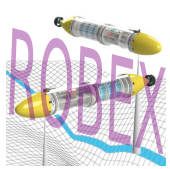
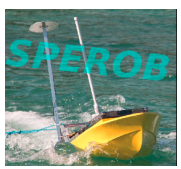
L'exploration sous-marine en autonomie

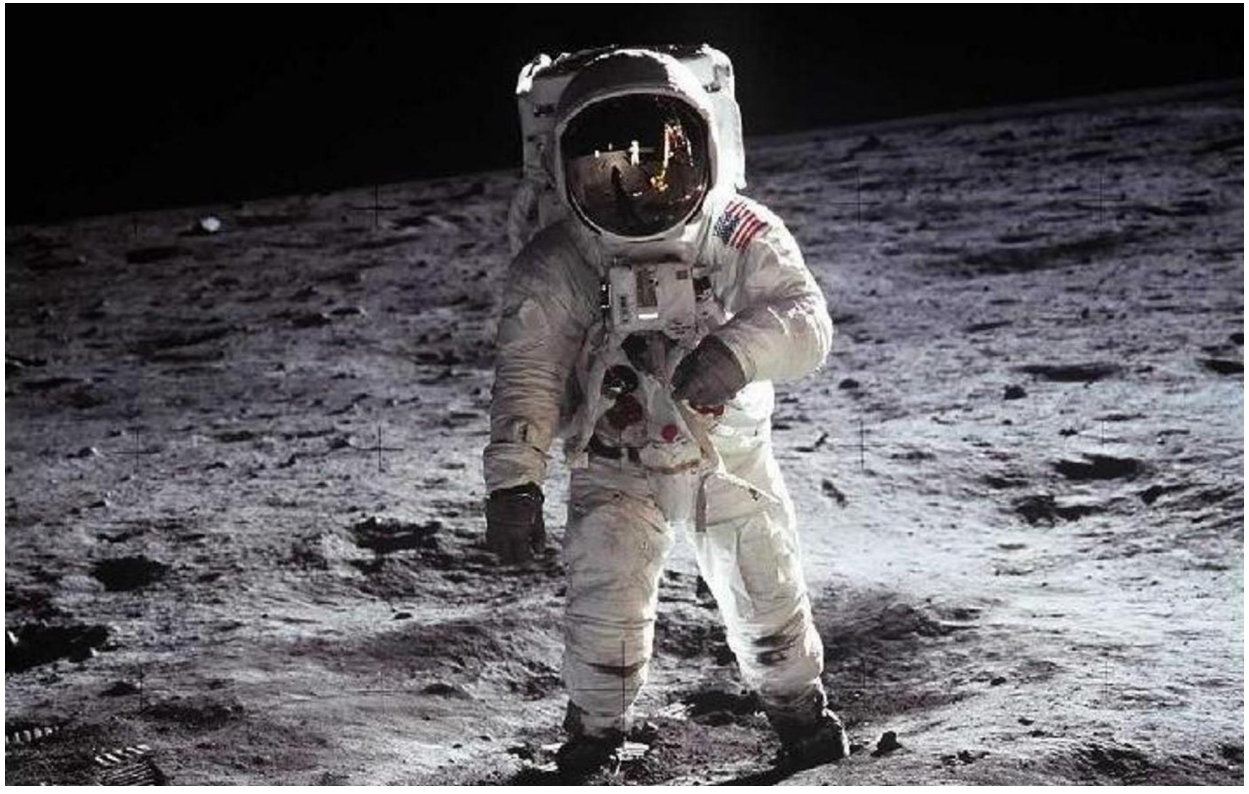
Luc Jaulin

Submeeting 2022, Saint Raphaël, 7 avril 2022





Robot mobile

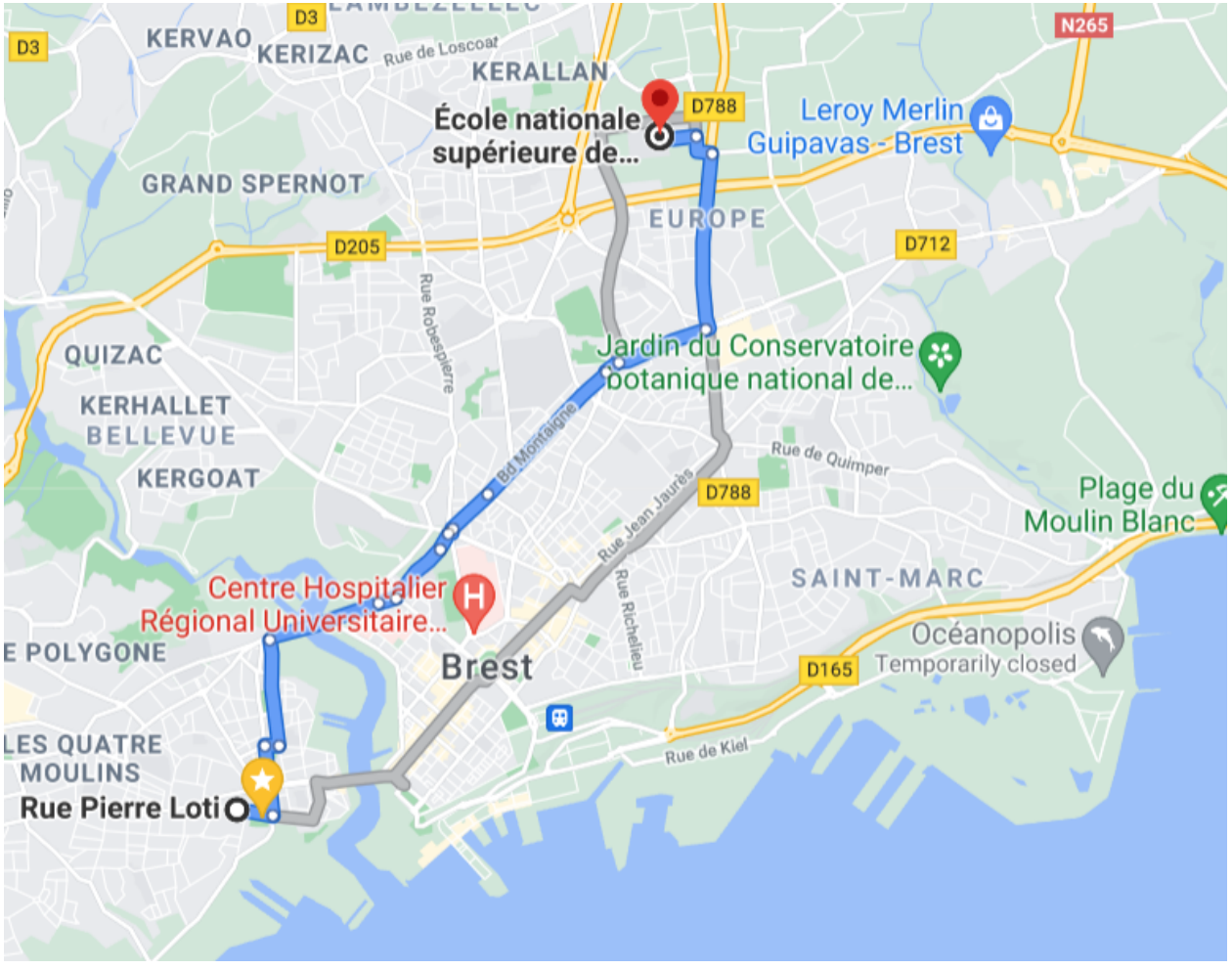


Les robots sont demandés dans des environnements toxiques, dangereux, pour des travaux pénibles

