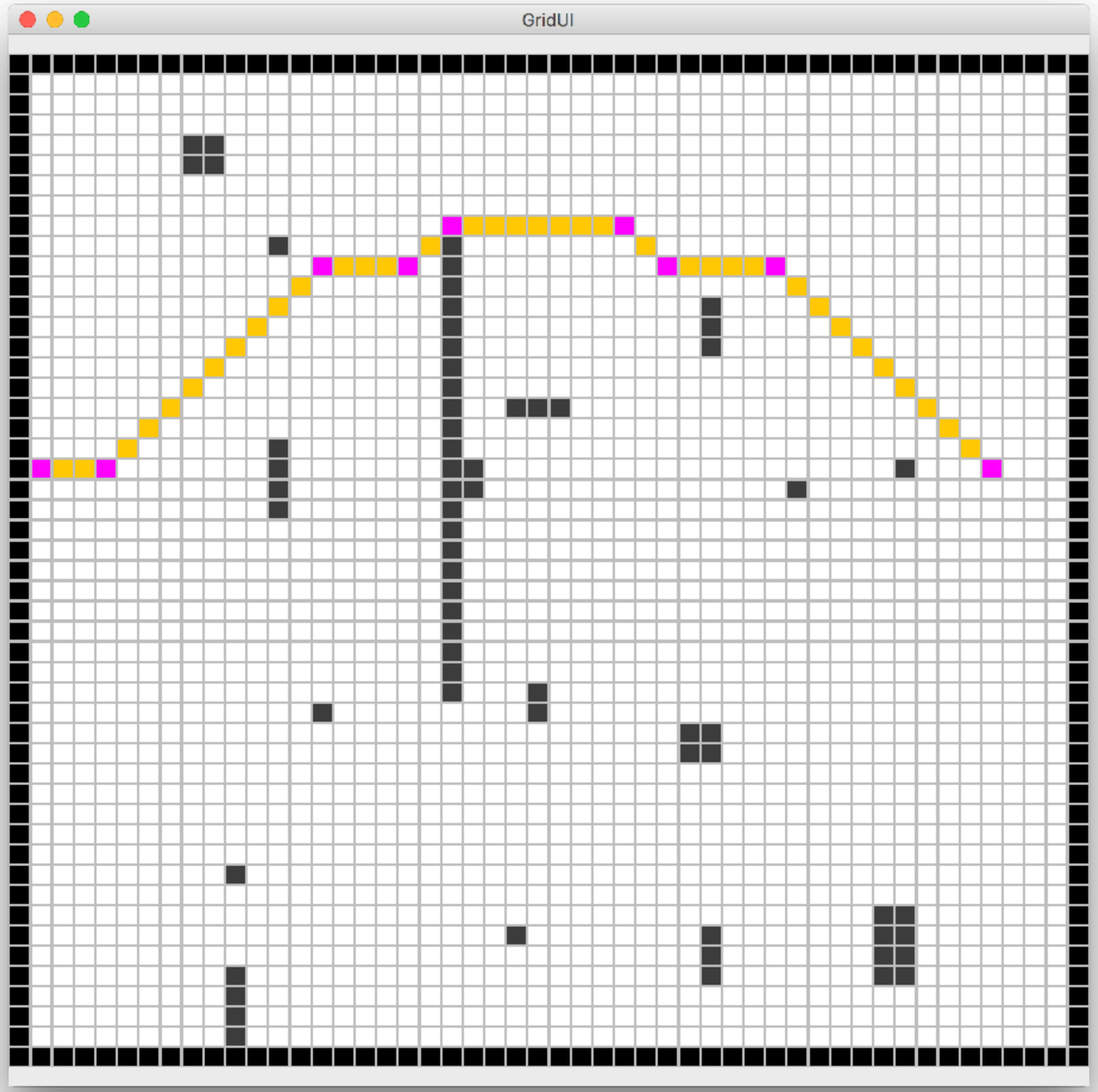
A*

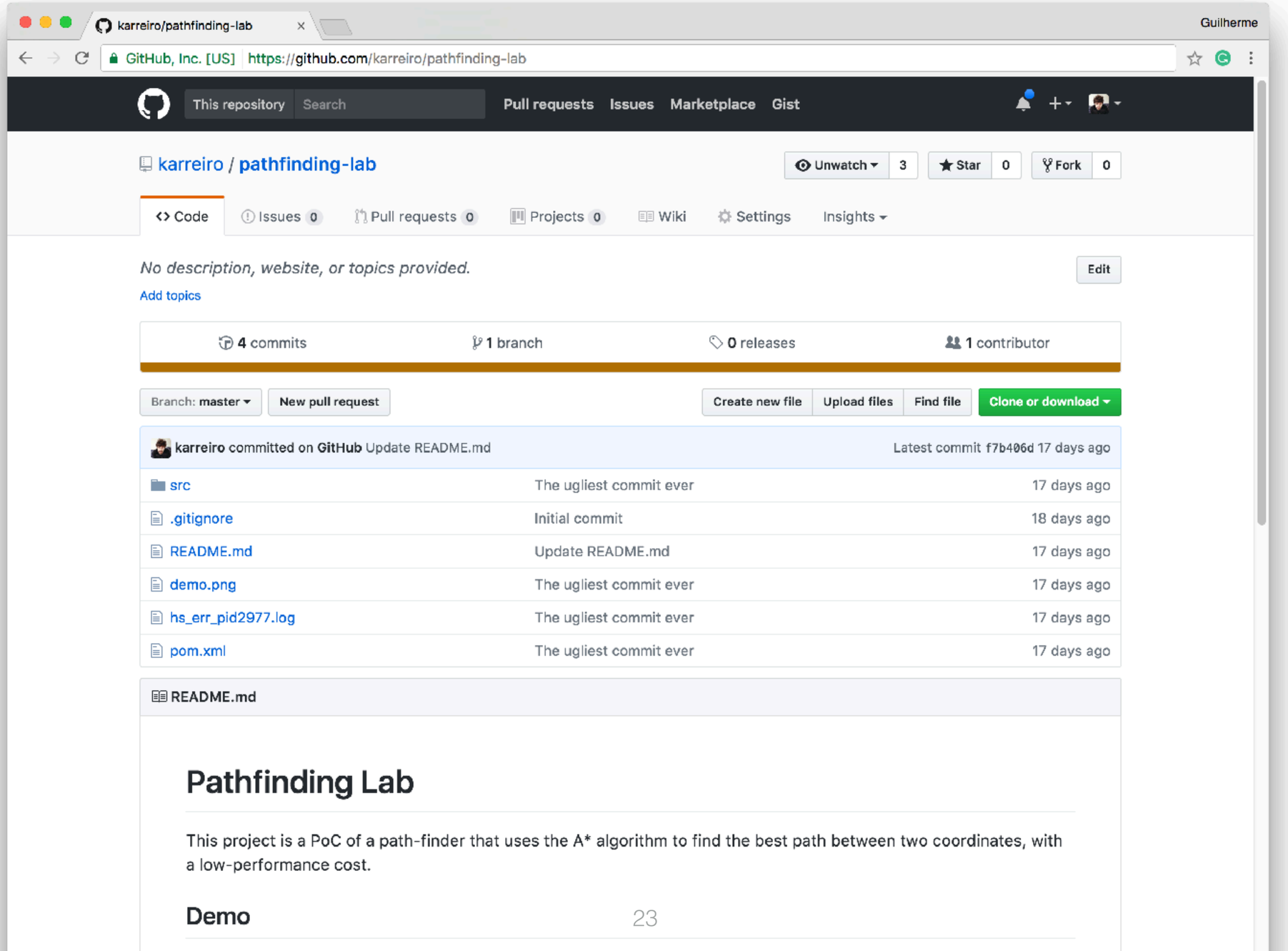




$$f(n) = g(n) + h(n)$$




GridUI


karreiro/pathfinding-lab
Guilherme
GitHub, Inc. [US] https://github.com/karreiro/pathfinding-lab
This repository Search
Pull requests Issues Marketplace Gist
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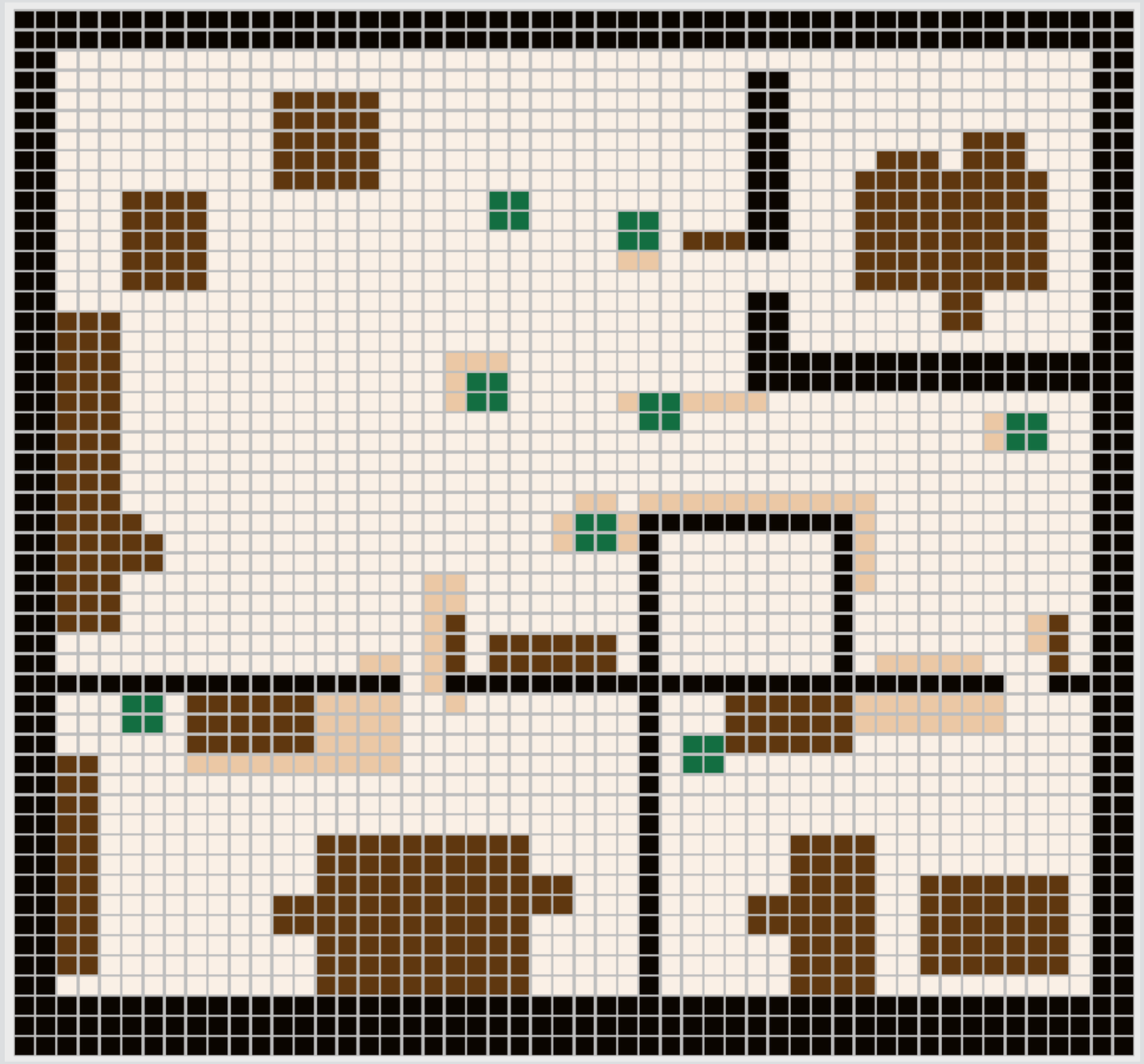
Unwatch 3 Star 0 Fork 0
Code Issues 0 Pull requests 0 Projects 0 Wiki Settings Insights
No description, website, or topics provided.
Edit
Add topics
4 commits 1 branch 0 releases 1 contributor
Branch: master New pull request
Create new file Upload files Find file Clone or download
karreiro committed on GitHub Update README.md
Latest commit f7b406d 17 days ago
src The ugliest commit ever 17 days ago
.gitignore Initial commit 18 days ago
README.md Update README.md 17 days ago
demo.png The ugliest commit ever 17 days ago
hs_err_pid2977.log The ugliest commit ever 17 days ago
pom.xml The ugliest commit ever 17 days ago
README.md
Pathfinding Lab
This project is a PoC of a path-finder that uses the A* algorithm to find the best path between two coordinates, with a low-performance cost.
Demo
23



