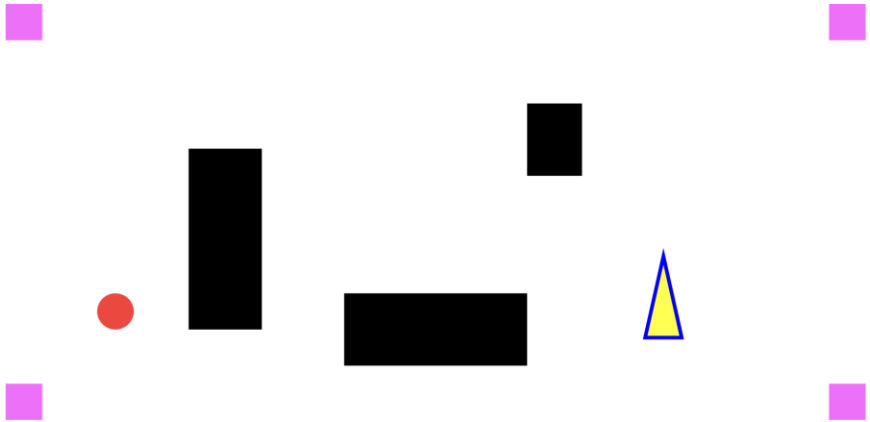
Basics of Mobile Robotics presentation

Kilian Pouderoux
Matas Jones
Gautier Demierre
Geoffroy Renaut

Source:
https://roboticopenplatform.org/wiki/Thymio_II



École polytechnique fédérale de Lausanne

Professor: Francesco Mondada

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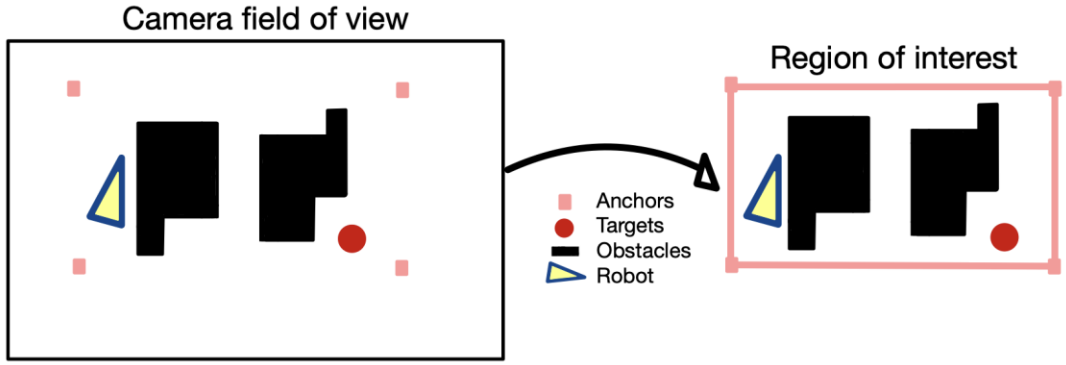
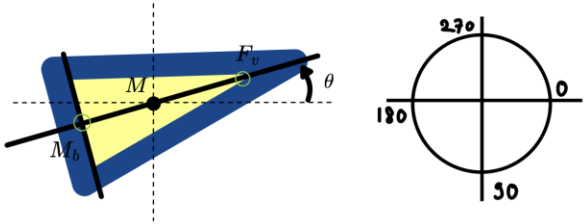
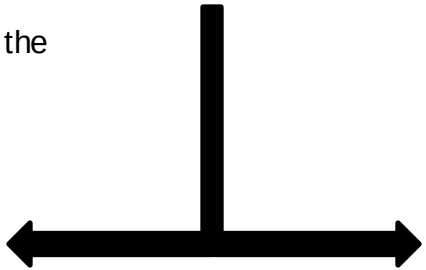
Computer Vision



