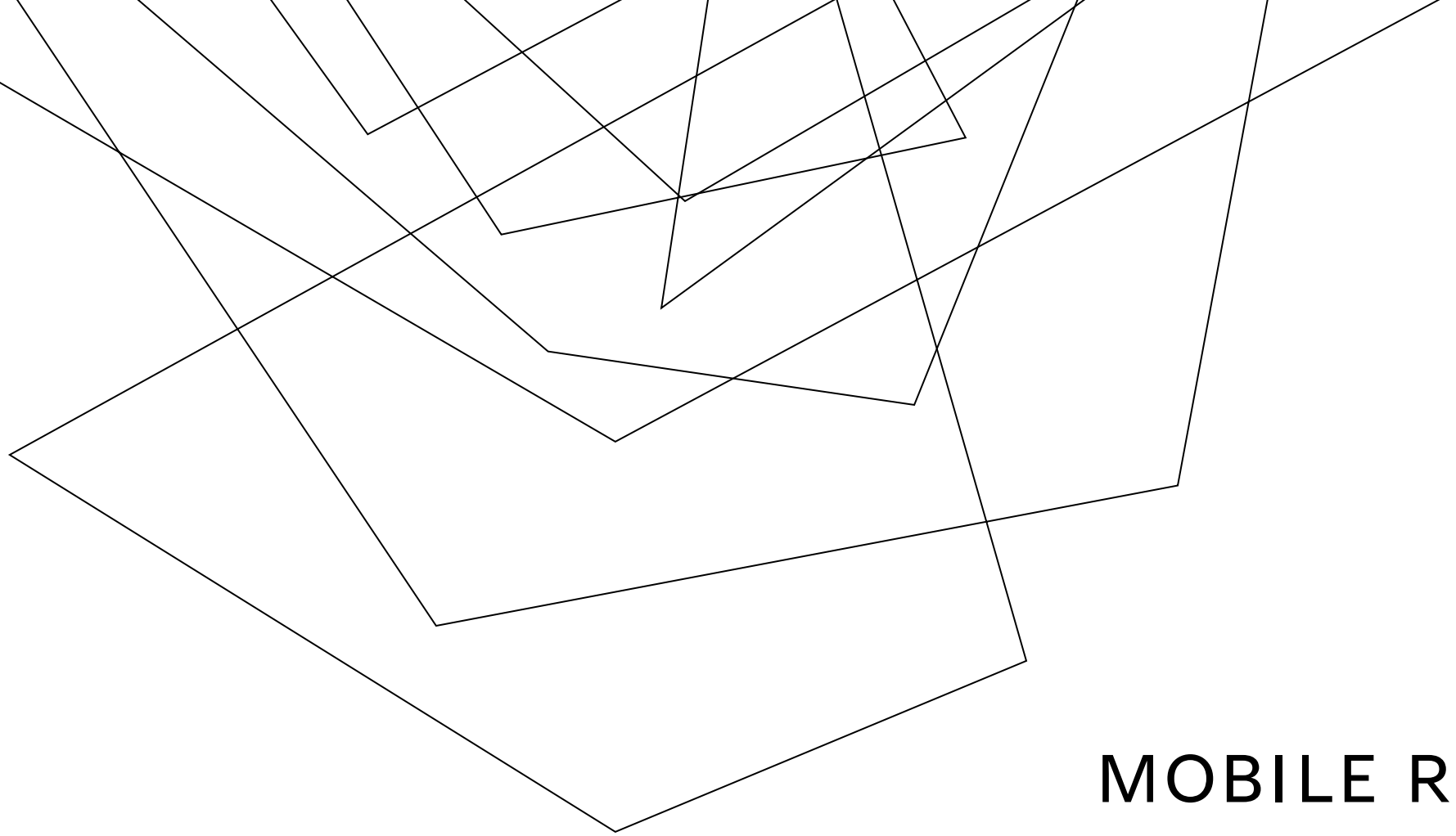

Andrew Brown

Daniel Elmaleh

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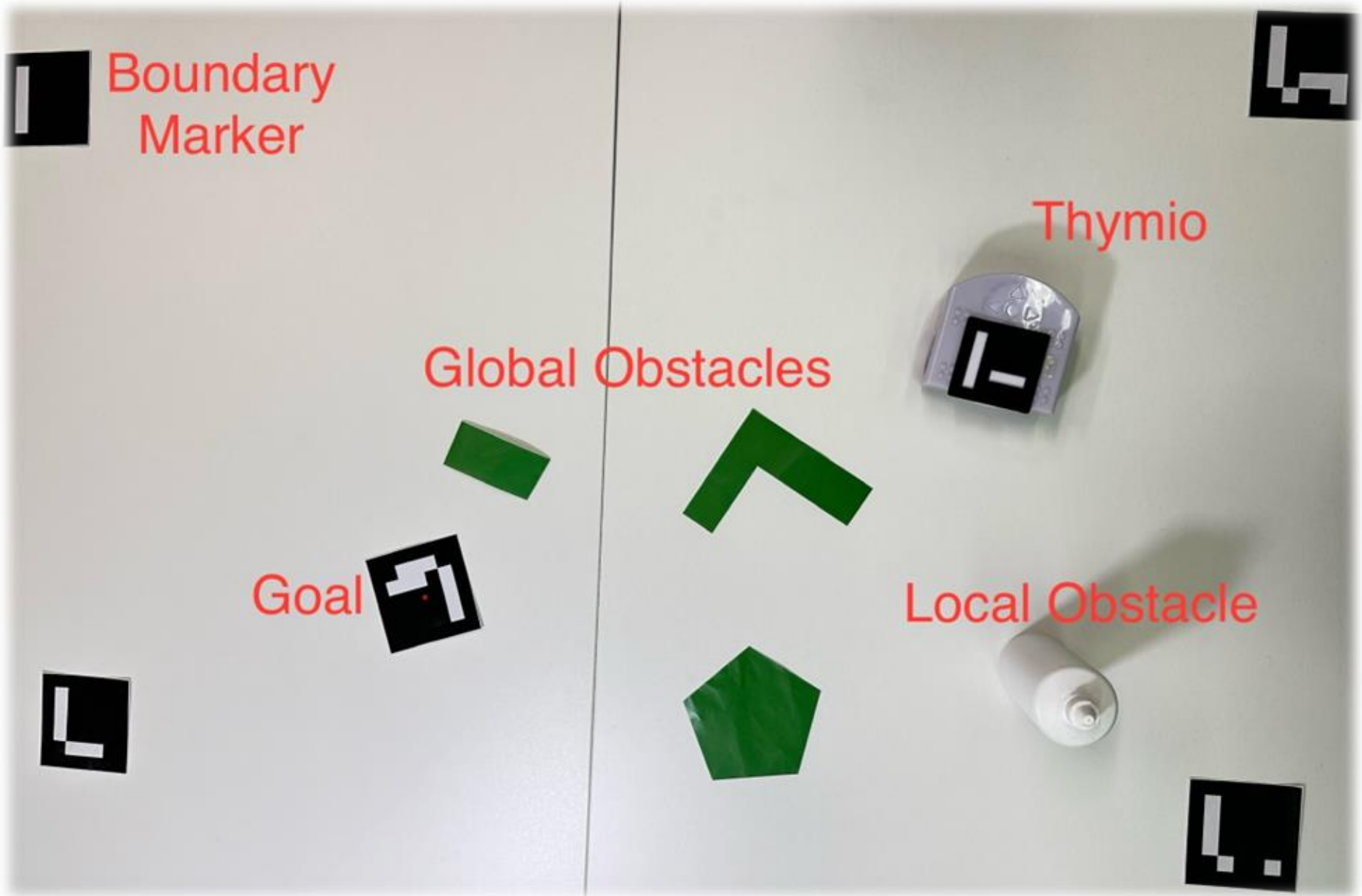
MOBILE ROBOTICS PROJECT

GROUP 29

YEAR 2023-2024

ENVIRONMENT



ROBOT CLASS

CREATION

Vision update

Measurements update

Kalman update (State)

command

UPDATE

Creates a Robot instance.

Initialization of attributes:

Vision, Kalman, Controller, Navigation, other parameters.

COMMUNICATION

Communication with sensors.

Communication with actuators.

VISION CLASS

DETECT BOUNDARIES

LOCATE THE ROBOT

FIND THE TARGET

SEE OBSTACLES

NAVIGATION CLASS

BUILD THE ENVIRONMENT

- Build the environment from the vision data
- Expand obstacle and add walls

GLOBAL NAVIGATION

- Build visibility graph
- Compute shortest path

LOCAL NAVIGATION

- Build potential map due to fixed environment
- Build repulsive map and sum it to the other
- Find motion direction

KALMAN FILTER CLASS

STATE

Position X

Position Y

Orientation

Velocity X

Velocity Y

MEASURMENTS

Position X Camera

Position Y Camera

Orientation Camera

Speed Left Wheel

Speed Right Wheel

MODEL & VAR.

