

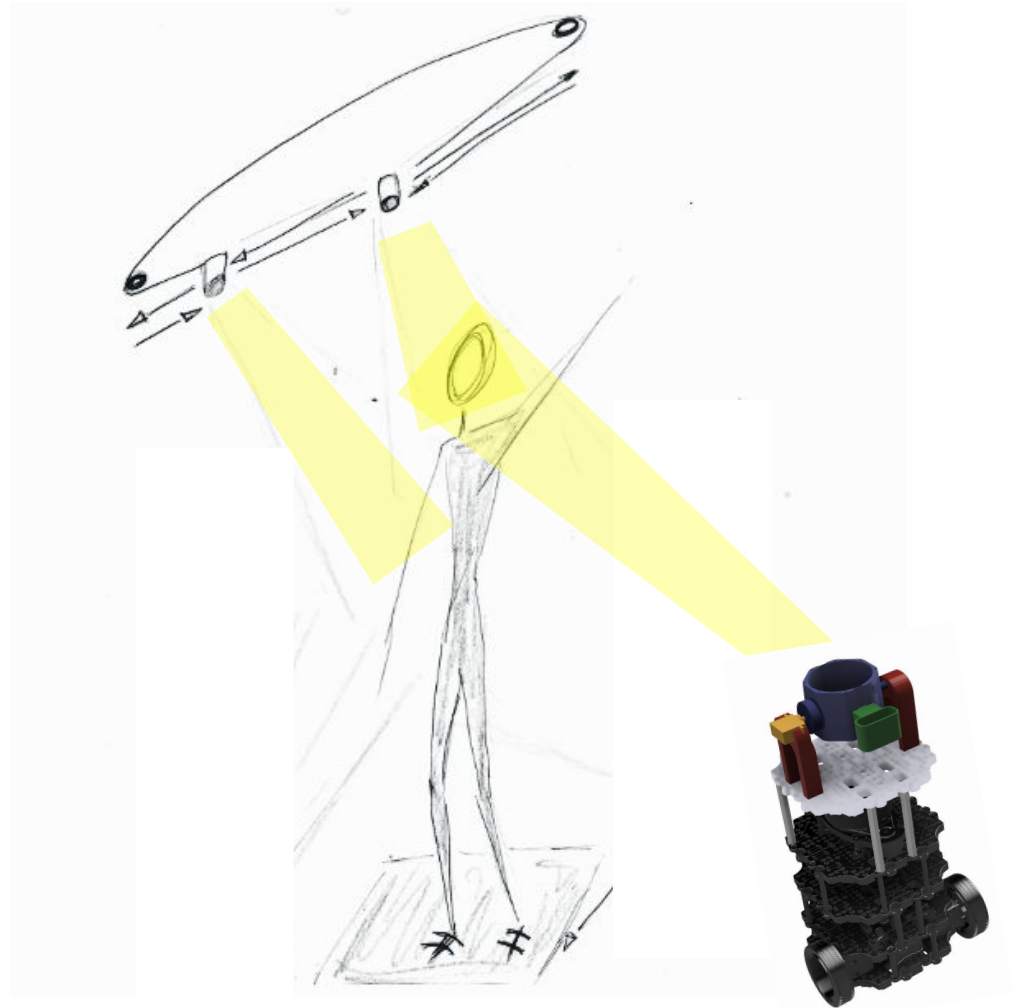
# Face-followin g illumination

Ángel Oroz  
Beñat Solaegui



# Main Idea

- Illuminate from below.
- The face is the highest source of expression.
- Illuminate from different perspectives.



# Needed new Components

1

## Camera

To detect where the face of the actress is.

2

## Light source

To illuminate the face of the actress, controlled by the integrated Arduino.