Once the region is defined, one computes the robot's orientation and position





The digital grid is created to compute the global path

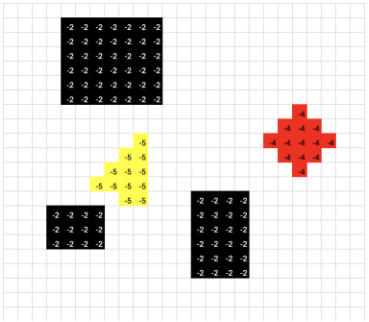
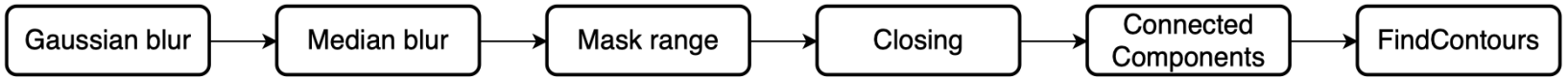
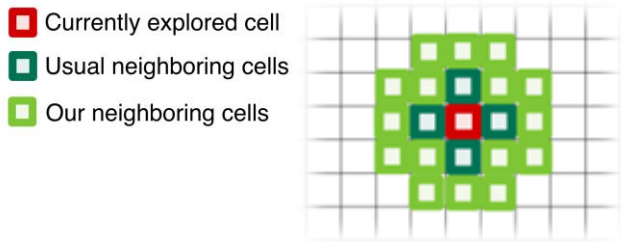


Image processing pipeline

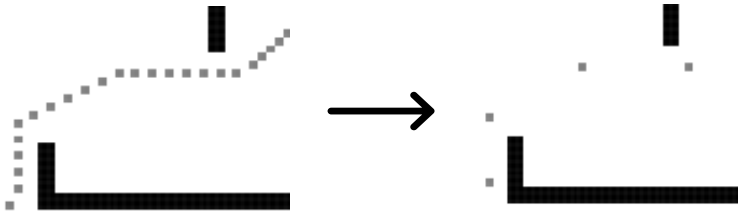


Global Navigation

- Use of a **A* algorithm** with an **approximate cell decomposition** of the map.
- Heuristic function defined as the **euclidian distance** divided by two.
- The neighboring cells explored can be further away than usual.

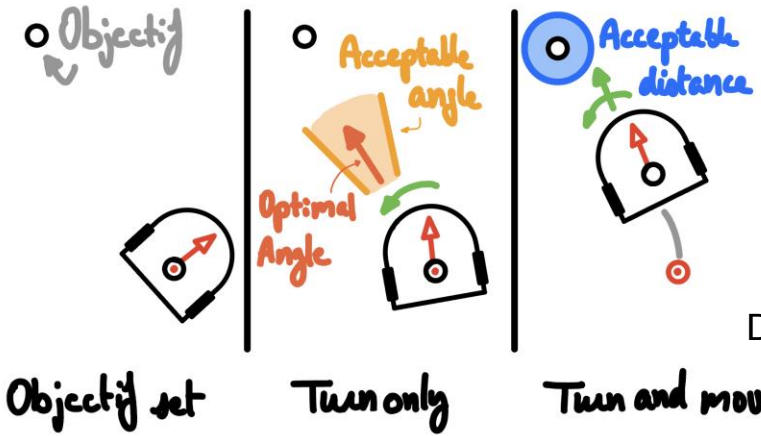


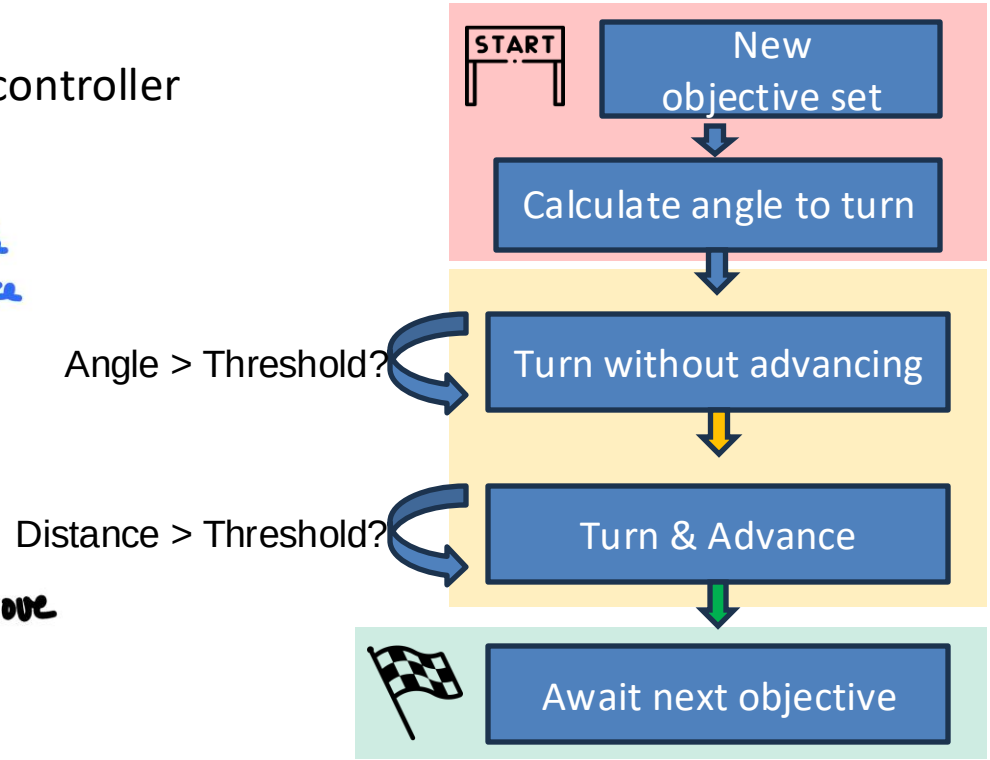
- The obtained path is then cleaned by removing points where no change of direction occurs.



