

Open Hardware
Shape-Shifting
Sailing Robot
to Explore & Protect
the Oceans

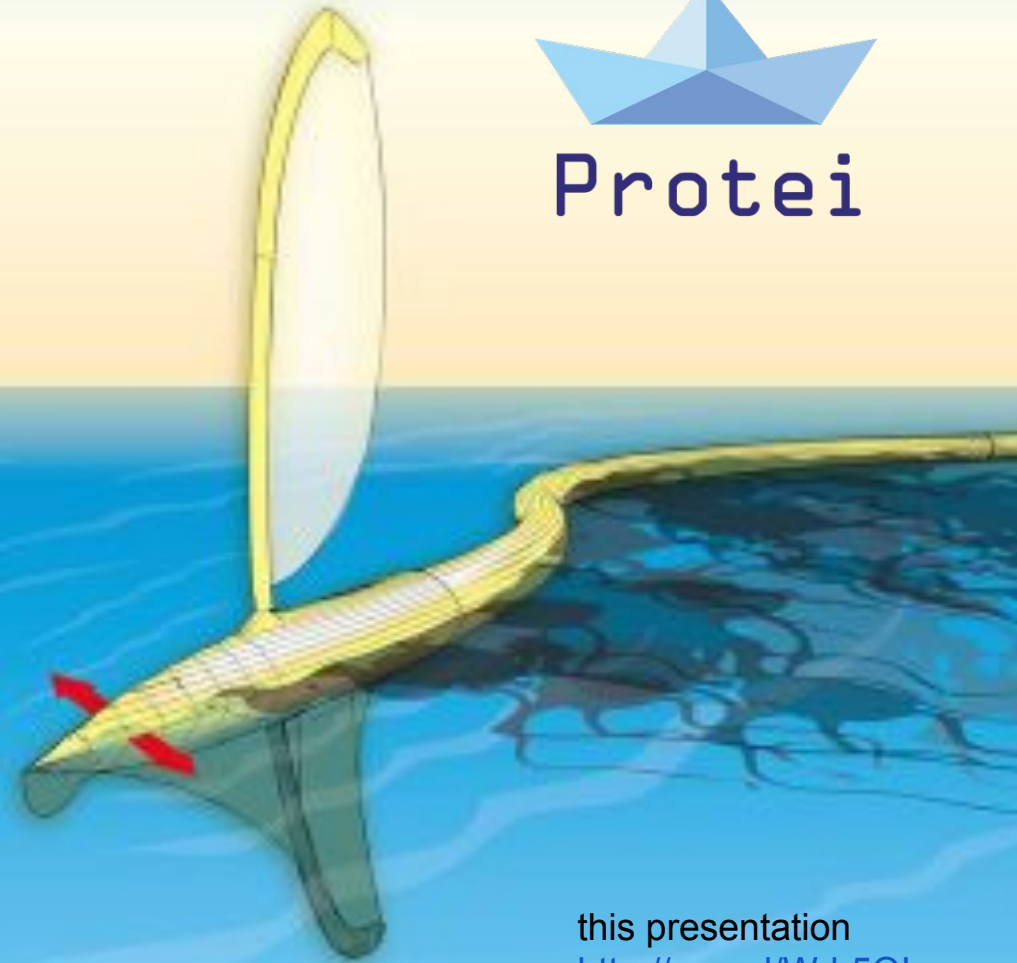
protei.org

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Protei



this presentation
<http://goo.gl/Wrb5O1>

A photograph of a large oil spill in the ocean. The water is dark blue with a prominent, irregular brownish-red slick in the foreground and middle ground. Several large oil tankers are visible on the horizon under a clear sky. The word "Oil" is overlaid in white text in the center of the image.

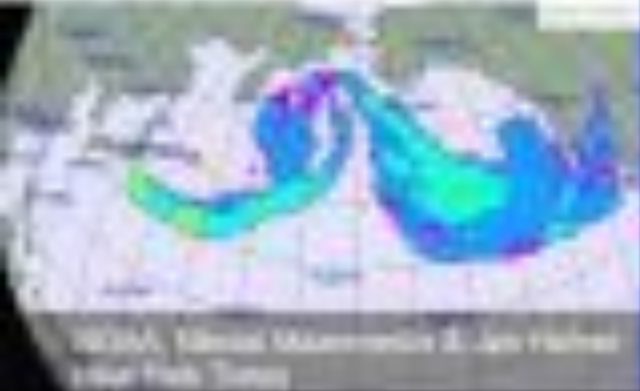
Oil

An aerial photograph of a vast ocean surface covered with a dense field of plastic debris. The debris is scattered across the blue water, appearing as a complex network of dark, brownish lines and patches. Some individual pieces of plastic are visible, including a bright cyan kayak and several red and green floats. The overall scene illustrates the scale of marine plastic pollution.

Plastic

An aerial photograph of a nuclear power plant facility. A large, billowing plume of white steam or smoke rises from the central part of the plant, partially obscuring the sky. The plant itself consists of several large, rectangular buildings with flat roofs, interspersed with smaller structures and piping. The facility is situated near a body of water, which is visible in the lower-left corner. The overall scene is somewhat desaturated, with a mix of greys, browns, and the white of the steam.

Radioactivity?



Oil

Plastic

Radioactivity

Man-made problems
controlled by
natural forces

Natural forces
to remediate
man-made problems



BP Oil Spill









Drag



Pull & Direction











Business




Proteus







1m Remote Controlled



1m Arduino + Android



6m Unmanned





Oil



Coral



Fisheries

Radioactivity

A photograph of a coastal area with large concrete structures, possibly a seawall or breakwater. A person wearing a bright yellow protective suit and a blue cap stands on one of the concrete blocks. The ocean is visible in the background under a pale sky. The word "Radioactivity" is written in large, white, sans-serif font across the center of the image.



Safecast.org

LOW LEVEL





We arrived in Minamiboson, which is just south of the new exclusion zone. Exact location map.