Curiosity

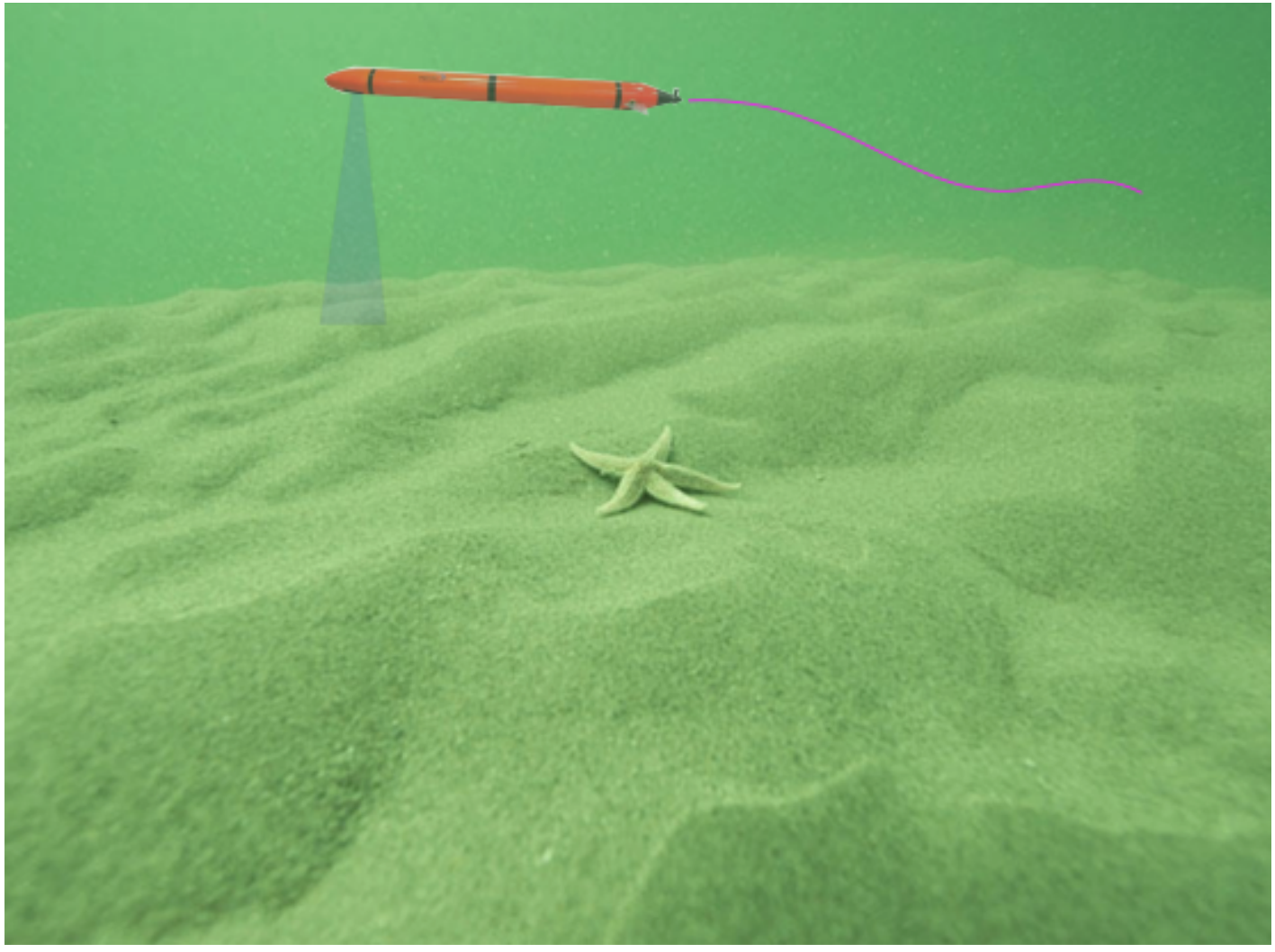
Un satellite est un robot

Navigation sous-marine

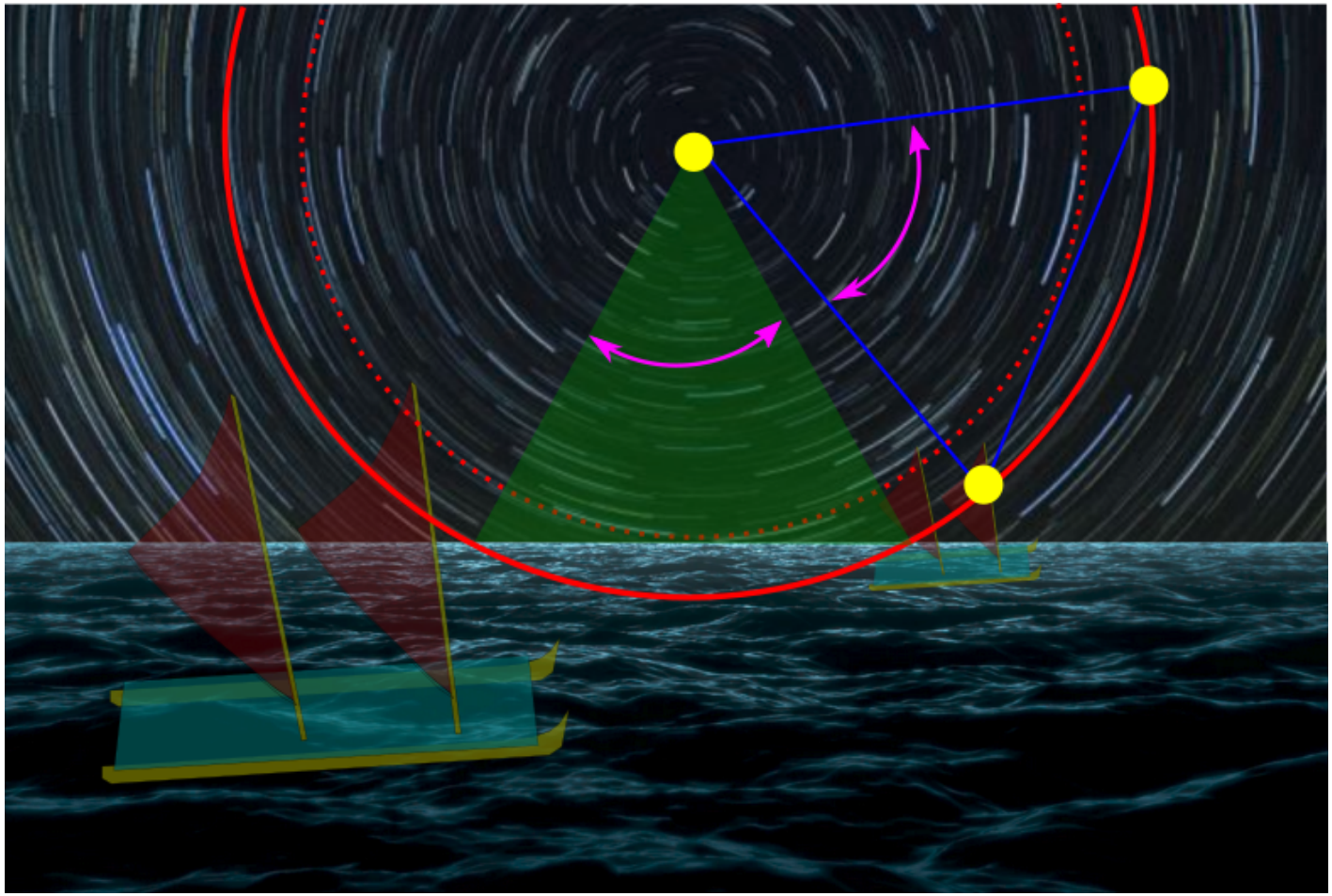


Navigation moderne

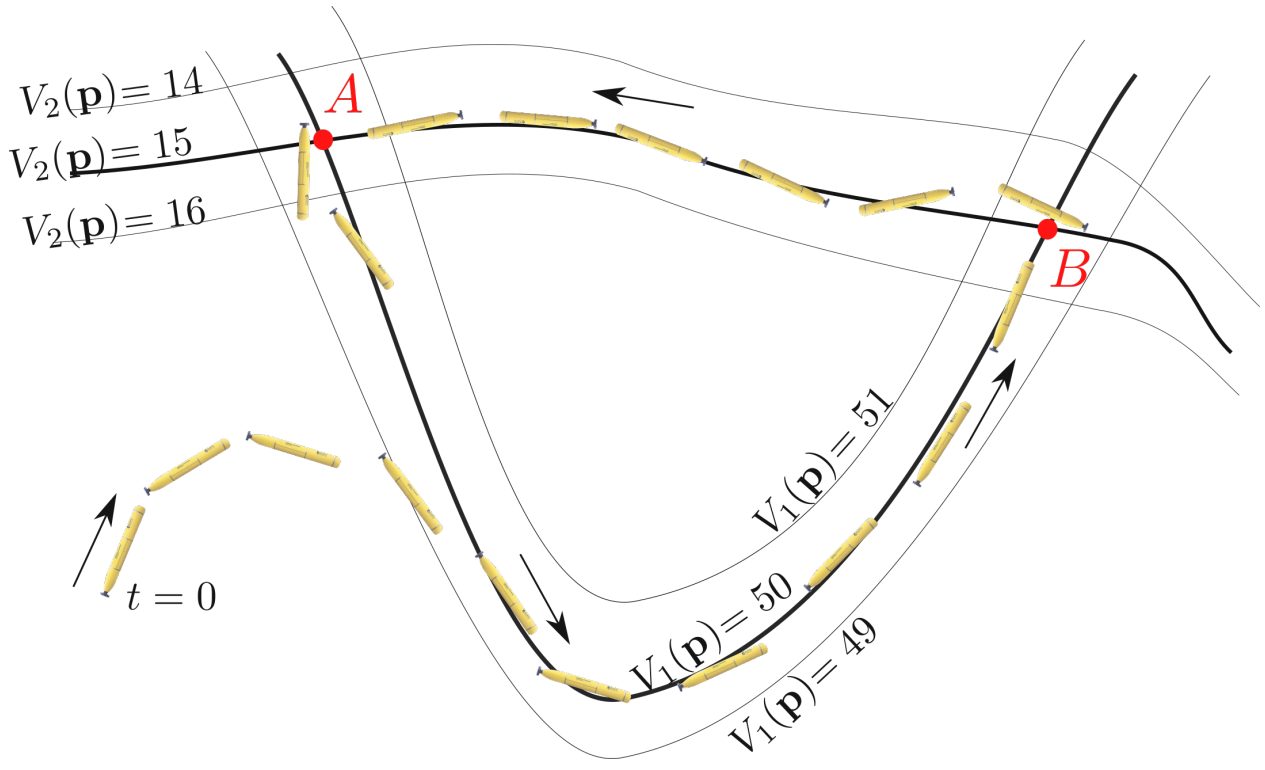
Navigation à l'ancienne : sans GPS, ni boussole, ni horloge