EXECUÇÃO

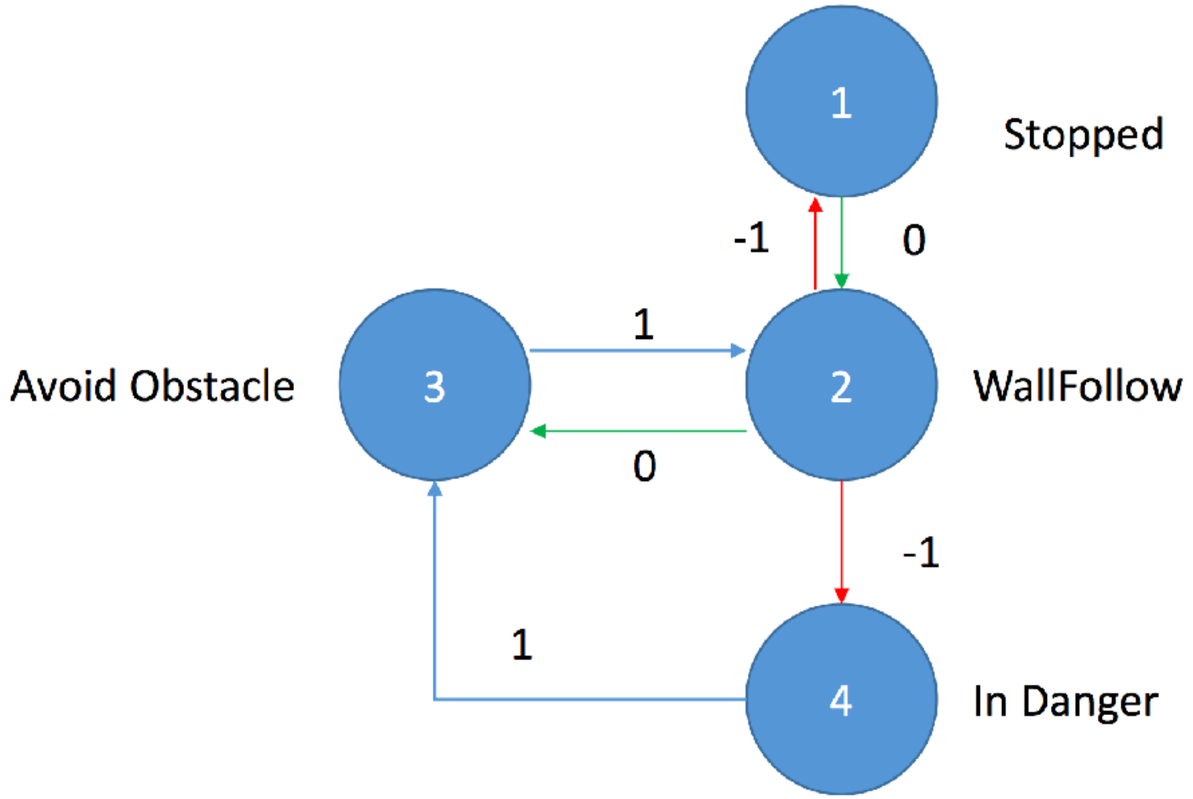
GO TO GOAL (PID)

```
Pose pose = pioneer.getPose();

if (isFound(pose)) {
    if (!nodes.isEmpty()) {
        goTo(nodes.pop());
    } else {
        setVelocity(0, 0);
        return;
    }
}

double u = u(pose);
setVelocity(3 - (u * 2),
            3 + (u * 2));
```