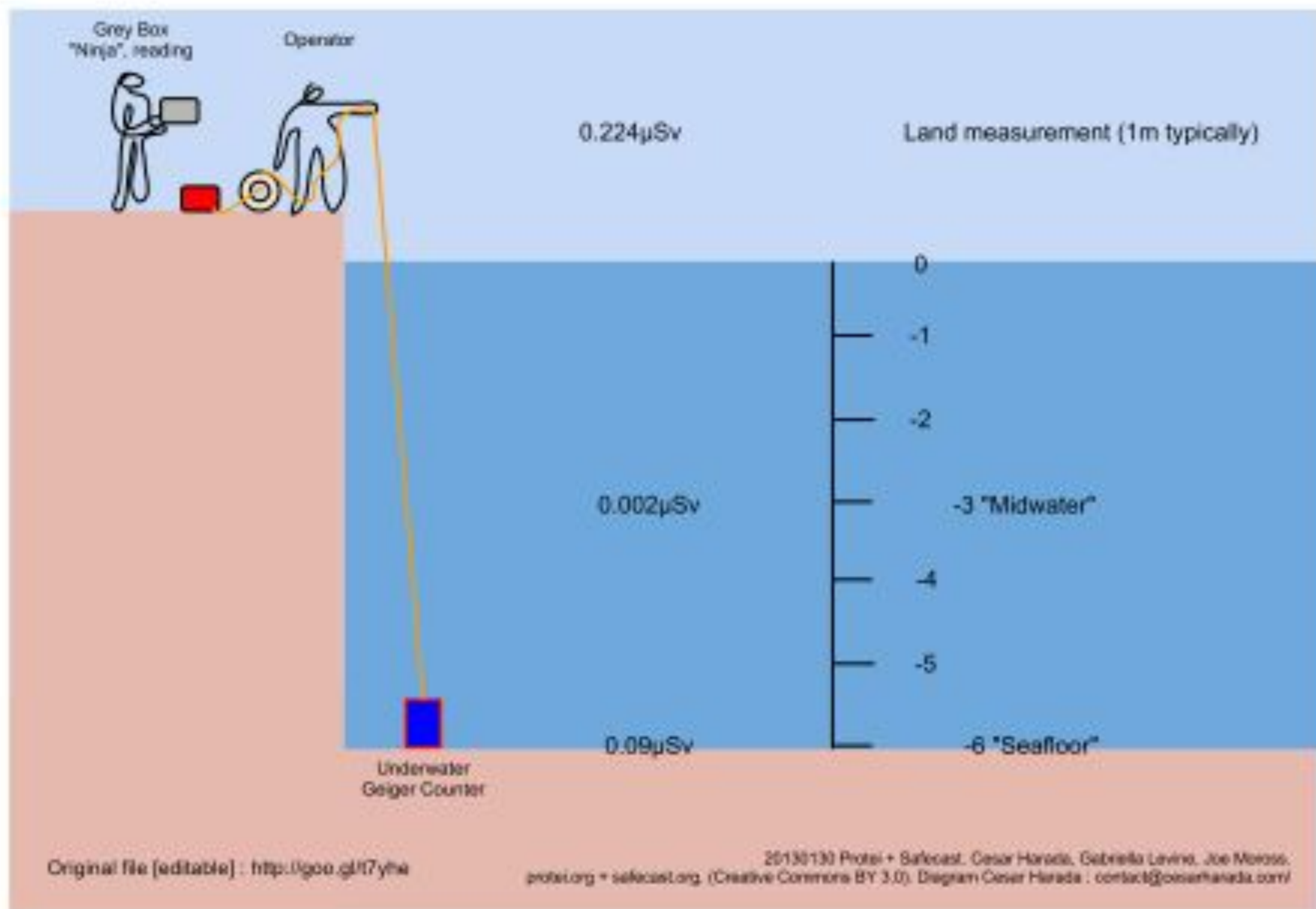


We tested Protei v10.4 in the water. The electro-mechanics are working well but it lacked ballast (weight at the bottom of the lead) - the wind flattened it on the water and careless transport later broke the mast. We'll work on the build again soon. Because we were in Fukushima, we focused not on Protei itself but on the radioactivity sensing part.



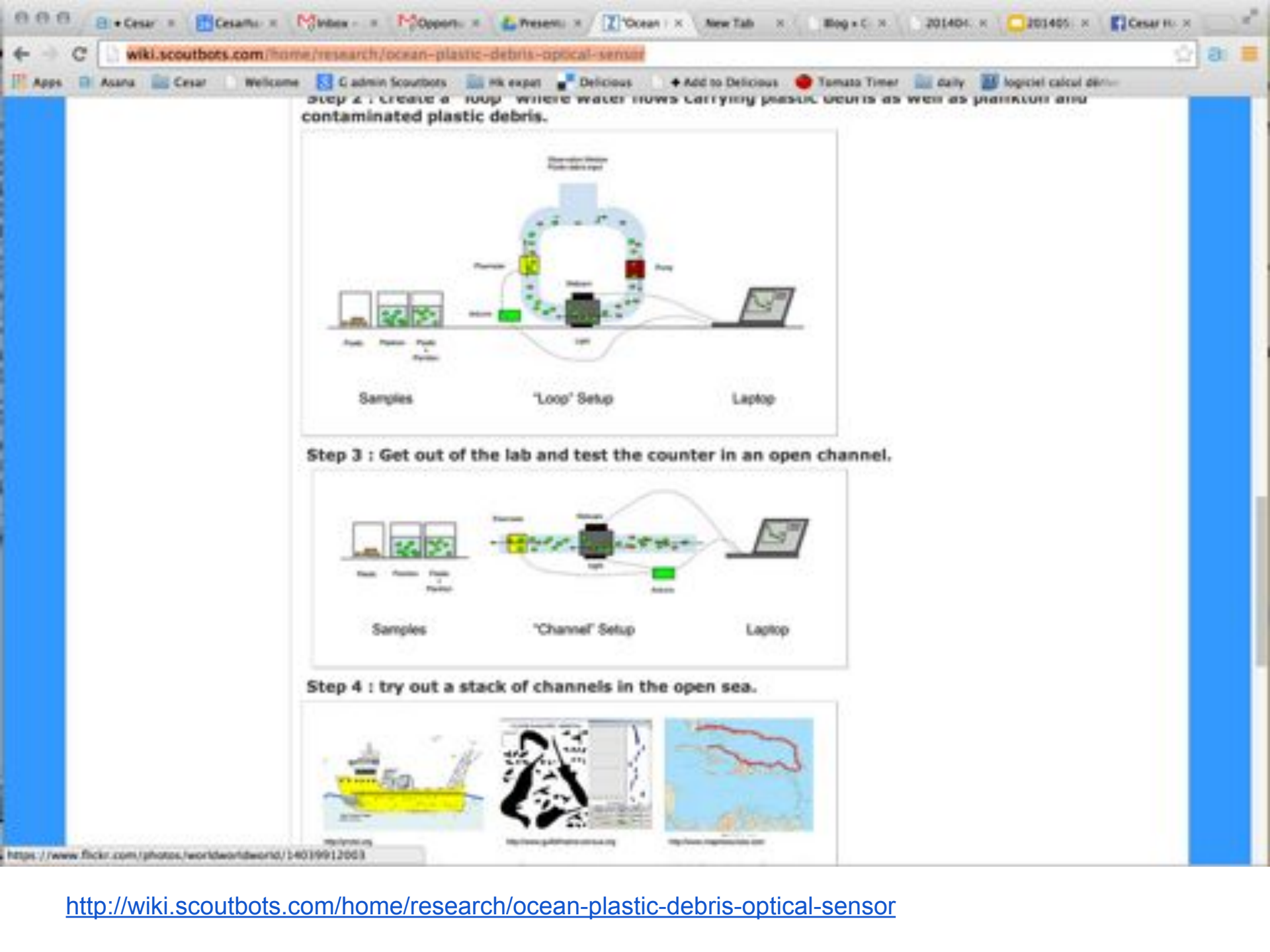
We tested our freshly built underwater gripper controller up to 6 meter depth without leaks nor damage to the mouse.

