SLAM in Matlab (Exercise)

--- General structure ---

```
pseudo_code:
```

```
Factors (x11) = 1 poses + 2 motions + 8 lmks
```

States
$$(x7) = 3 poses + 4 lmks$$

While

```
[A,r] = buildproblem(states, factor);
dx= solvelinearized(A,r);
```

states = updatesstates(states,dx);

drawmap(states, fator);]

--- Structure of the function ---

```
[A,r] = buildproblem(states,factor)

case 'motion': [e, J_e_rob1, J_e_rob2] = error_move(rob1.value, rob2.value,y)

[e, J_e_rob1, J_e_rob2] = error_move(rob1.value, rob2.value,y)

case 'lmk': [e, J_e_rob, J_e_lmk] = error_observe(rob.value, lmk.value,y)

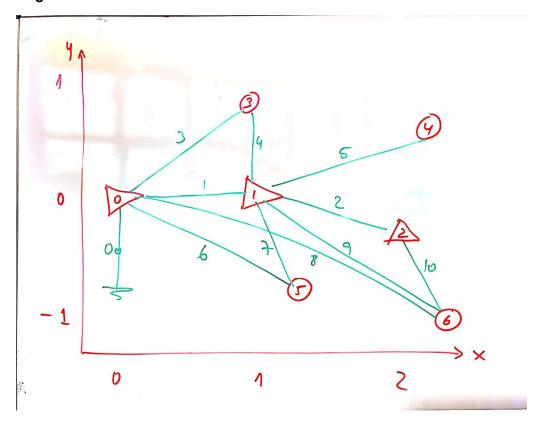
[h, J_h_rob, J_h_lmk] = observe(rob, lmk)

[lmkrob, J_lmkrob_rob, J_lmkrob_lmk] = toFrame2D(rob, lmk)

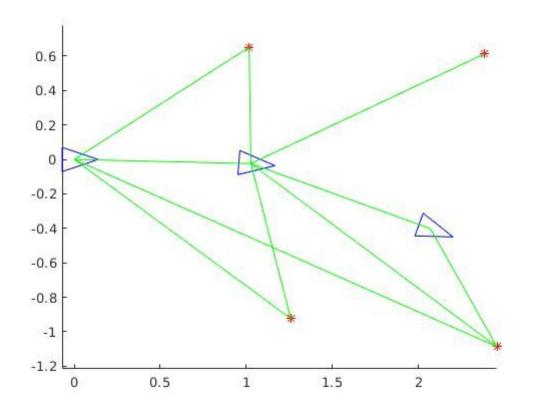
[y, J_y_lmkrob] = c2p(lmkrob)

case 'pose': [e, J_e_rob] = error_pose(rob.value, y)
```

--- Image of the advertised ---



--- Image of the first result ---



--- Before ---

```
% --- Factors ---
factor{1+ 0} = struct(...
        'type', 'pose',...
        'measurement', [0;0;0],...
        'covariance', 1e-3*eye(3,3),...
        'index', 0);
factor{1+ 1} = struct(...
        'type', 'motion',...
        'measurement', [1.0; 0.0; -5*torad],...
        'covariance', diag([1e-2, 1e-2, (2*torad)^2]),...
        'index', [0,1]);
factor{1+ 2} = struct(...
        'type', 'motion',...
        'measurement', [1.05; -0.25; -15*torad],...
        'covariance', diag([1e-2, 1e-2, (5*torad)^2]),...
        'index', [1,2]);
factor{1+ 3} = struct(...
        'type', 'lmk',...
        'measurement', [1.2; 40*torad],...
        'covariance', diag([1e-2, (10*torad)^2]),...
        'index', [0,3]);
factor{1+4} = struct(...
        'type', 'lmk',...
        'measurement', [0.65; 95*torad],...
        'covariance', diag([1e-2,(5*torad)^2]),...
        'index', [1,3]);
factor{1+ 5} = struct(...
        'type' , 'lmk',...
        'measurement', [1.5; 30*torad],...
        'covariance', diag([1e-2,(10*torad)^2]),...
        'index', [1,4]);
factor{1+ 6} = struct(...
        'type' , 'lmk',...
        'measurement', [1.6; -35*torad],...
        'covariance', diag([1e-2,(15*torad)^2]),...
        'index', [0,5]);
factor{1+ 7} = struct(...
        'type', 'lmk',...
        'measurement', [0.9; -75*torad],...
        'covariance', diag([1e-2,(10*torad)^2]),...
```