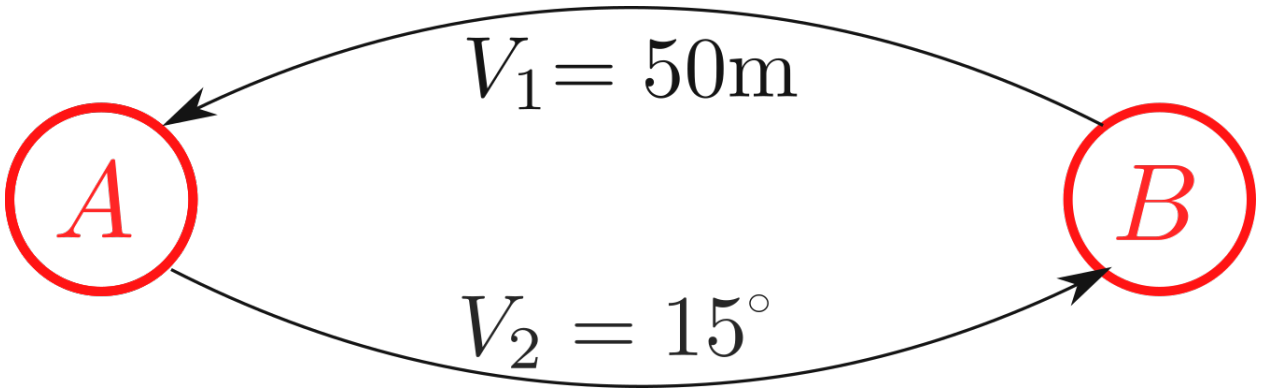


Les routes

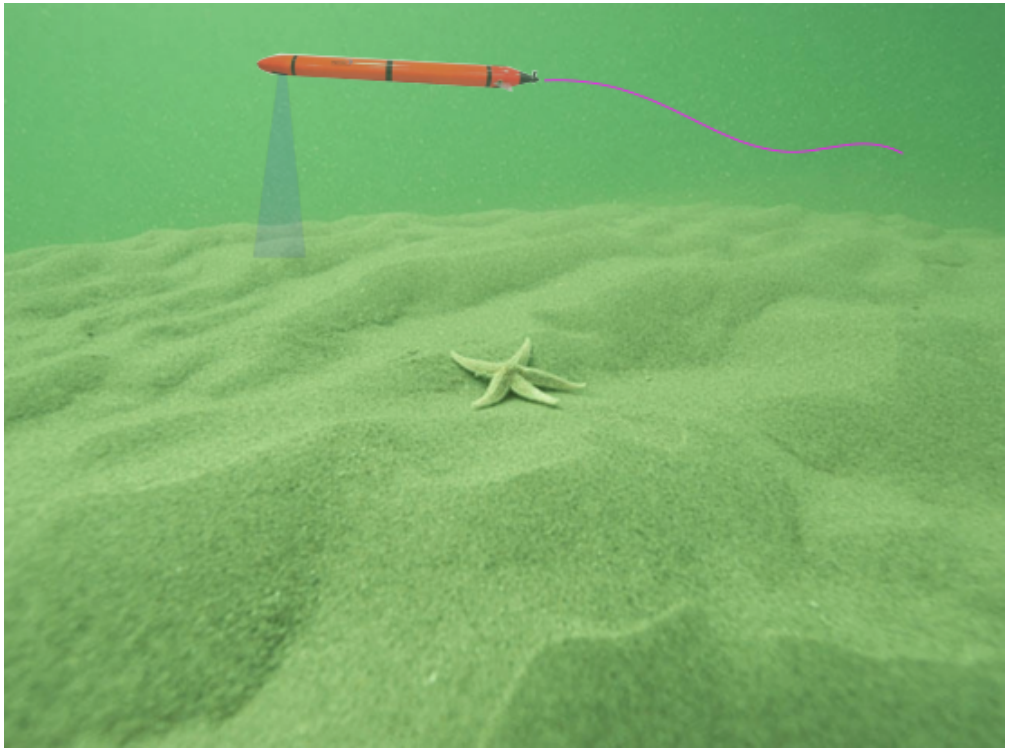


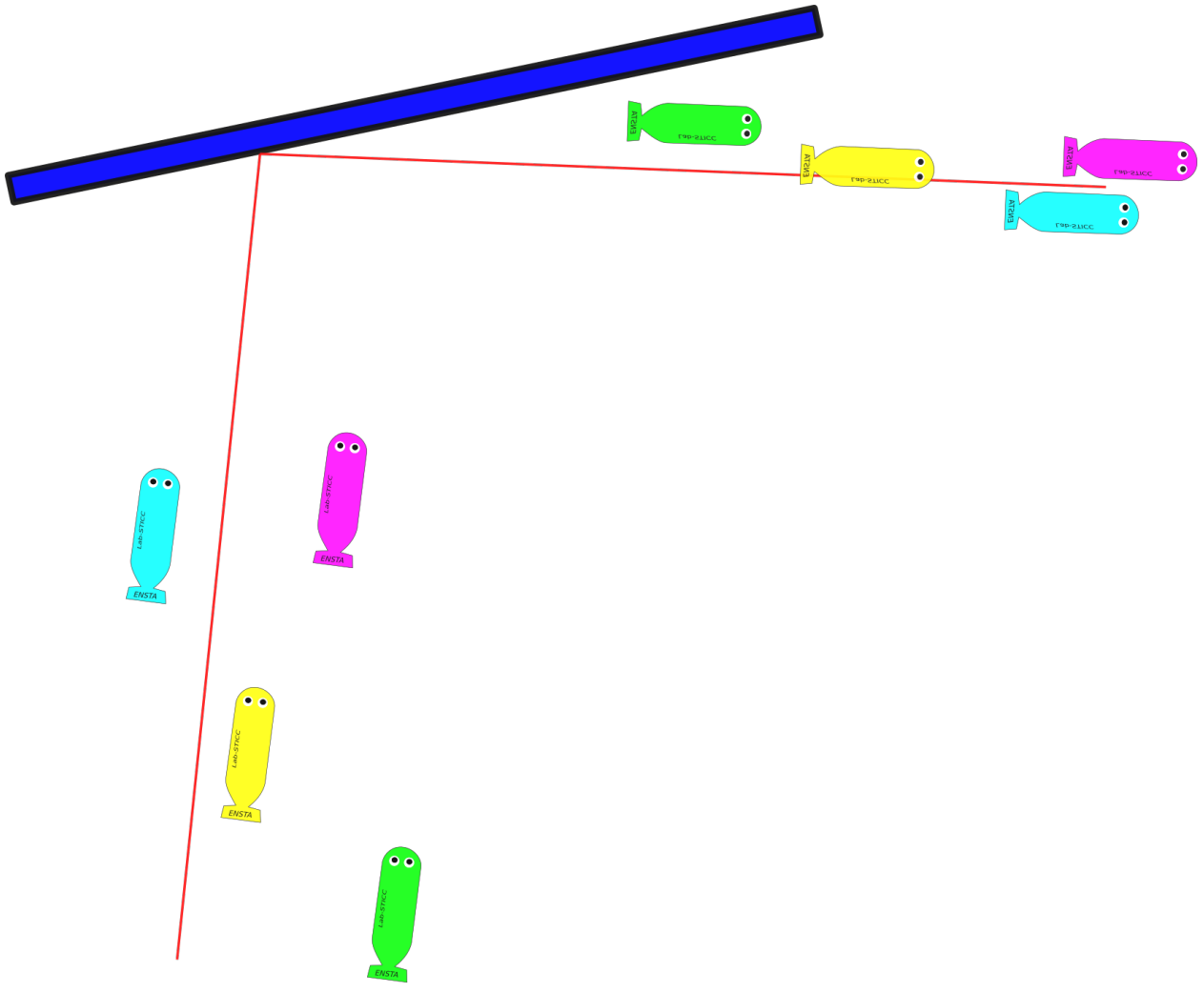
Navigation sous-marine