3

## Servomotor

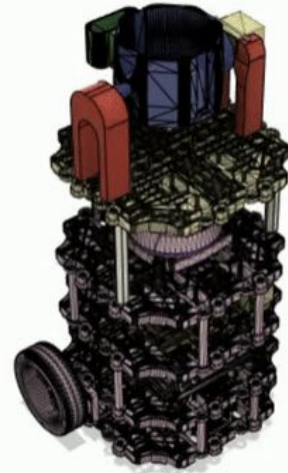
To be able to orient the light depending on the actress's face position, requiring an additional Arduino.

4

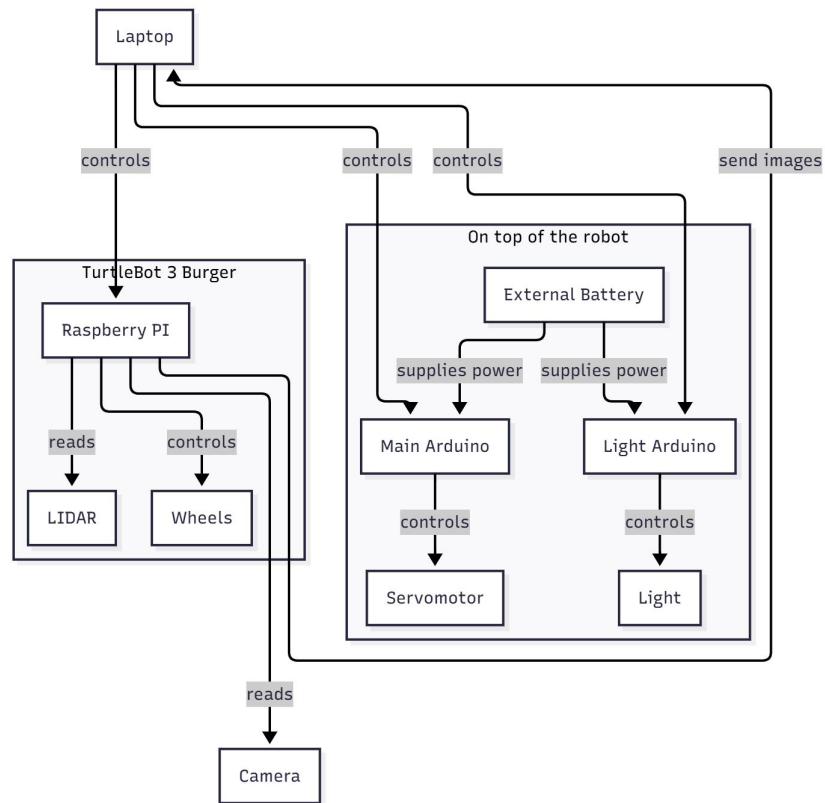
## External Battery

Powering both the light source and the servomotor.