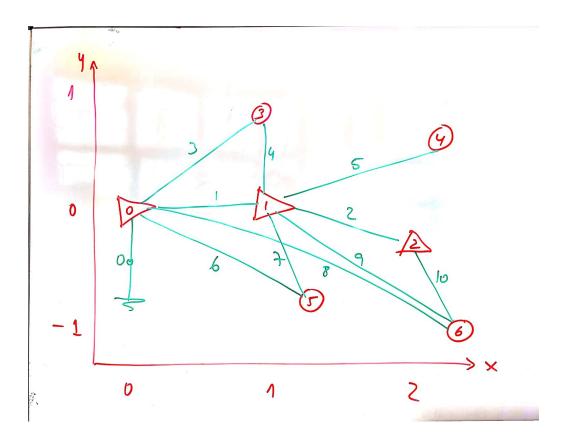
```
Màster de robòtica
        'index', [1,5]);
factor{1+ 8} = struct(...
        'type', 'lmk',...
        'measurement', [2.8; -28*torad],...
        'covariance', diag([4e-2,(7*torad)^2]),...
        'index', [0,6]);
factor{1+ 9} = struct(...
        'type', 'lmk',...
        'measurement', [1.8; -35*torad],...
        'covariance', diag([3e-2,(10*torad)^2]),...
        'index', [1,6]);
factor{1+ 10} = struct(...
        'type', 'lmk',...
        'measurement', [0.7; -40*torad],...
        'covariance', diag([2e-2,(10*torad)^2]),...
        'index', [2,6]);
```

--- After ---

```
% --- Factors ---
factor{1+ 0} = struct(...
        'type', 'pose',...
        'measurement', [0;0;0],...
        'covariance', 1e-3*eye(3,3),...
        'index', 0);
factor{1+ 1} = struct(...
        'type', 'motion',...
        'measurement', [1.0; 0.0; -5*torad],...
        'covariance', diag([1e-2, 1e-2, (2*torad)^2]),...
        'index', [0,1]);
factor{1+ 2} = struct(...
        'type', 'motion',...
        'measurement', [1.05; -0.25; -15*torad],...
        'covariance', diag([1e-2, 1e-2, (5*torad)^2]),...
        'index', [1,2]);
factor{1+ 3} = struct(...
        'type', 'lmk',...
        'measurement', [1.3; 40*torad],...
        'covariance', diag([1e-2, (10*torad)^2]),...
        'index', [0,3]);
factor{1+4} = struct(...
        'type', 'lmk',...
        'measurement', [0.72; 95*torad],...
        'covariance', diag([1e-2,(5*torad)^2]),...
        'index', [1,3]);
factor{1+ 5} = struct(...
        'type' , 'lmk',...
        'measurement', [1.15; 25*torad],...
        'covariance', diag([1e-2,(10*torad)^2]),...
        'index', [1,4]);
factor{1+ 6} = struct(...
        'type' , 'lmk',...
        'measurement', [1.5; -40*torad],...
        'covariance', diag([1e-2,(15*torad)^2]),...
        'index', [0,5]);
factor{1+ 7} = struct(...
        'type', 'lmk',...
        'measurement', [0.7; -78*torad],...
        'covariance', diag([1e-2,(10*torad)^2]),...
```

```
Màster de robòtica
        'index', [1,5]);
factor{1+ 8} = struct(...
        'type', 'lmk',...
        'measurement', [2.4; -26*torad],...
        'covariance', diag([2e-2,(7*torad)^2]),...
        'index', [0,6]);
factor{1+ 9} = struct(...
        'type', 'lmk',...
        'measurement', [1.5; -35*torad],...
        'covariance', diag([3e-2,(10*torad)^2]),...
        'index', [1,6]);
factor{1+ 10} = struct(...
        'type', 'lmk',...
        'measurement', [0.9; -37*torad],...
        'covariance', diag([2e-2,(10*torad)^2]),...
        'index', [2,6]);
```

--- Image of the advertised ---



--- Image of the final result ---