State = $f(\mu, \Sigma)$.

New_State = $A\ state + B\ command + pertur$.

Measur. = $C\ state + noise$.

Q(pertur.) from model and tests.

R(noise) from measurements intrinsic noise.

PREDICT & UPDATE

Estimation of state mean and variance.

Calculation of kalman gain.

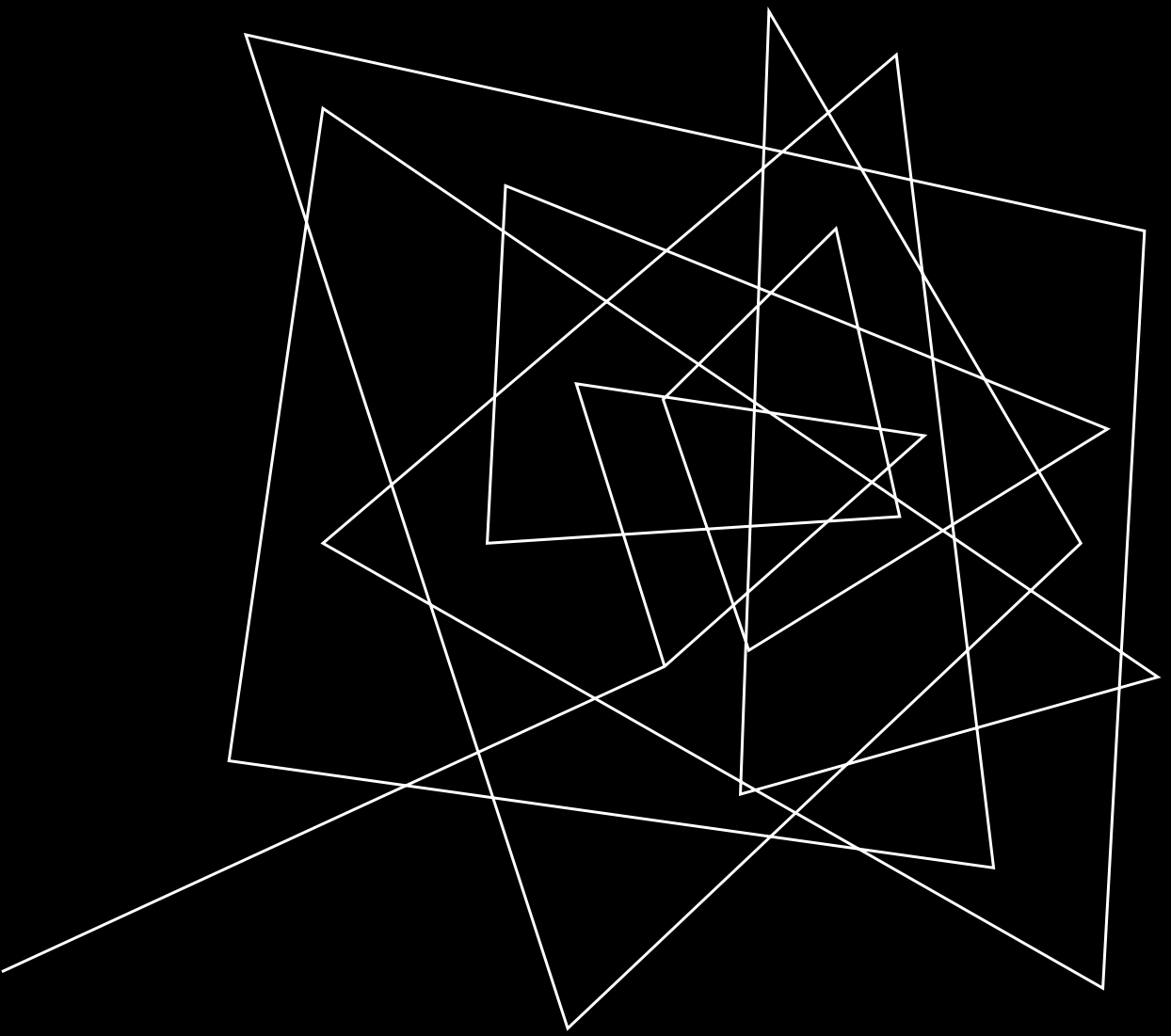
Definition of the state.

CONTROLLER CLASS

1. Global PD Control of Position Using Steering Angle

2. Local PD Control towards Desired Steering Angle
   - Desired angle is the inverse of the gradient of the potential field.

3. Pause Condition prevents PD controller from bring the robot in a big loop.



THANK YOU FOR LISTENING!