Motion control

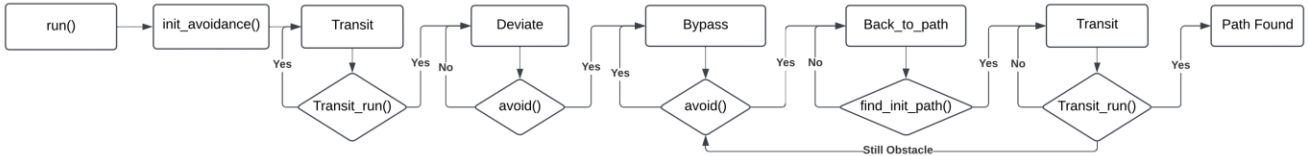
- Motion control based on differential drive
- Angular control based on PID controller





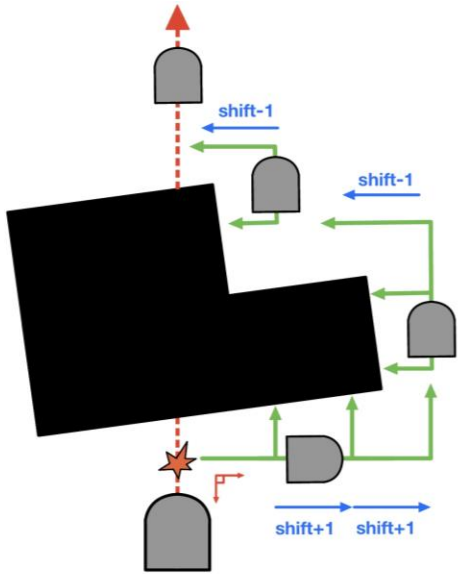
Local navigation

Trial-and-error avoidance system



Execution order :

- Obstacle detection
  Corresponding state : *Transit*
- Move away from obstacle
  Corresponding state : *Deviate*
- Bypass the obstacle
  Corresponding state : *Bypass*
- Return to initial path
  Corresponding state : *back_to_path*



Kidnapping

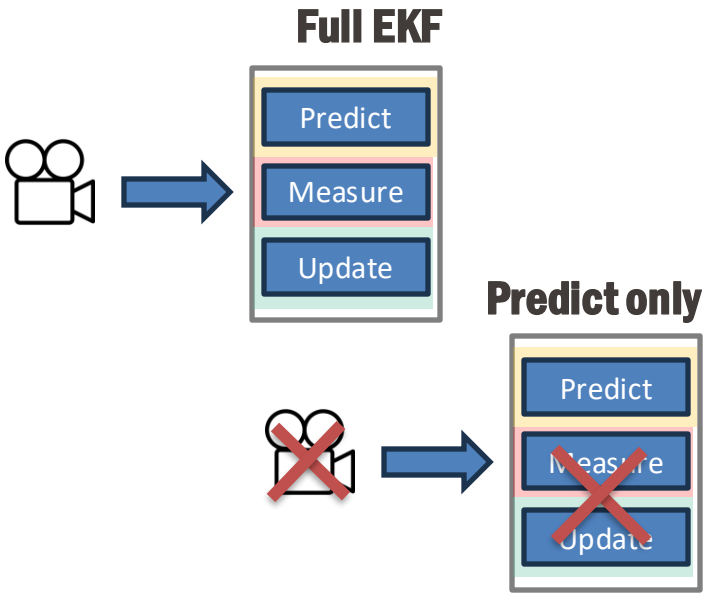
Threshold of 18 on both x and y axes of the IMU