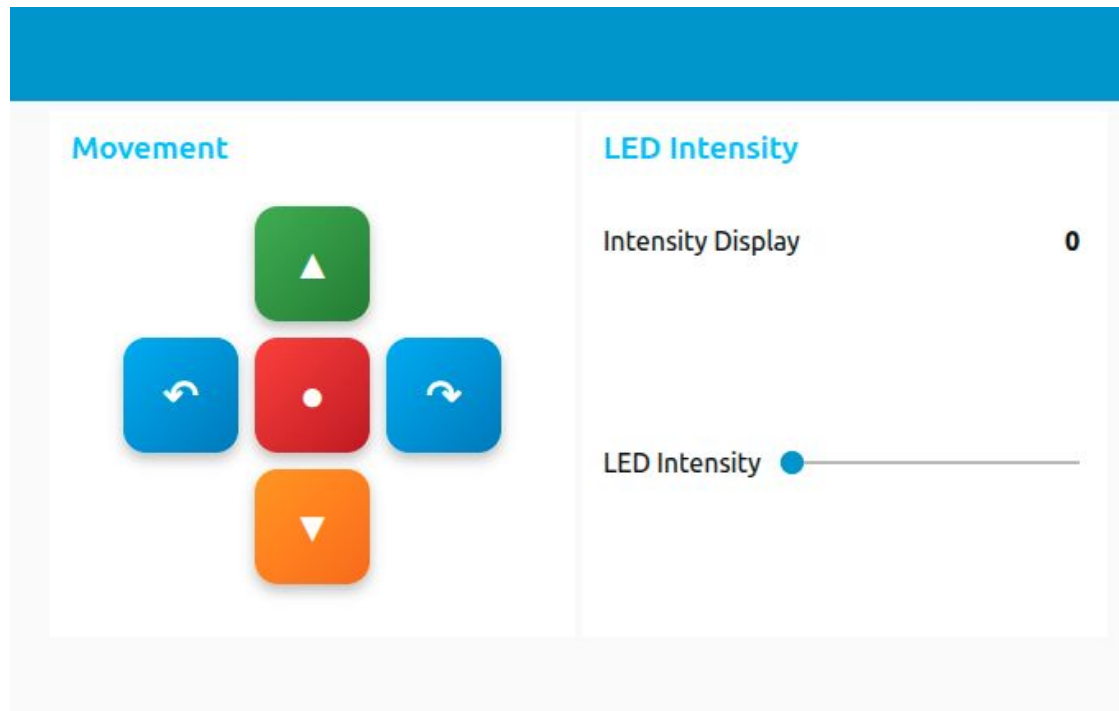
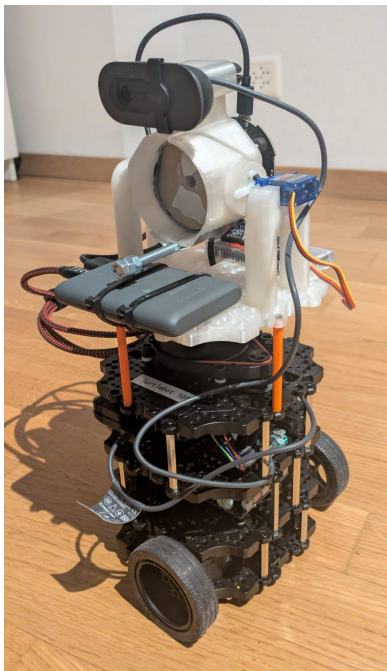
# Robot Design