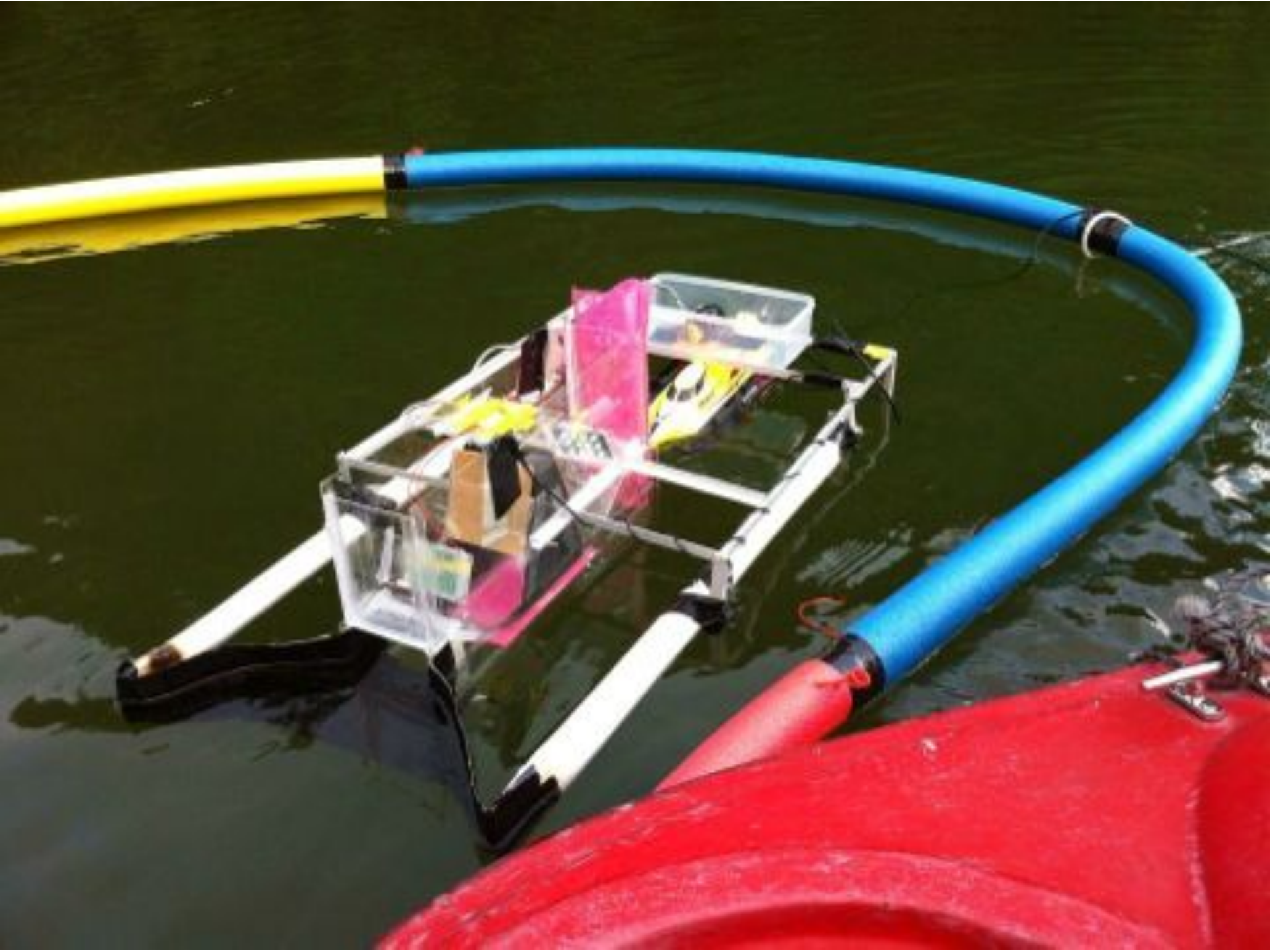
20130130 Hisanohama underwater radioactivity measurements : Protei + Safecast



An aerial photograph of a large oceanic gyre, a circular current that traps floating debris. The water is a deep blue, and the debris is visible as a dark, irregular ring. Several sailboats with yellow sails are scattered around the gyre. The word "Plastic" is written in large, white, sans-serif font across the center of the image, highlighting the nature of the debris.

Plastic



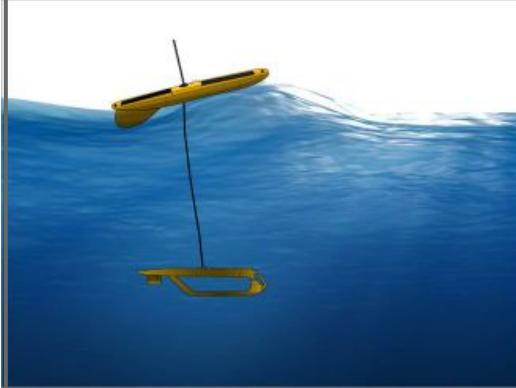






Competition

WaveGlider



Size
Speed
Payload
Endurance
Price
Status

2.9 m Long
1-2 knots avg speed
45 kg payload
6 months
250'000 USD
Commercial

Saildrone



5.7 m Long
3-5 knots avg speed
100 kg payload
2100 N miles in 34 days
<30'000 USD / day
Not commercial yet

Protei



4 m Long
1-3 knots avg speed
50 kg payload
needs further testing
750 USD (estimate)
Beta release April 2014