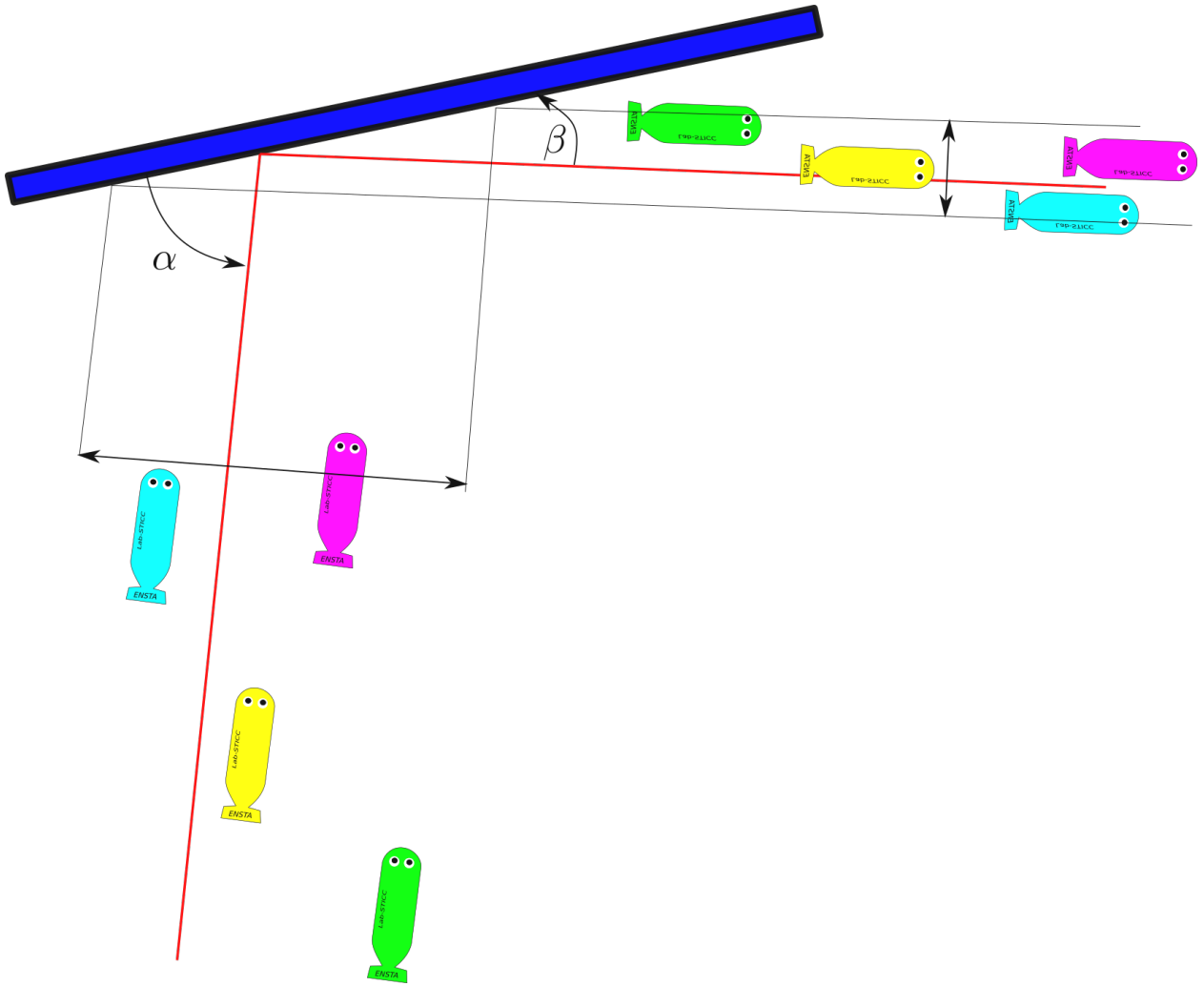

$V_2(\mathbf{p}) = 14$
$V_2(\mathbf{p}) = 15$
$V_2(\mathbf{p}) = 16$
A
B
$t = 0$
$V_1(\mathbf{p}) = 51$
$V_1(\mathbf{p}) = 50$
$V_1(\mathbf{p}) = 49$