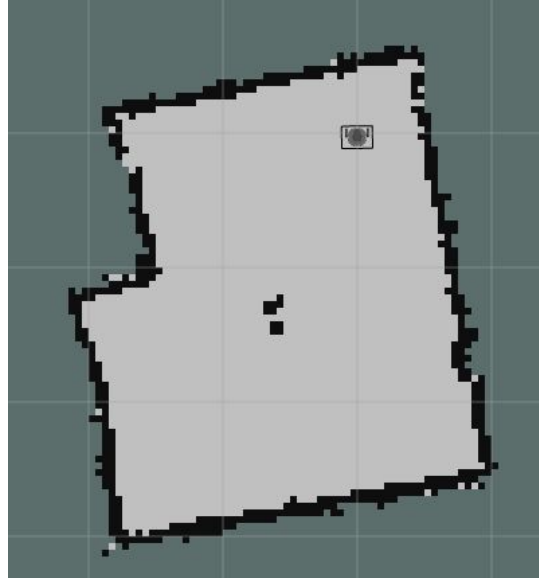
# Hardware Structure



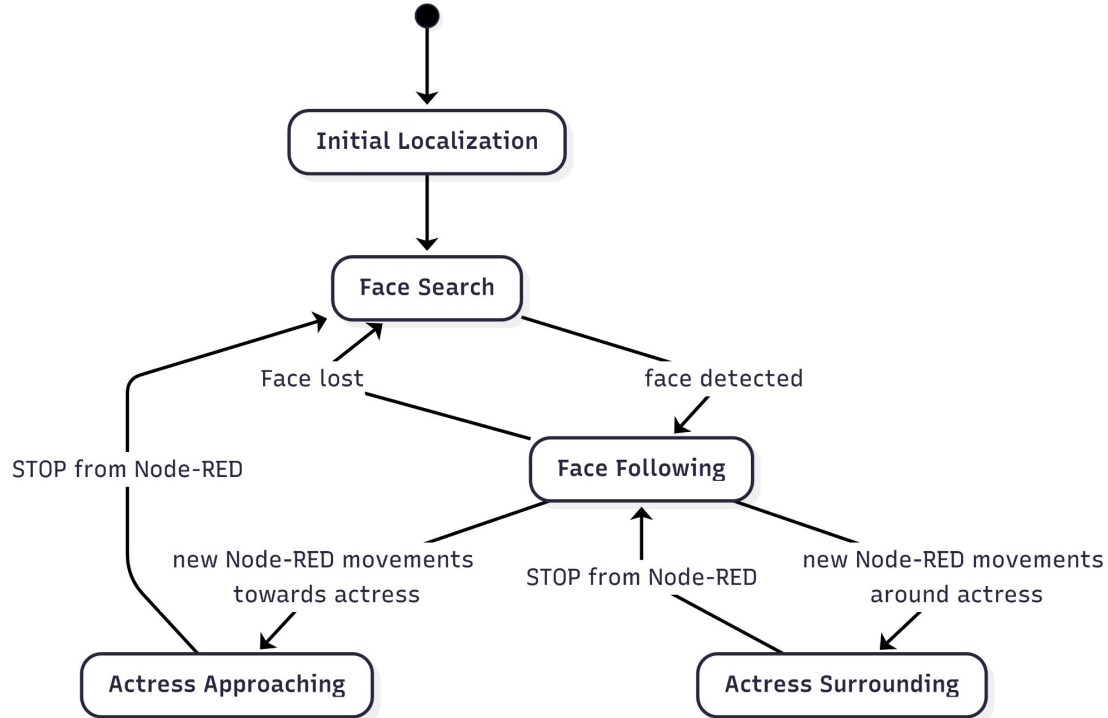
# Movement & Node-RED Interface



# Mapping



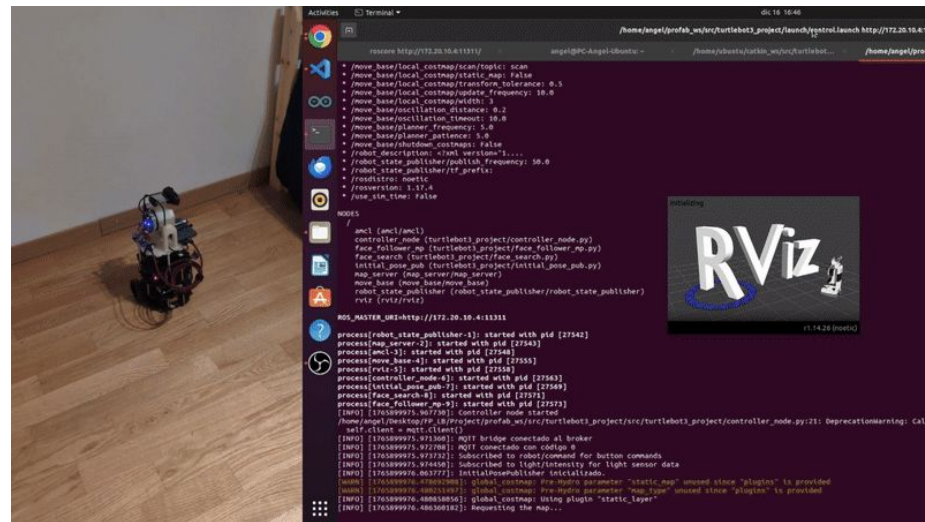
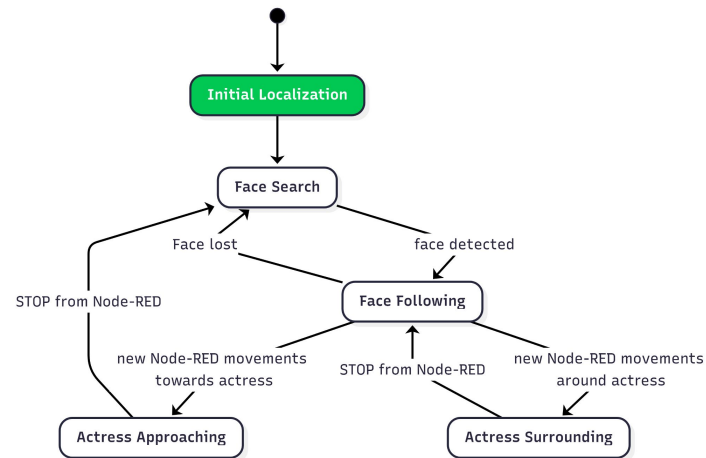
# Robot States





