

MOBILE ROBOTS Case Studies 2

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Session ID: **845505**



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EPFL

2024-2025 1

Drones offer new opportunities

Monocular Vision Based Navigation



Inspection of pipes



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Drones offer new opportunities

We need to inspect the pipe of a water system (see picture, imagine a straight pipe of 20m).

I want to send in a drone. How should I localize the drone inside the pipe (distance from the entrance):

- A – Vision looking at the tube surface**
- B – Vision looking at the end of tube**
- C – No vision (laser, rope, ultrasound, ...)**



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Angle of robot based on image

From a drone we look with a camera at a ground robot that has a long black line on his top surface (see image). We would like to extract the angle of the robot. How could we do this with the less possible computational power?



- A. Applying a Sobel and Hough transform and get the peak > get angle
- B. For each pixel apply various Sobel with various angles (for instance for 45 degrees:
$$\begin{matrix} 0 & 1 & 1 & 0 \\ 1 & 2 & 0 & -1 \\ 1 & 0 & -2 & -1 \\ 0 & -1 & -1 & 0 \end{matrix}$$
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- C. For each pixel we compute Sobel vertical and horizontal, then extract angle, making an *atan*

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Where do we look?

For an indoor mobile robot running on a flat ground, it would be interesting to use vision to identify locations in the environment. How would you position the camera to have the most easy-to-use vision input?

- A – Camera looking forward**
- B – Camera looking on the side**
- C – Camera looking to the ground**
- D – Camera looking to the ceiling**

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