$V_1 = 50\text{m}$
A
B
$V_2 = 15^\circ$

Rebonds

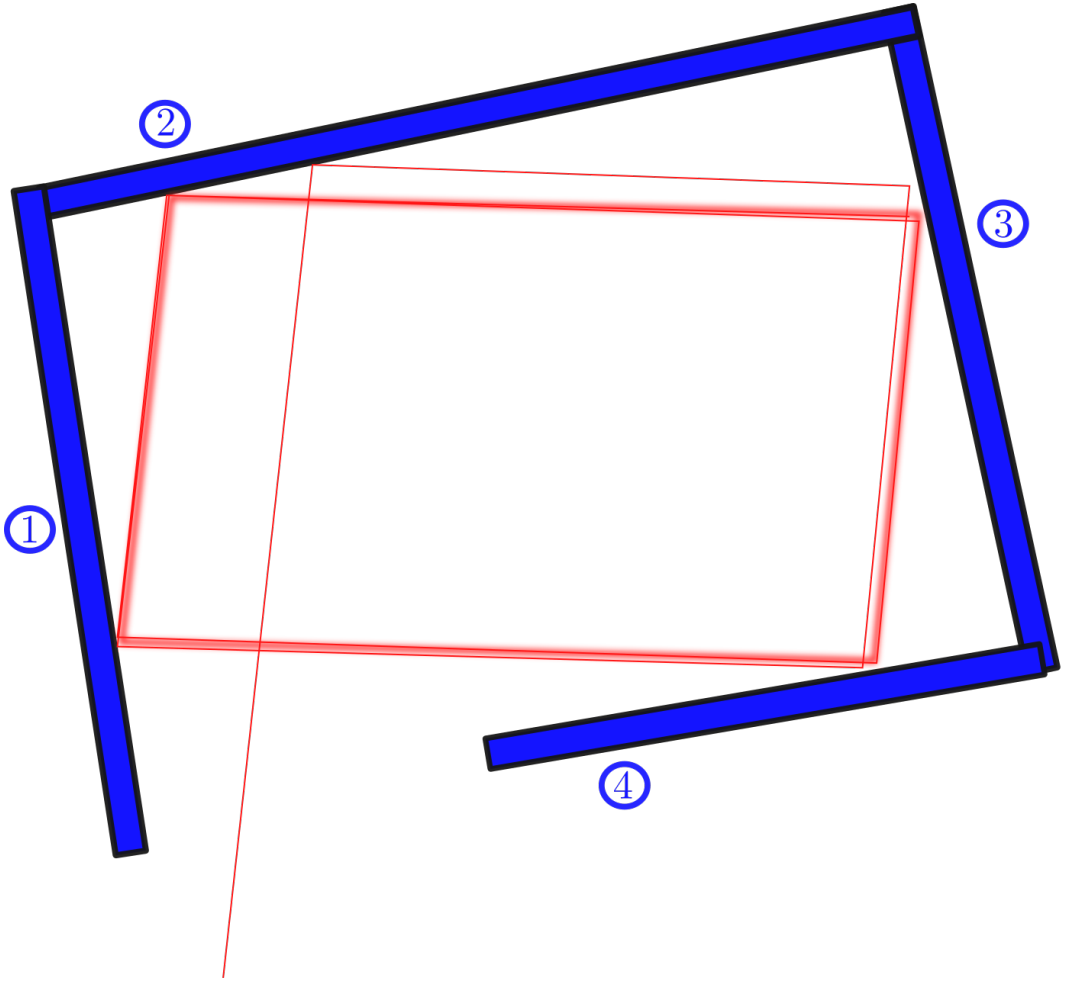


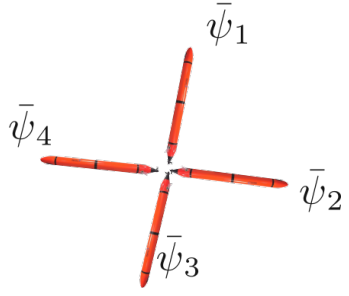

ENSTA
ENSTA
ENSTA
ENSTA
ENSTA
ENSTA
ENSTA
ENSTA

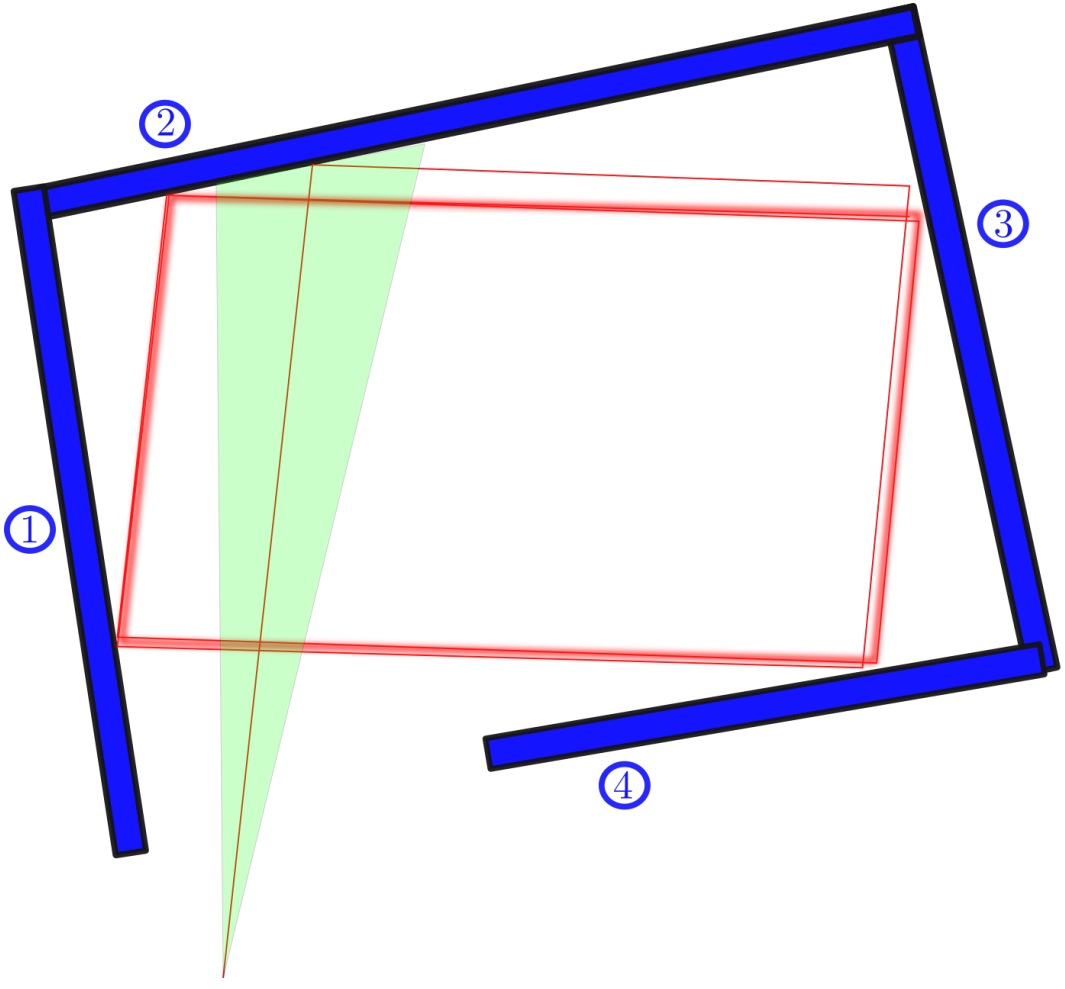

β
α
ENSTA

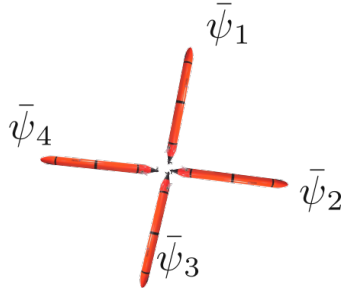
On a un cycle stable si

$$\prod_i \frac{\sin \beta_i}{\sin \alpha_i} < 1$$


2
3
1
4


$\bar{\psi}_1$
$\bar{\psi}_4$
$\bar{\psi}_2$