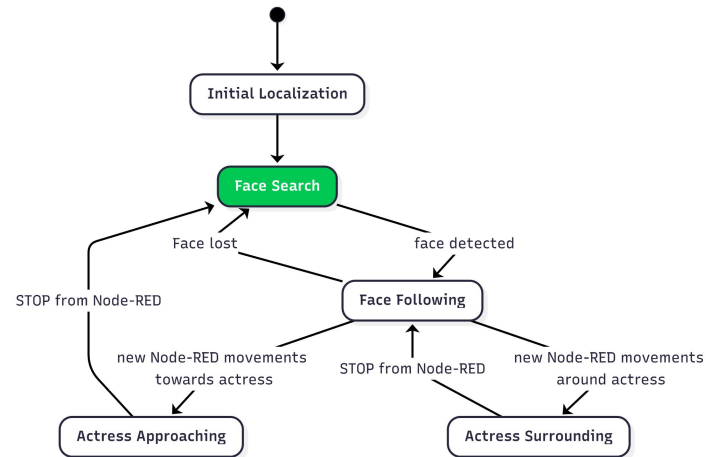
# Initial Localization

- Good initial guess
- 360° rotation + forward&backward
- At the end the robot is **localized**.



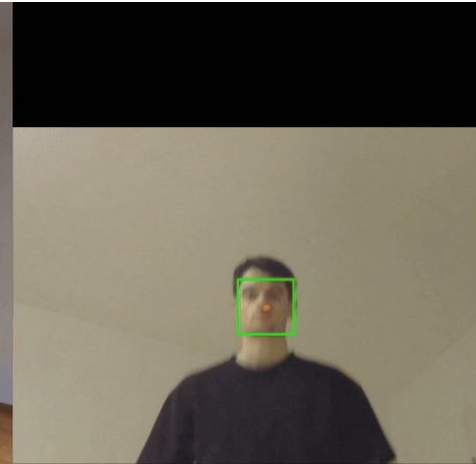
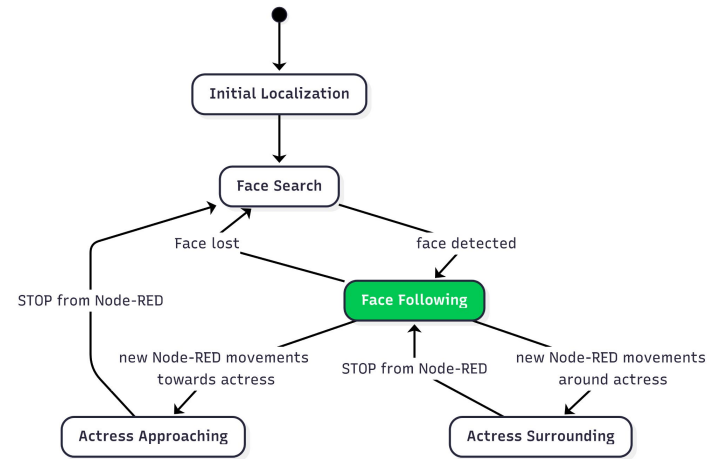
# Face Search

- Orient robot toward actress's known position on the map
- Perform vertical sweep to search for a face
- If face **not found**:
  - Move slightly to the left, repeat vertical sweep
  - Move slightly to the right, repeat vertical sweep



