

# EVALUACIÓN 11.2. Planeación de Trayectorias

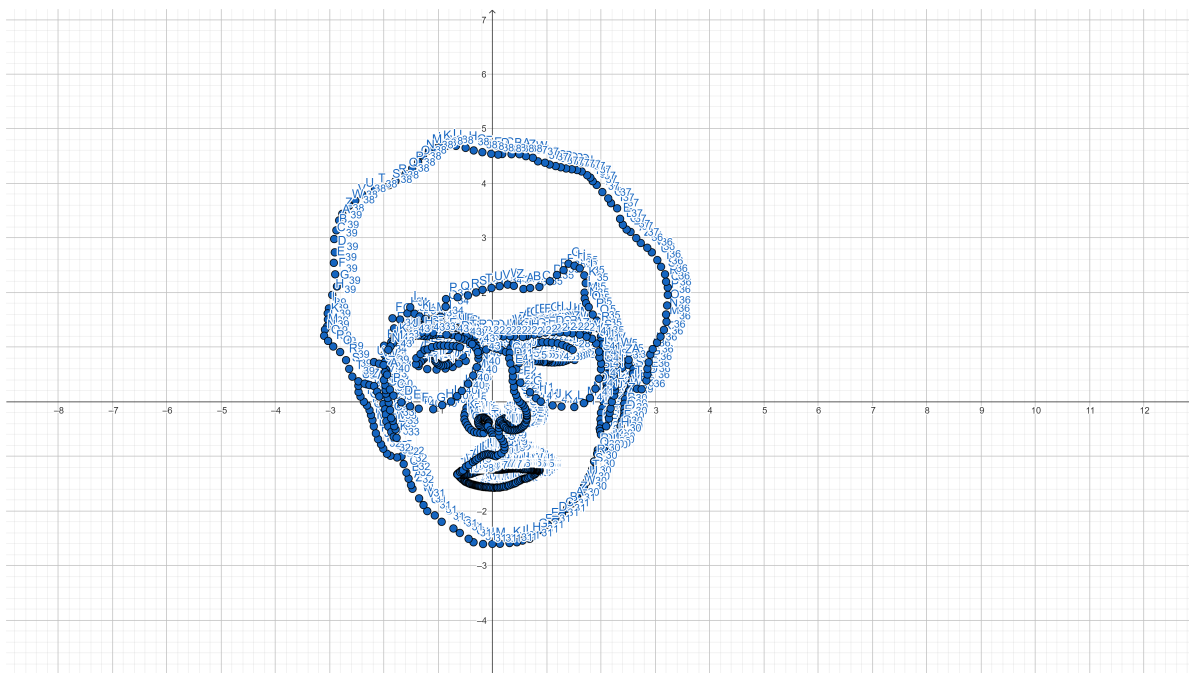
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1. **Obtener** el mapa de puntos para generar la planeación de trayectorias a partir de tu rostro, marcando **set-points** con el software Geogebra.
2. **Planear** la trayectoria que debe seguir el algoritmo empleando el mapa de puntos obtenido, considerando la descripción más próxima a los rasgos físicos de tu rostro (Forma de la cara, forma del cabello, ojos, cejas, nariz, boca y orejas), (barba en caso de que aplique).
3. **Implementar** el código requerido para generar la planeación de trayectorias empleado la técnica que consideres más eficiente para esta aplicación (**Control en lazo abierto, control de posición, control de trayectorias ó PurePursuit (way-points)**). Considerando el ajuste de los parámetros cinemáticos del robot móvil como: Velocidad angular ( $w$ ), velocidad lineal ( $v$ ), ancho de la muestra ( $t_s$ ), tiempo de simulación ( $t$ ), ganancias, etc.

Foto base empleada para la extracción de puntos



Puntos generados



```
%% Define Vehicle
```

```
R = 0.1;           % Wheel radius [m]
L = 0.5;           % Wheelbase [m]
dd = DifferentialDrive(R,L);
```

```
%% Simulation parameters
```

```
sampleTime = 0.05;           % Sample time [s]
tVec = 0:sampleTime:190;      % Time array
```

```
initPose = [-1.3588966874359718;0.6532906325081589;0];
pose = zeros(3,numel(tVec));   % Pose matrix
pose(:,1) = initPose;
```

```
% Initial pose (x y theta)
```

```
% Define waypoints
```

```
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-1.2000    0.6000
-1.0290    0.5909
-0.8659    0.6101
-0.7315    0.6389
-0.6212    0.7013
-0.4916    0.7493
-0.5444    0.8452
-0.6212    0.9028
-0.7325    0.9391
:

```

```

% Create visualizer
viz = Visualizer2D;
viz.hasWaypoints = true;

%% Pure Pursuit Controller
controller = controllerPurePursuit;
controller.Waypoints = waypoints;
controller.LookaheadDistance = 0.1;
controller.DesiredLinearVelocity = 0.4;

```

```

controller.MaxAngularVelocity = 8;

%% Simulation loop
close all
r = rateControl(1/sampleTime);
for idx = 2:numel(tVec)
    % Run the Pure Pursuit controller and convert output to wheel speeds
    [vRef,wRef] = controller(pose(:,idx-1));
    [wL,wR] = inverseKinematics(dd,vRef,wRef);

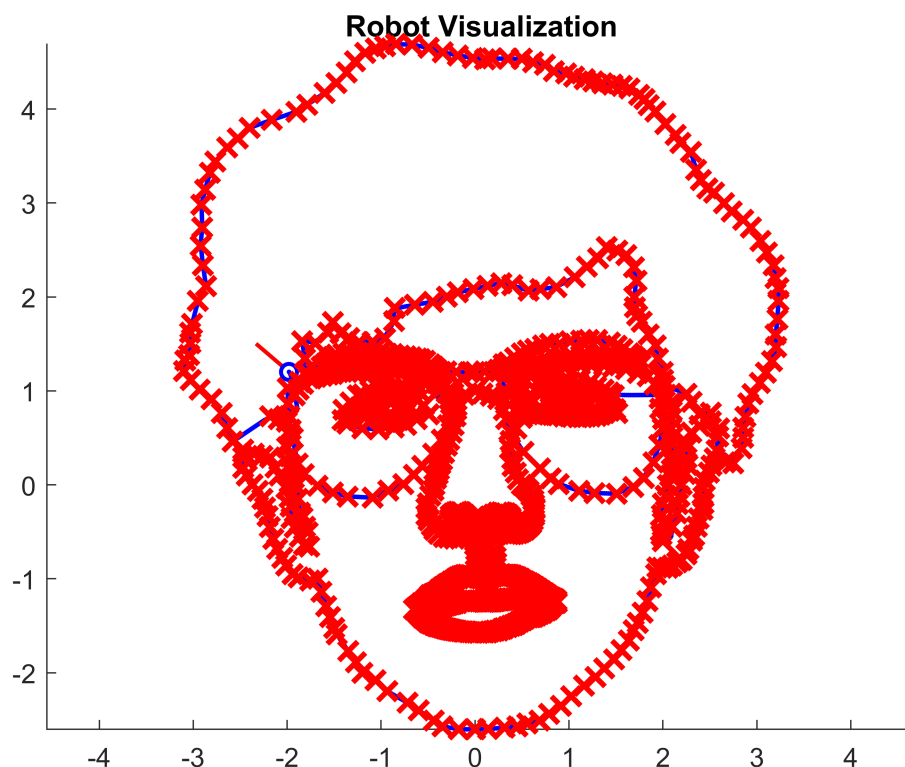
    % Compute the velocities
    [v,w] = forwardKinematics(dd,wL,wR);
    velB = [v;0;w]; % Body velocities [vx;vy;w]
    vel = bodyToWorld(velB,pose(:,idx-1)); % Convert from body to world

    % Perform forward discrete integration step
    pose(:,idx) = pose(:,idx-1) + vel*sampleTime;

    % Update visualization
    viz(pose(:,idx),waypoints)
    waitfor(r);
end

```

Warning: System Object 'Visualizer2D' is inherited from mixin class 'matlab.system.mixin.CustomIcon' that will no longer be supported. Remove 'matlab.system.mixin.CustomIcon' and define corresponding System object methods instead.





### ***Explicación***

Debido a la gran cantidad de puntos utilizados para el trazado de las características faciales (43 veces el abecedario, lo que resulta en un total de 1118 puntos), es crucial mantener la fidelidad en los detalles del rostro. Para lograr esto utilizando el software GeoGebra, se emplean puntos para caracterizar la cara. Considerando que no se requieren curvas complejas, sino más bien puntos consecutivos para definir las formas, opté por utilizar nuevamente el algoritmo de waypoints. Este enfoque ha demostrado ser robusto para seguir puntos de manera eficiente y precisa, minimizando el tiempo y manteniendo el control del trazo. Así, el uso del algoritmo de waypoints resulta conveniente y útil para este propósito.

No obstante, considero que se puede reducir la cantidad de puntos a la mitad de los empleados sin perder mucha calidad en los detalles del rostro, agilizando así el procesamiento y recorrido del bot por todos los puntos indicados.