APRENDIZADO

PROBLEMA

APLICAR OS ESTADOS PARA DEFINIR A NAVEGAÇÃO
DO ROBÔ PARA MÁXIMA EXPLORAÇÃO


1
Stopped
-1
0
1
Avoid Obstacle
3
2
WallFollow
0
-1
1
4
In Danger

IMPLEMENTAÇÃO

- CUSTOMIZAÇÃO PARA O CENÁRIO DESCRITO
- ESTUDO DE CASO
- FRAMEWORK BURLAP

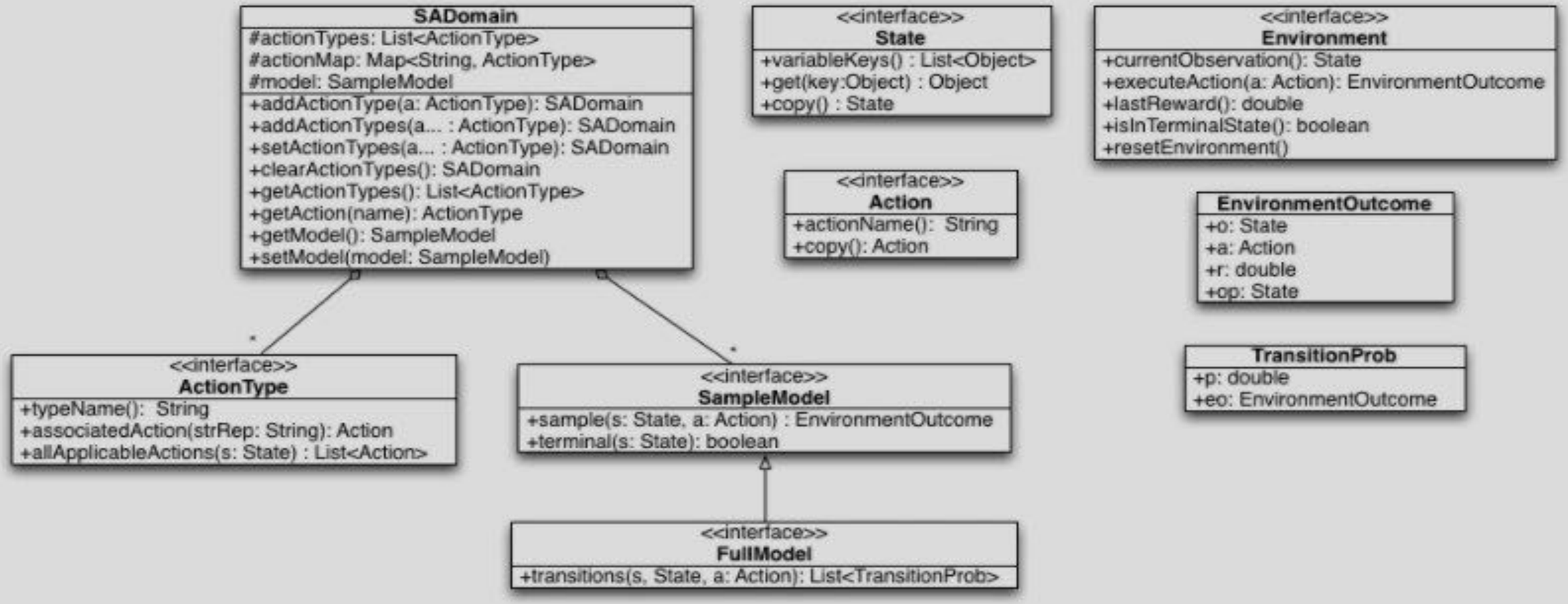