Intellectual
property
open hardware

Everyone is FREE to

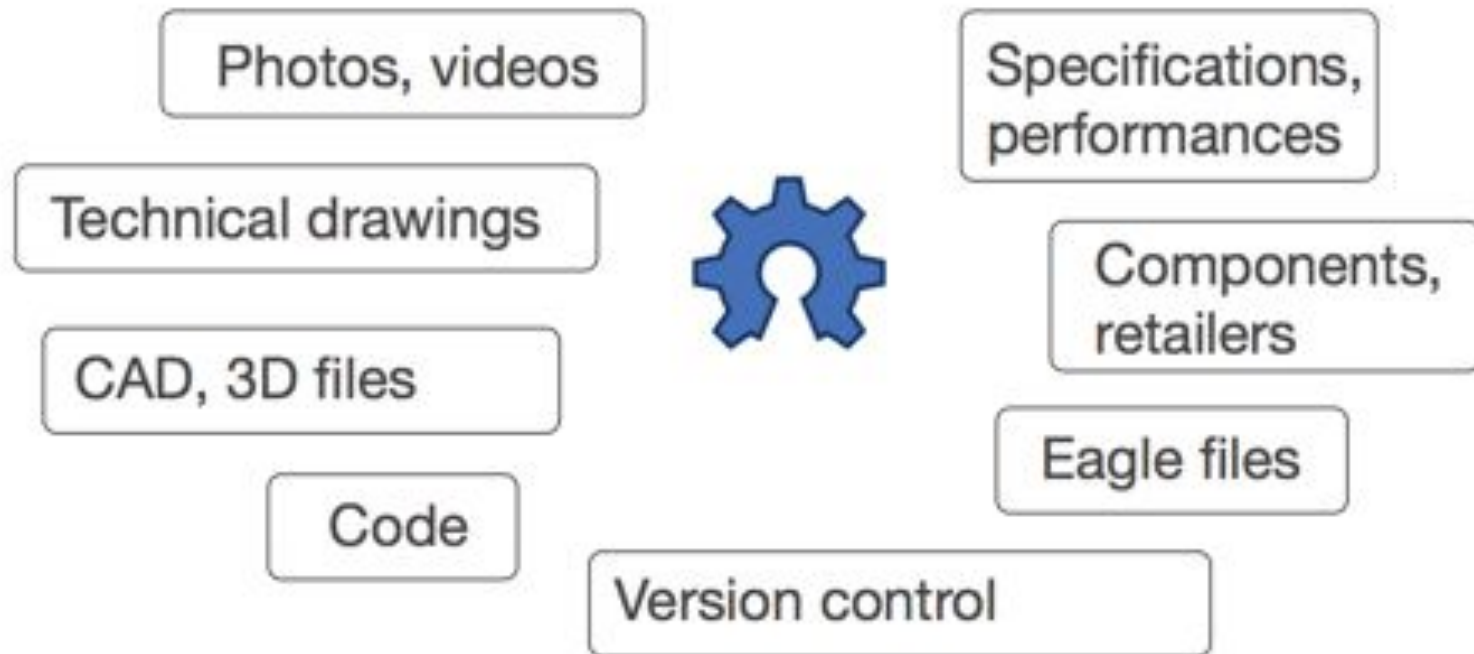
- . Use
- . Modify
- . Distribute



In exchange one must

- . Credit "Protei"
- . Share finding with community

Open Hardware Documentation



People & Values

Social R&D

Protei, Open Hardware Oil Spill Cleaning Sailing Robot

An Open Hardware project in New Orleans, LA by Chris Harada · [write message](#)

PROJECT INFO **UPDATE** **BACKLOG** **COMMUNITY** **HELP**



ABOUT THE PROTEI

We are developing Protei: a low-cost open-source oil collecting robot that autonomously sails upwind, intercepting oil sheens going downwind. Protei combines conventional technologies in an innovative design that we can implement in the short term to address timely environmental crises such as the BP Oil Spill, cleaning the ocean from garbage patches or performing ocean research. We need your help to build our next prototype of Protei - the first articulated sailing boat that can tack upwind pulling a long heavy payload and initiating a revolutionary family in ocean robotics. <http://protei.org>

A situation we must change
 Current Oil spill skimming technology was able to collect only 3% of the BP Deepwater Horizon Oil Spill. The health of remediation workers was

331
 BACKERS
\$33,795
 PLEDGED OF \$27,000 GOAL
0
 SECONDS TO GO

FUNDING SUCCESSFUL
 This project successfully raised its funding goal on April 11, 2011.

PLEDGE \$1 OR MORE
 11 BACKERS
 Insider updates of Protei ahead of public releases on the Kickstarter blog.
[Pledge Now](#) - You can now create a backer

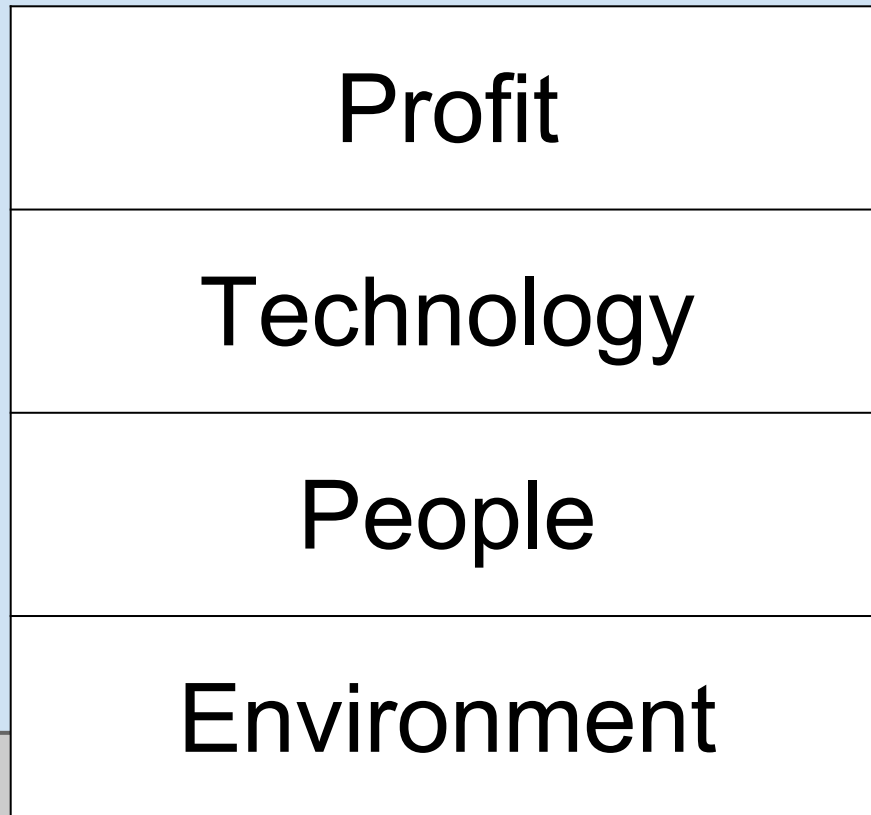
PLEDGE \$5 OR MORE
 21 BACKERS
 Your name on protei.org as "backer".
[Pledge Now](#) - You can now create a backer

PLEDGE \$10 OR MORE
 24 BACKERS
 Your name on protei.org as "backer" + a link to your website.
[Pledge Now](#) - You can now create a backer