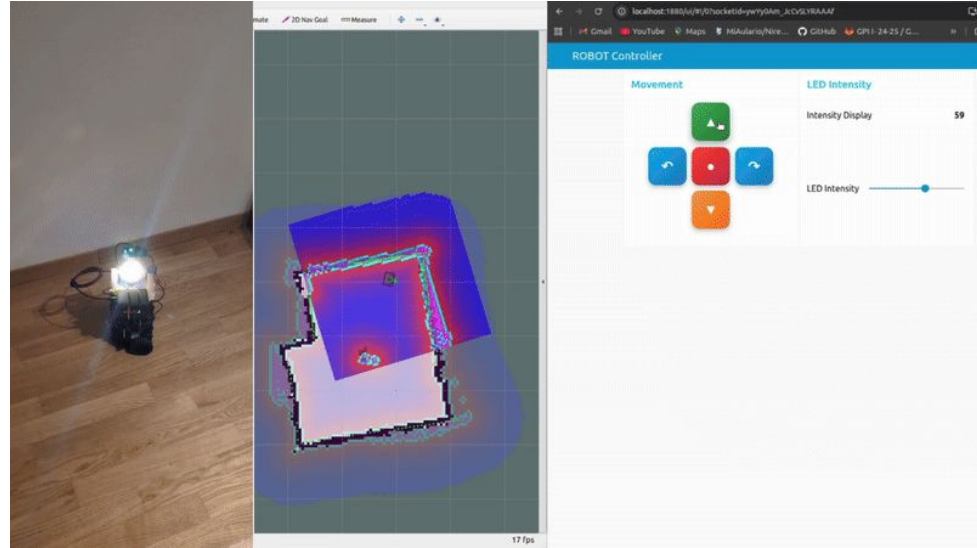
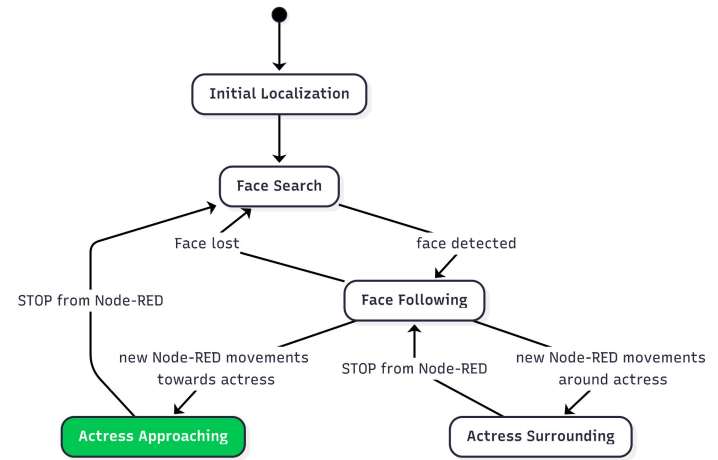
# Face Following

- Main robot functionality
- **Mediapipe** for face detection
  - Camera **confidence**
  - **Distance** to face
- **Proportional Controllers** → **face**  
always **centered** (light beam)
  - **Wheels** (x axis)
  - **Servo motor** (y axis)