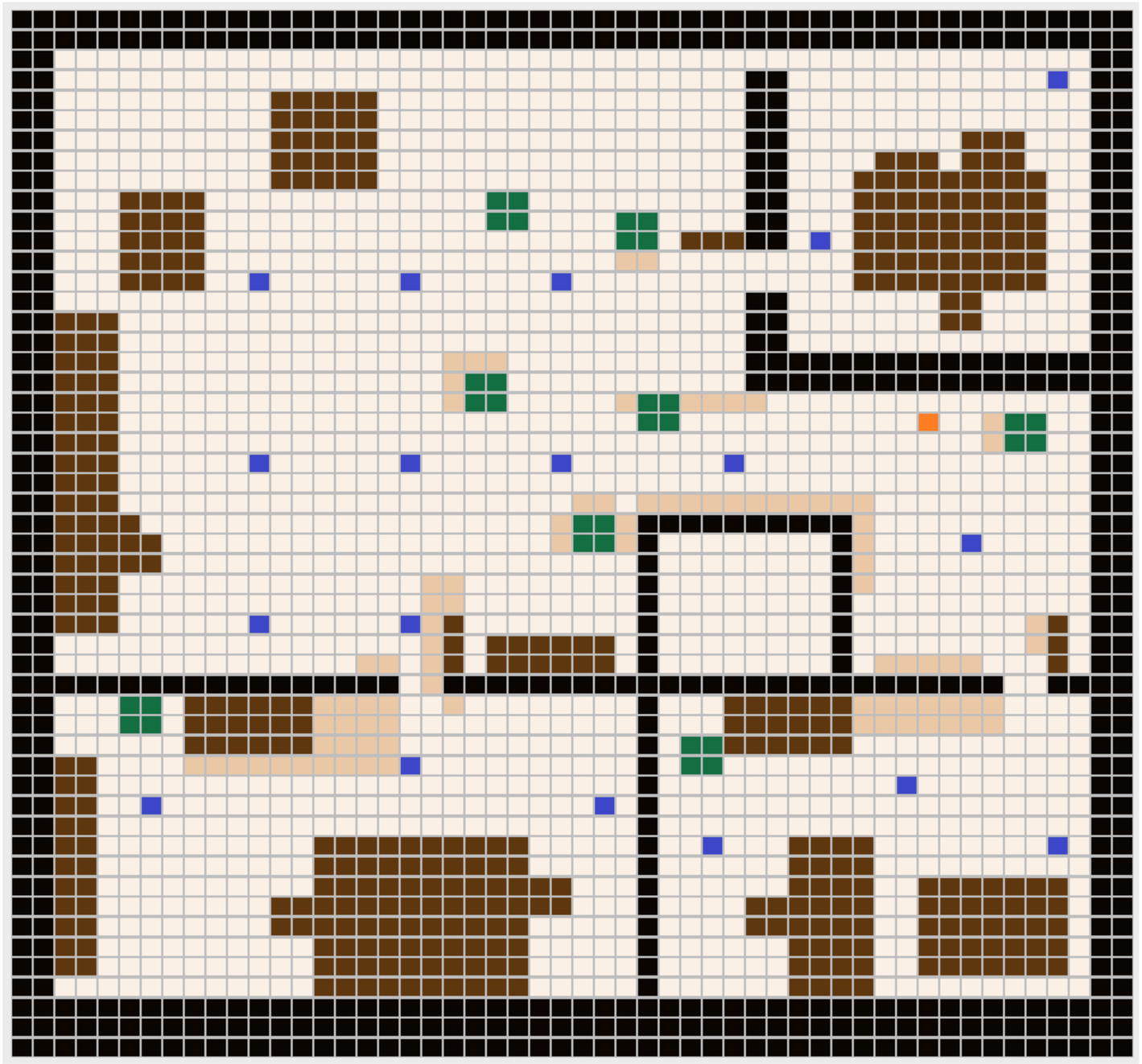


Figure: UML Digram of the Java interfaces/classes for an MDP definition.

DISCRETIZAÇÃO DO AMBIENTE

- CUSTOMIZAÇÃO PARA O CENÁRIO DESCRITO
- ESTUDO DE CASO
- FRAMEWORK BURLAP



AÇÕES SIMPLES:

- 1 ACIMA
- 1 ABAIXO
- 1 ESQUERDA
- 1 DIREITA

VÍDEO

OBRIGADO