Business as usual priorities



Protei Priorities

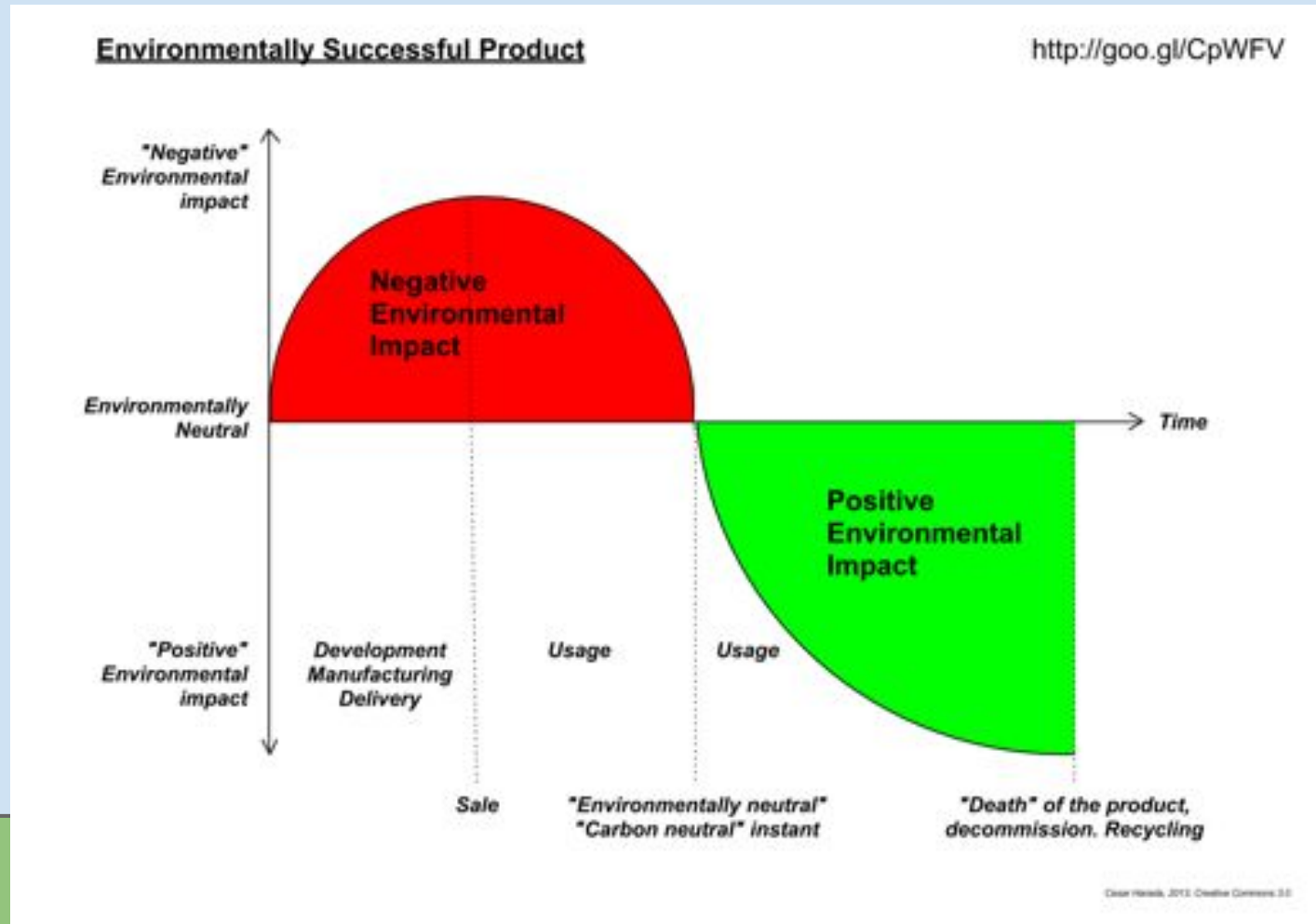
Environment

People

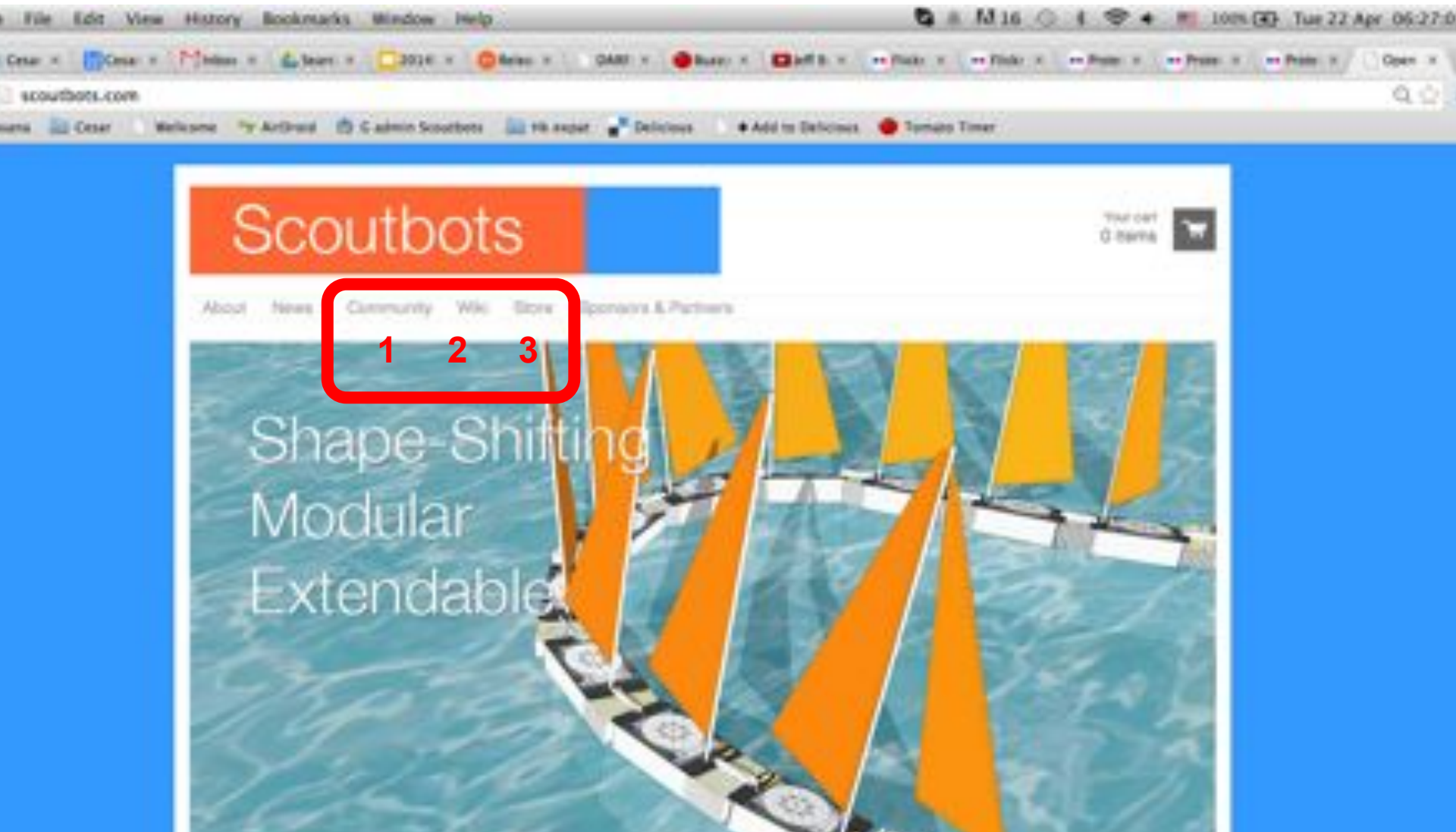
Technology

Profit

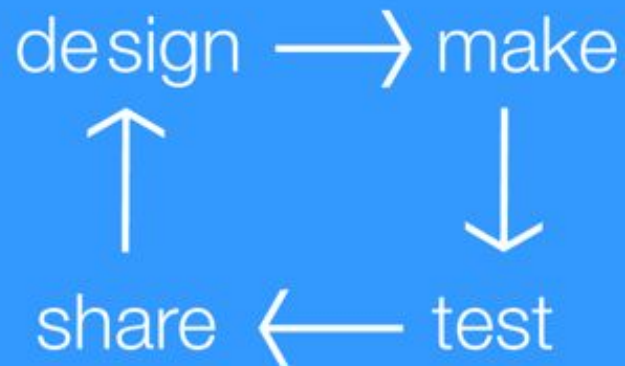
Environmentally Successful



New Website : Social R&D

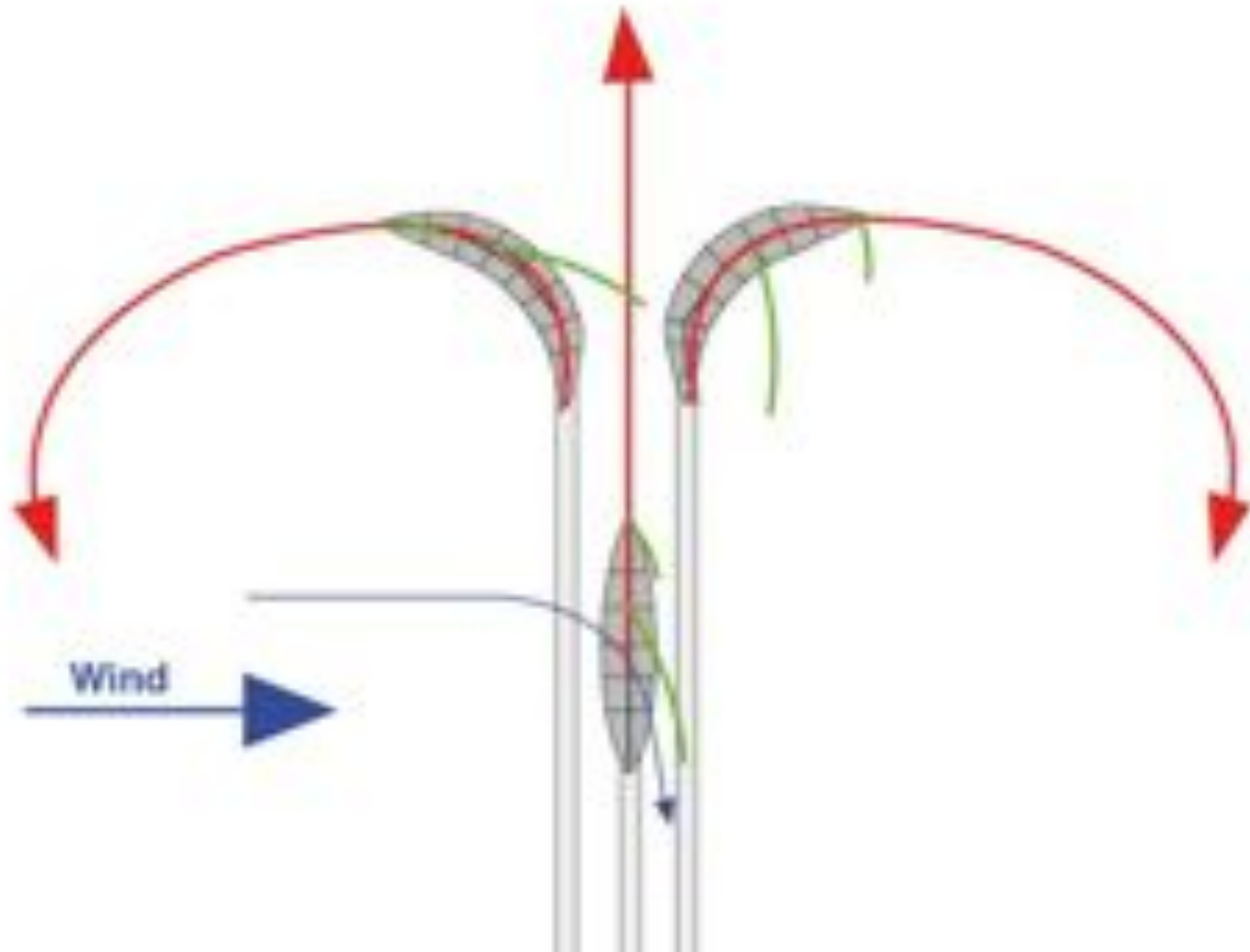