$\bar{\psi}_3$


2
3
1
4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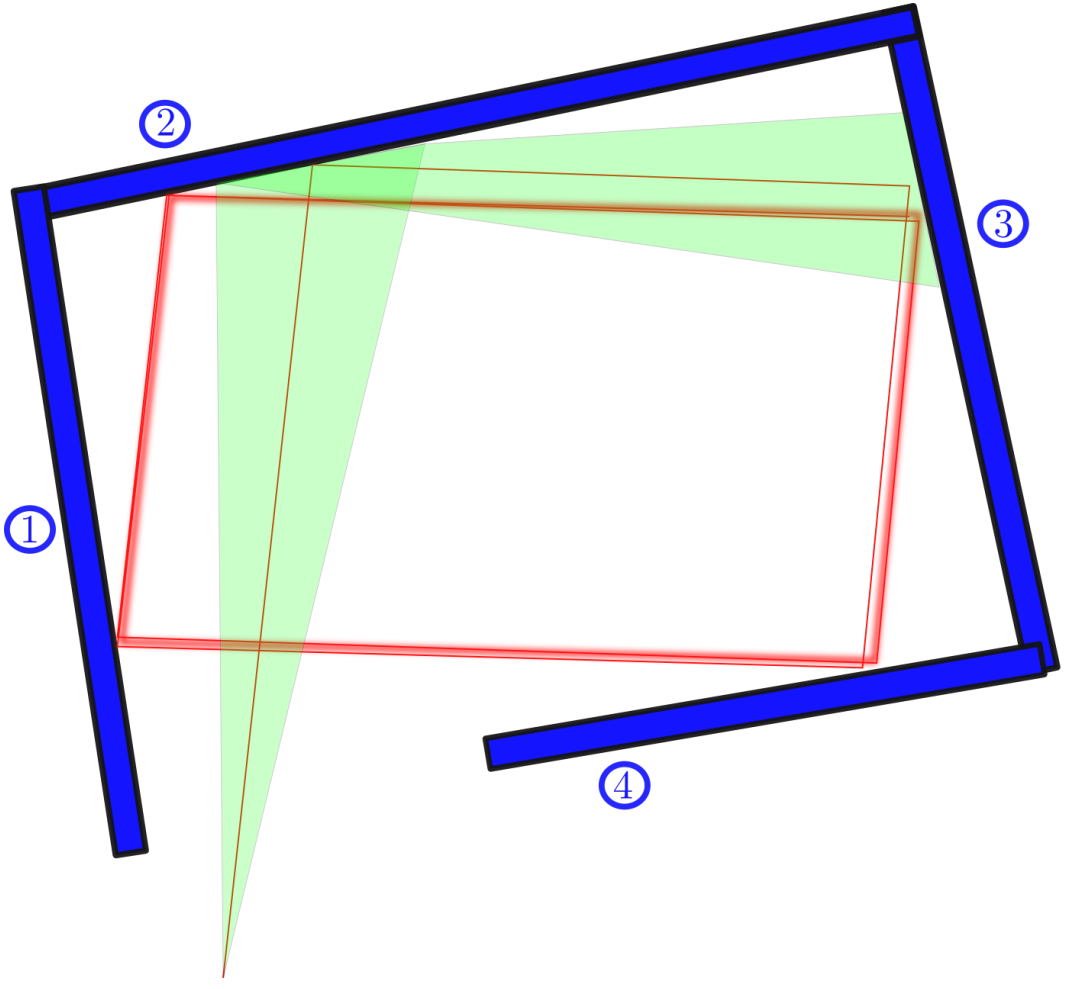
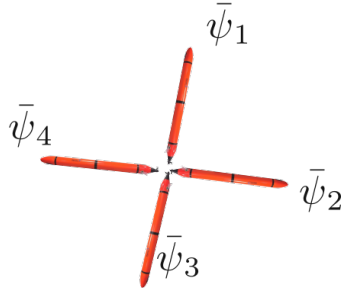
$\bar{\psi}_4$
$\bar{\psi}_2$
$\bar{\psi}_3$


2
3
1
4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$\bar{\psi}_4$
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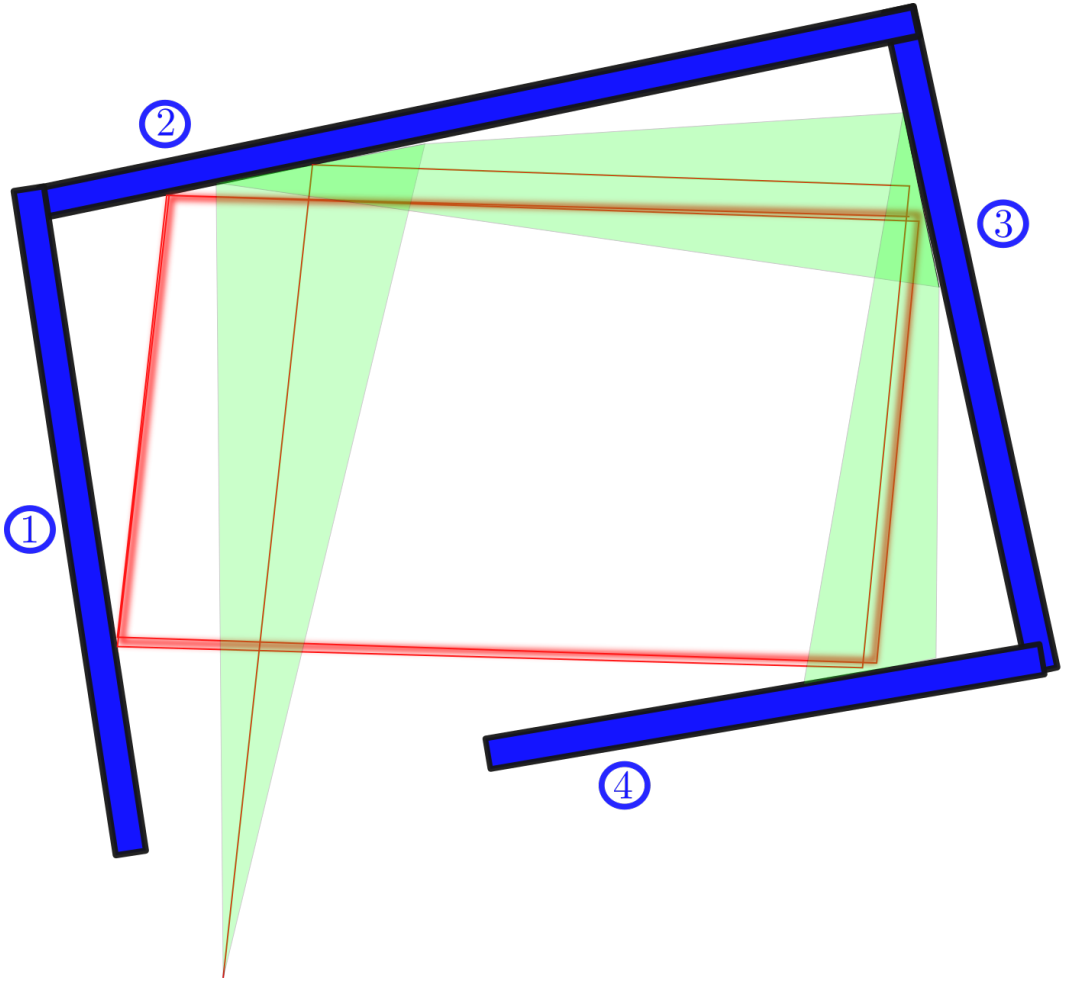
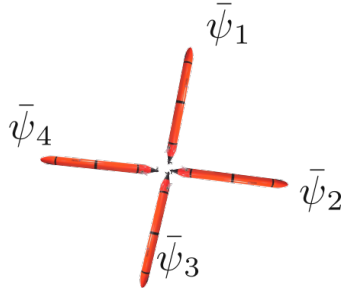