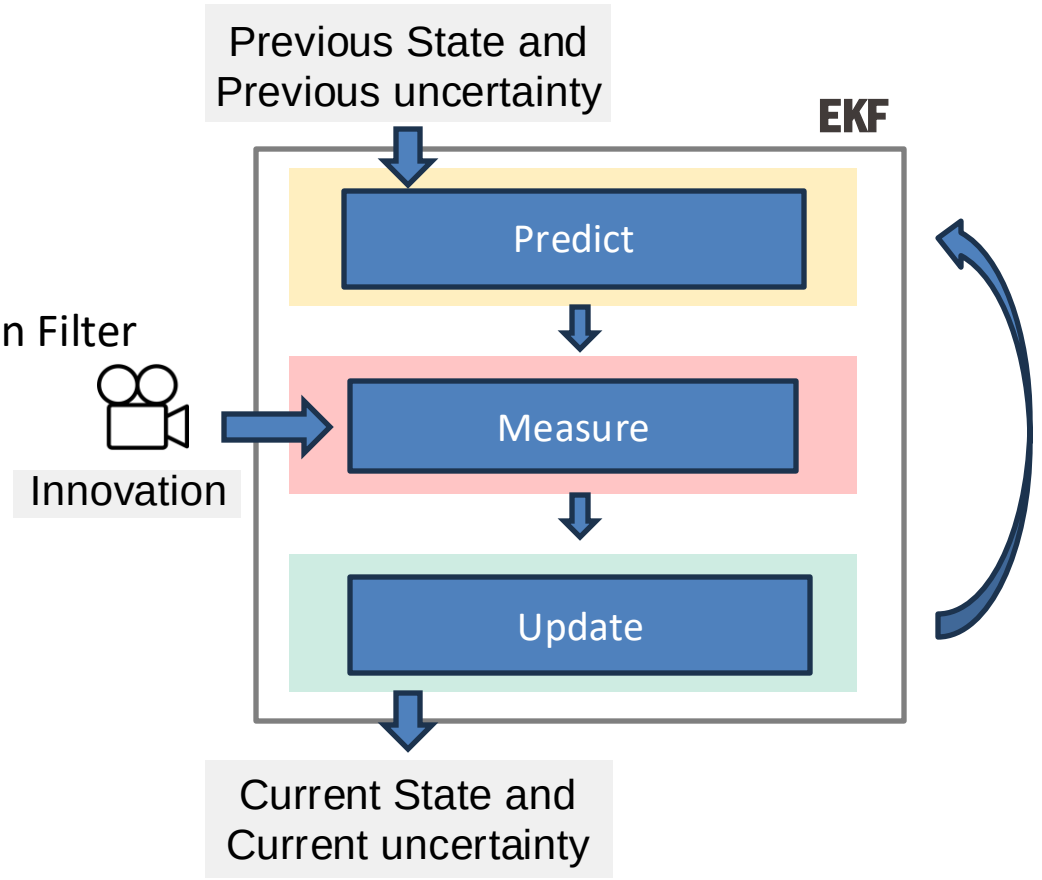
Acceleration
18 x 0,45 ≈ 8.1 N

Return a boolean for the FSM

Kalman filter

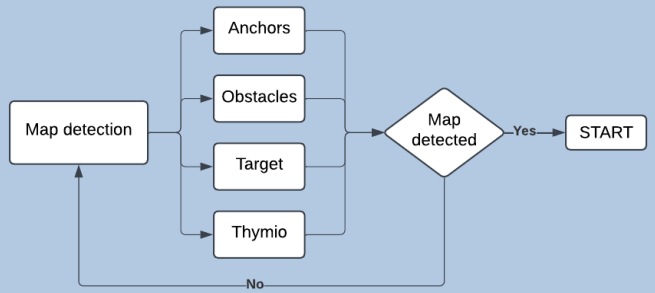
- Improve estimation of state
- Sensor fusion with state estimation
- Non-linear system -> Extended Kalman Filter



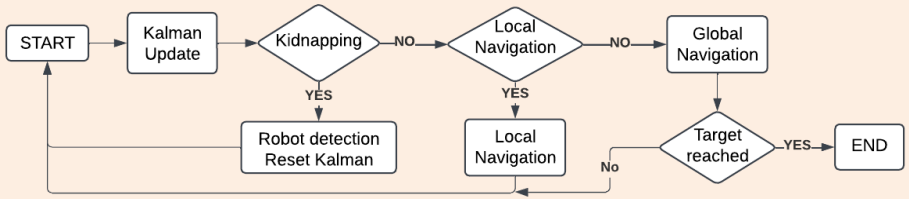


Final State Machine

Initialization



Loop States



Let's run it..

Demonstration

Questions ?

Thank you !