1. Community : discuss, invent
2. Wiki : document, learn, support
3. Store : Sell

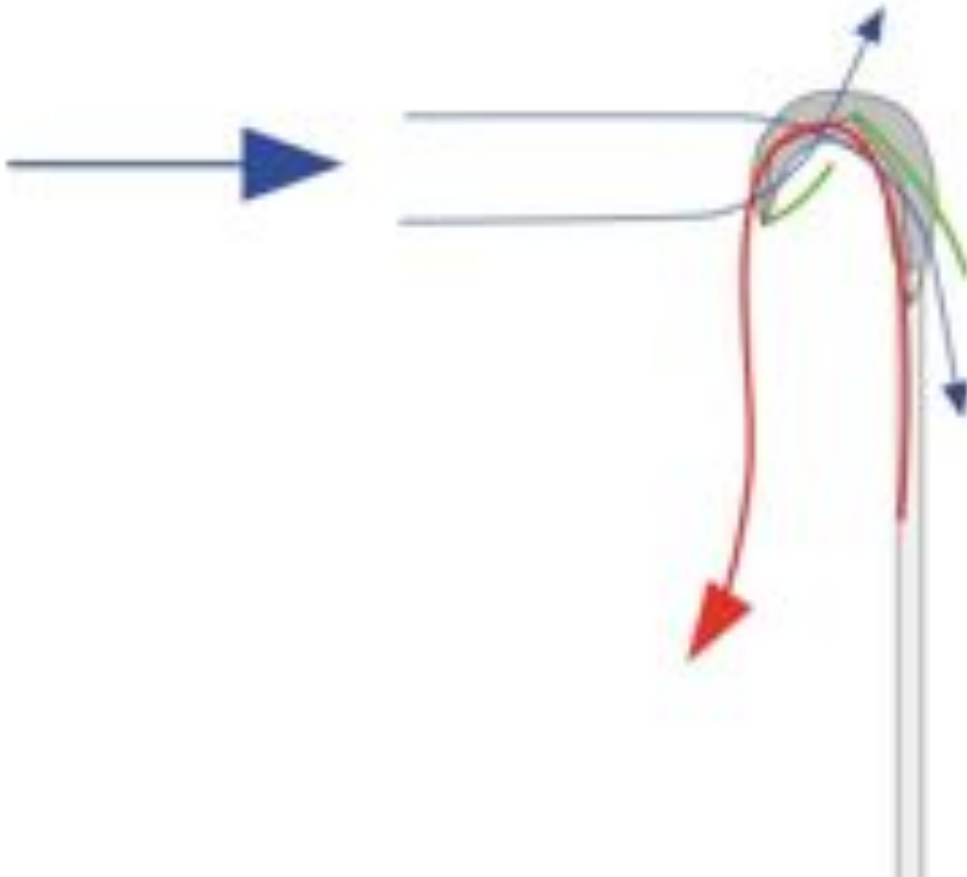


Mechanical
Engineering

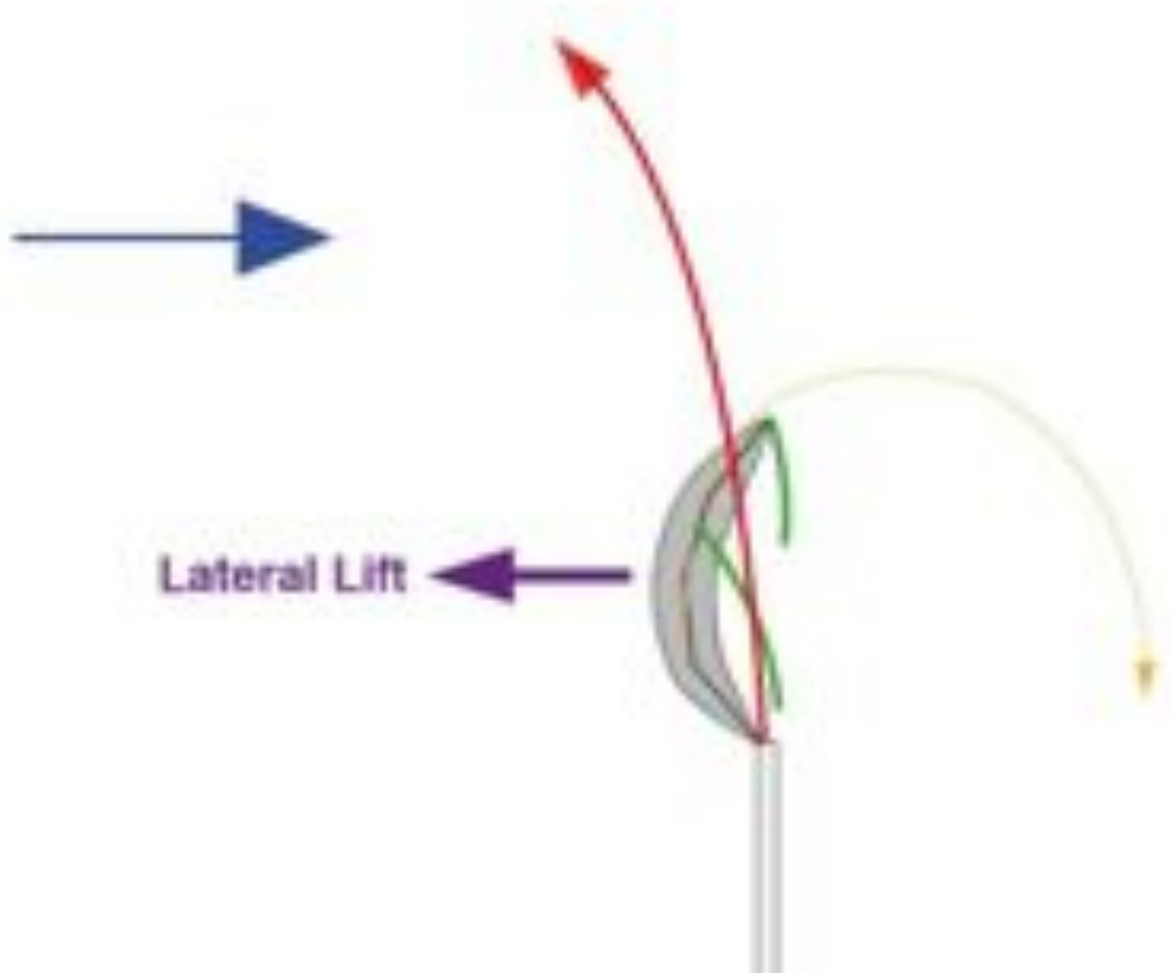
Trajectory & Stability



Maneuverability



Lateral Lift



The future of Aero & Hydrodynamics



Airbus A319

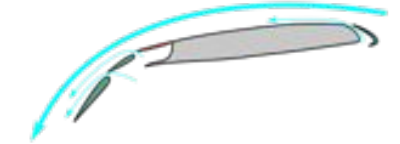
Best efficiency – for climbing, cruising, descent



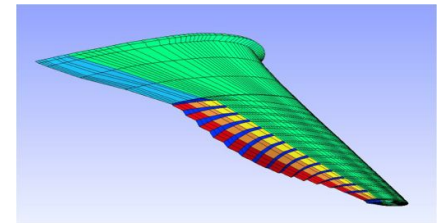
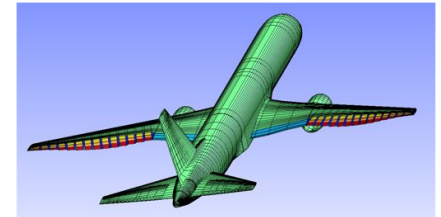
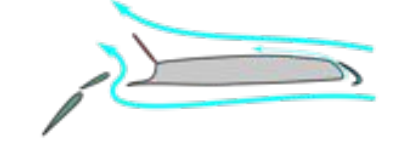
Increased wing area – for take-off and initial climb