1
2
3
4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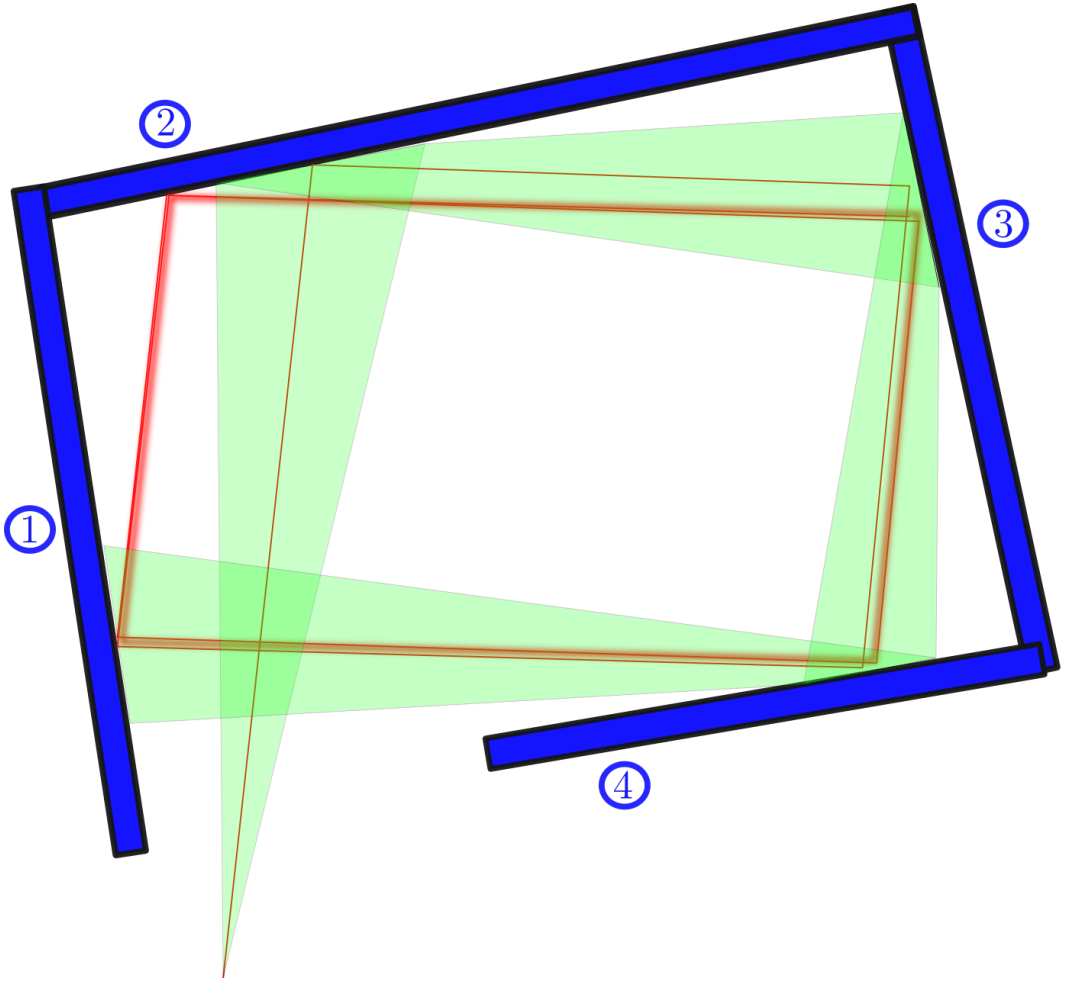
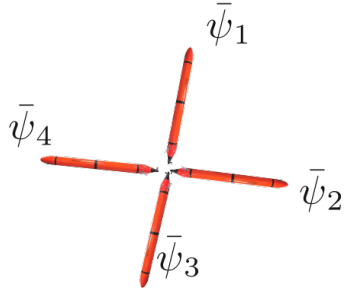
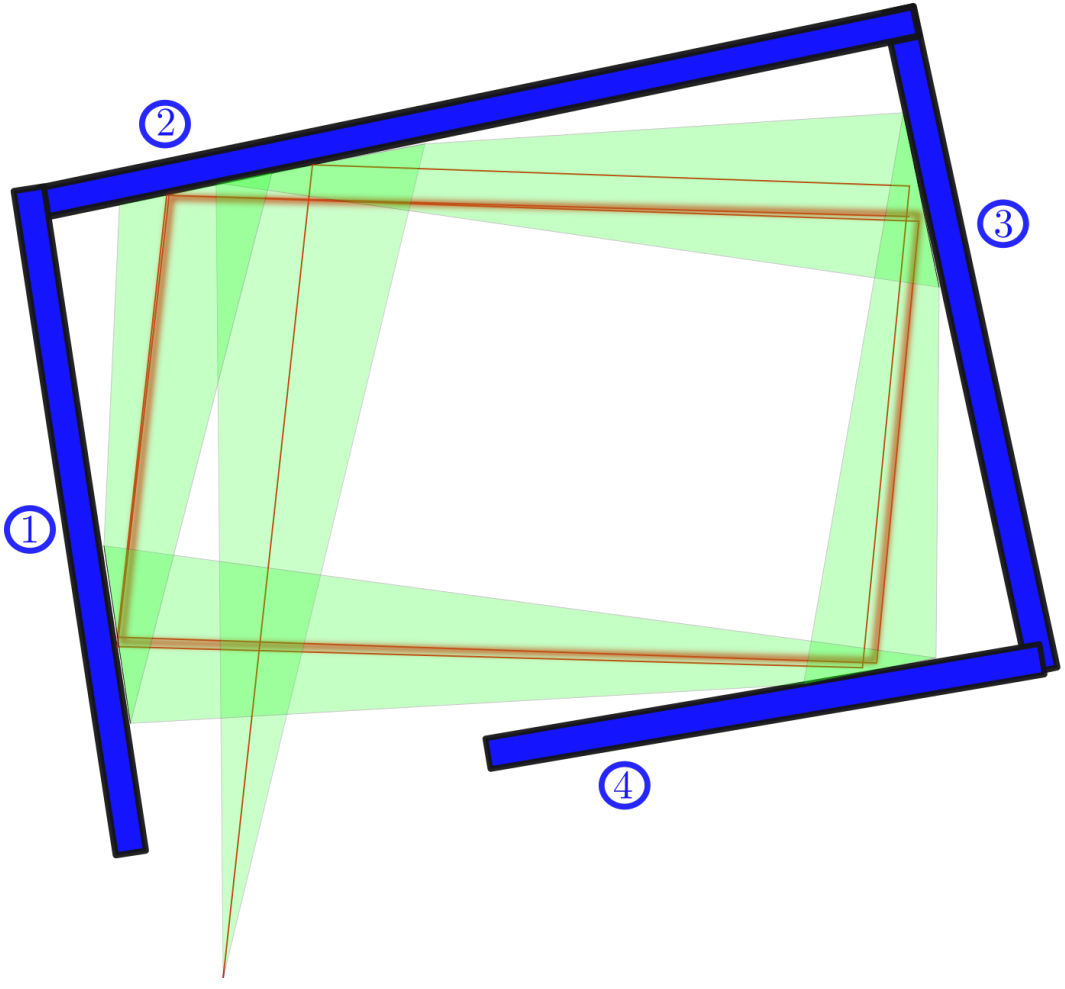
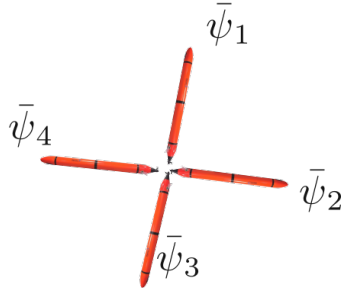
$\bar{\psi}_2$
$\bar{\psi}_3$
$\bar{\psi}_4$