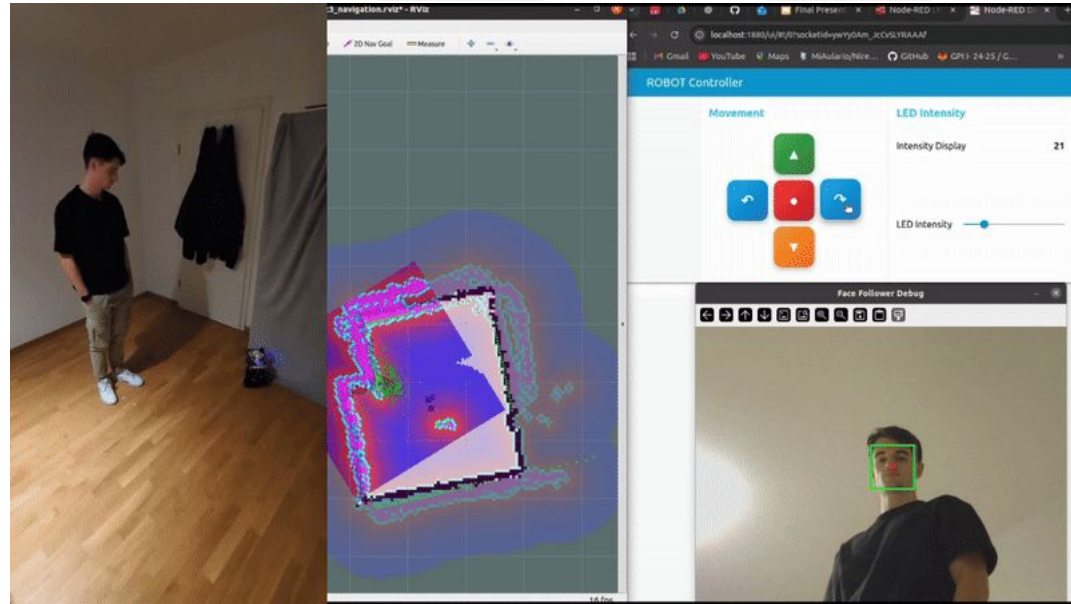
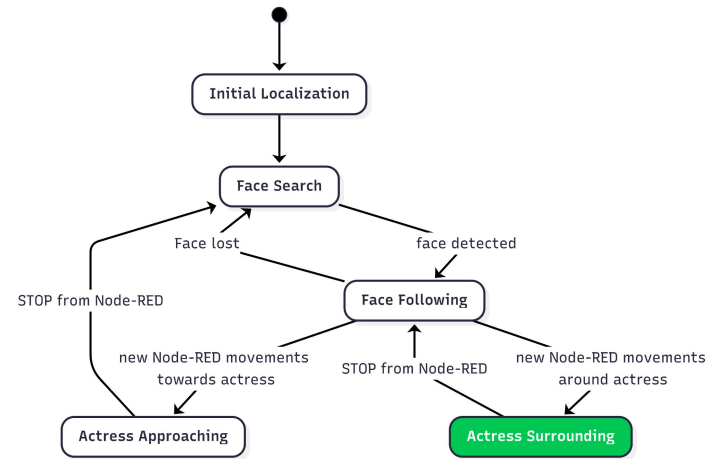
# Actress Approaching

- Movements
  - **Forward**
  - **Backward**
- **Camera** axis **perpendicular** to the **wheels**
- Switch the **light off**
- **Orient wheels** to the person
- Moves until **stopped** via **Node-RED**