1
2
3
4


$\bar{\psi}_1$
$\bar{\psi}_2$
$\bar{\psi}_3$
$\bar{\psi}_4$


①
②
③
④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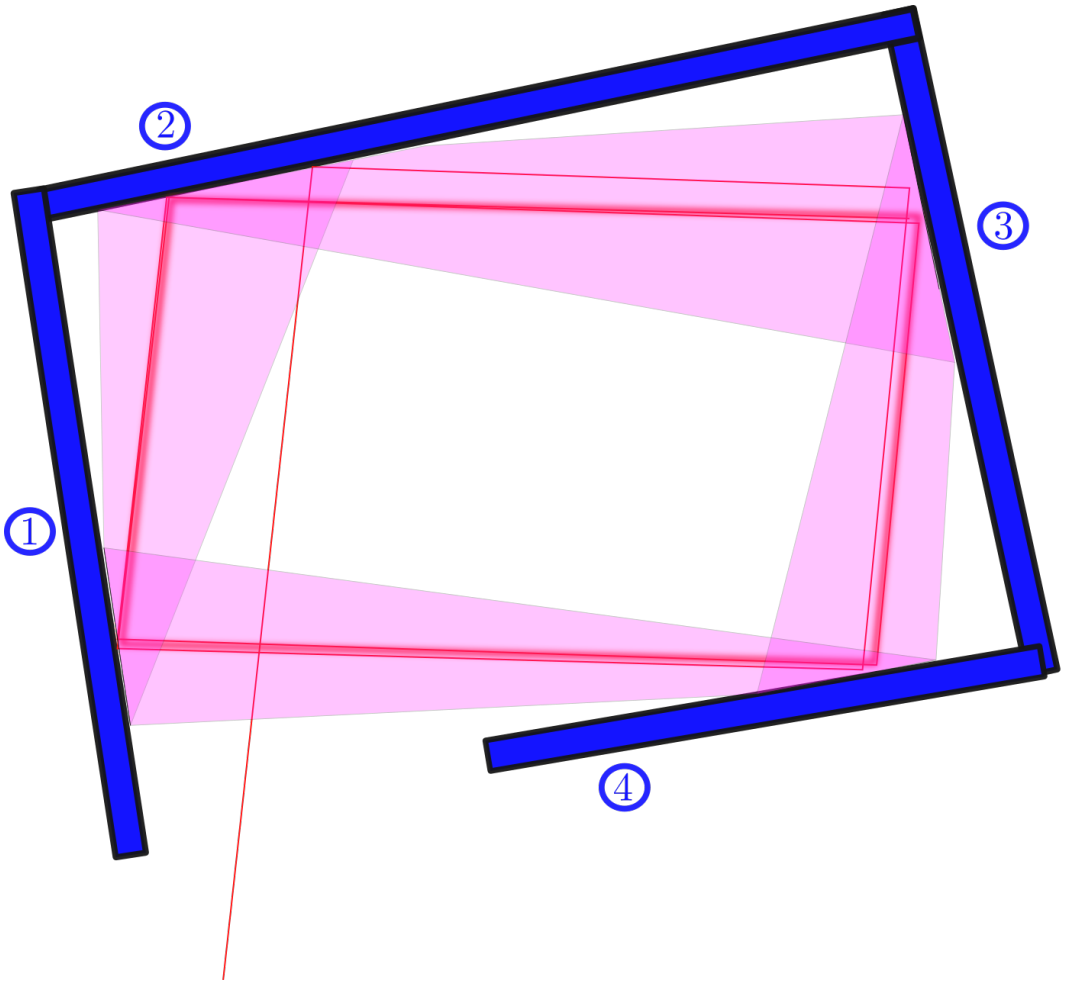
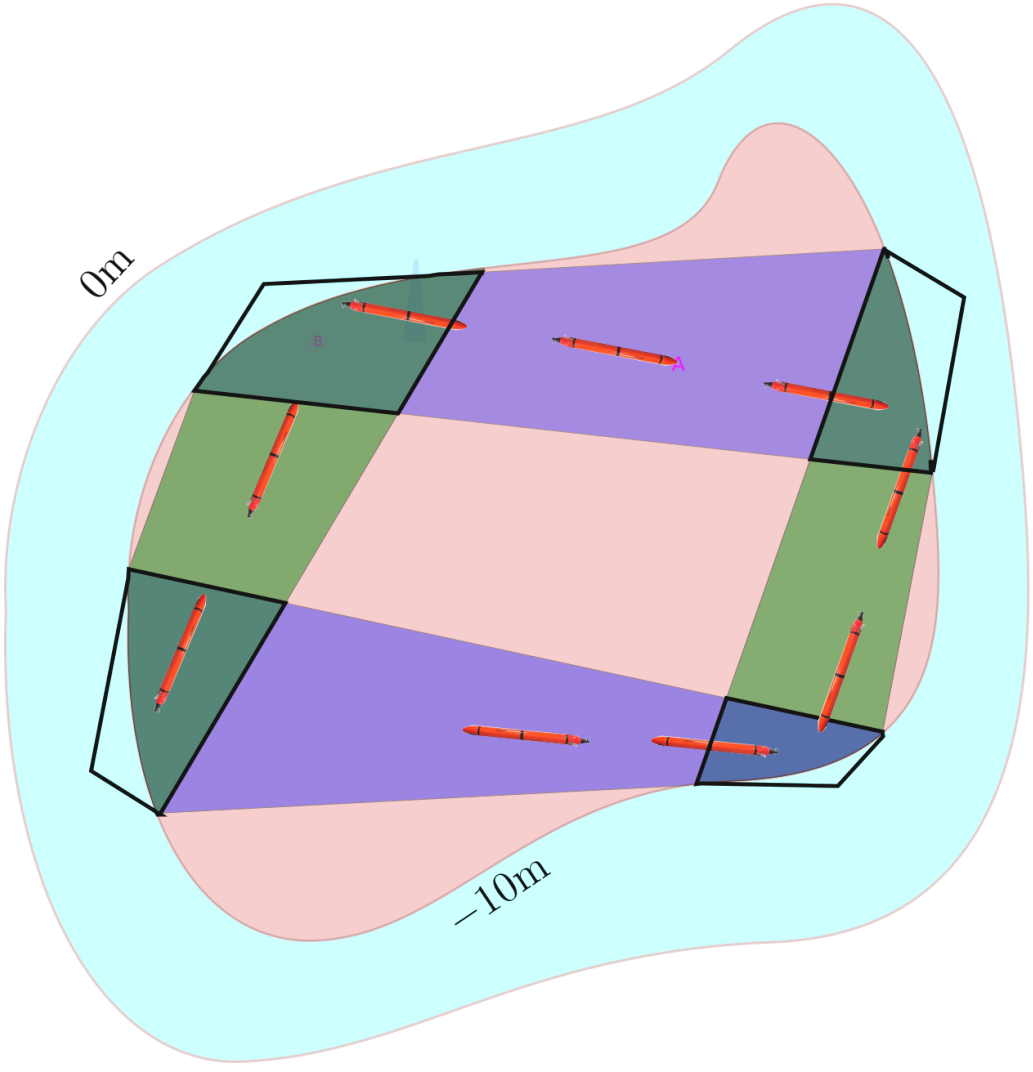
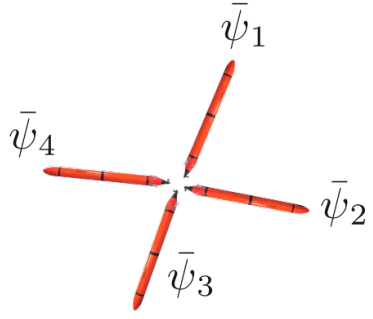

2
3
1
4


0m
−10m


$\bar{\psi}_1$
$\bar{\psi}_4$
$\bar{\psi}_2$
$\bar{\psi}_3$

[1] L. Jaulin (2019). Naviguer comme les polynésiens, Interstices.
[2] A. Bourgois, A. Chaabouni, A. Rauh and L. Jaulin (2021). Proving the stability of navigation cycles, SCAN'2020