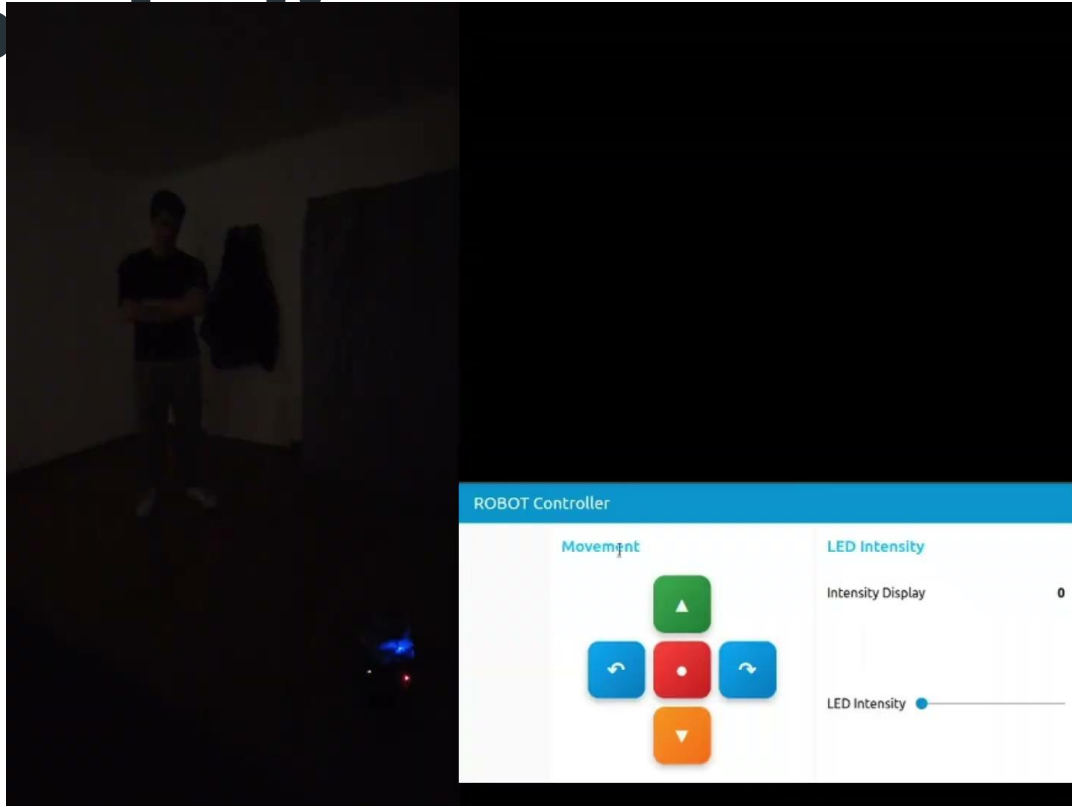


# Actress Surrounding

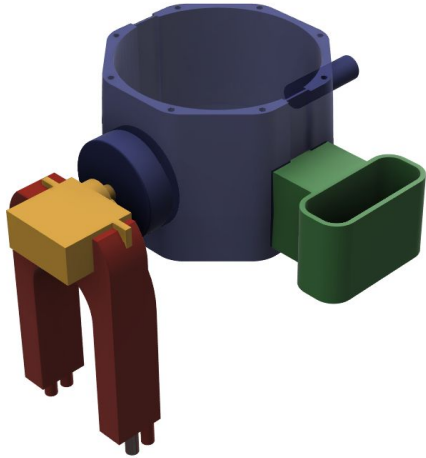
- Allows **face following** during **movements**
- **Circular movements** around the person
- **Face following corrections**
- Moves until **stopped** via **Node-RED**



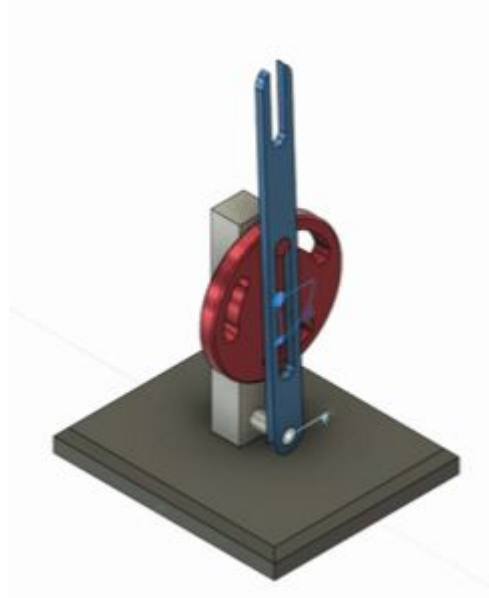
# Video Demo



# Challenges



VS



# Challenges

- Proportional controllers **parameters** were **difficult** to tune
- **Unstable** camera **frame rate**
- Issues with **darker environments**
- Basic move to goal **unreliable**
  - **Initial version** based on it
  - Moved the robot to a **position based on** the **person**
  - Depended on a **radius** and a **theta**



# Face-followin g illumination

Ángel Oroz  
Beñat Solaegui