Maximum lift and high drag – approach to landing



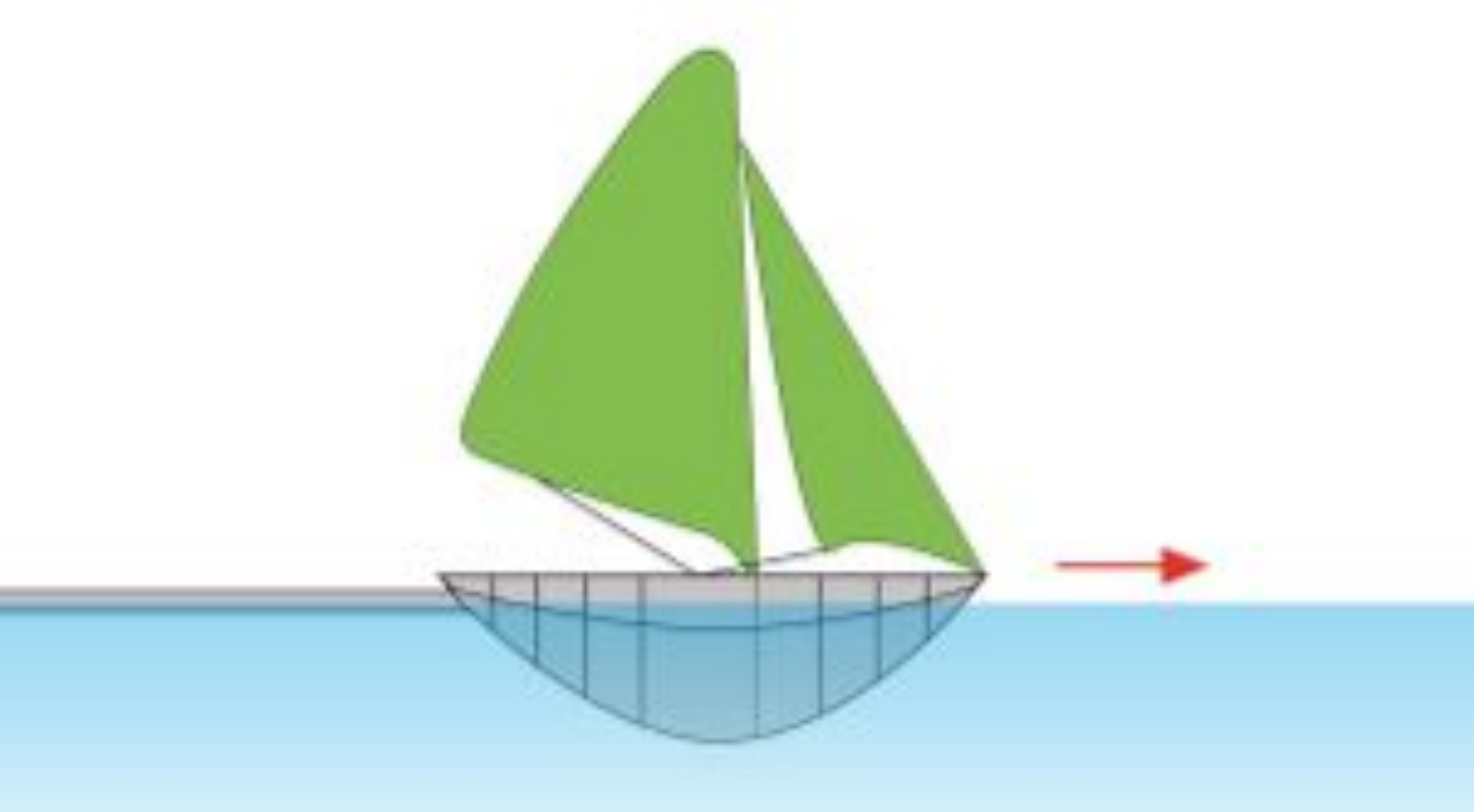
Maximum drag and reduced lift – for braking on runway



NASA Boeing “Flexible wing control [...] Weight reductions of 25% and aspect-ratio increases of 30-40% for cantilever wings”. Enter service 2025



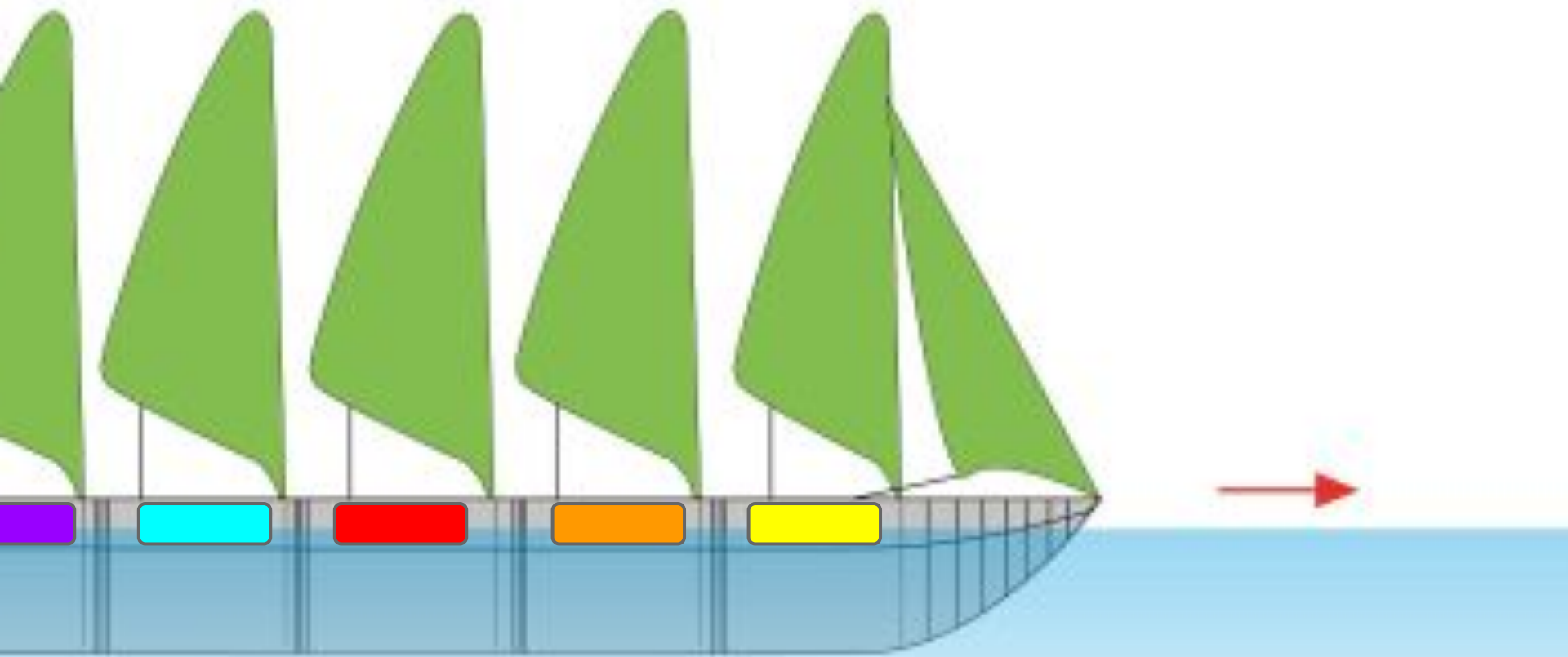
Less resistance & Turbulence



Absorbing "noise"



Modular, Energy efficient



Electrical
Engineering

=

Computer Science &
Engineering

Architectures

Autonomous : one agent senses & makes decisions

Swarm robotic : multiple agents collaborating

Timeframe : Short real-time navigation

Timeframe : Long strategic timeframe

App on board

Web interface

Science, apps, gaming

Evolutionary



RC hobby
250m



Arduino
500m



Android
3.5km

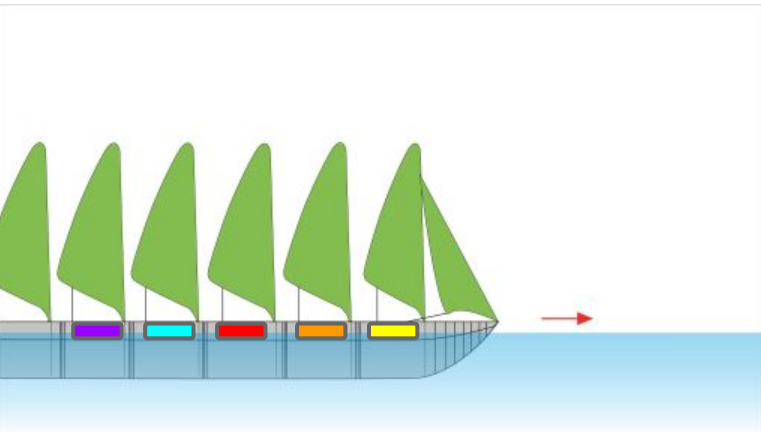


Iridium
Global

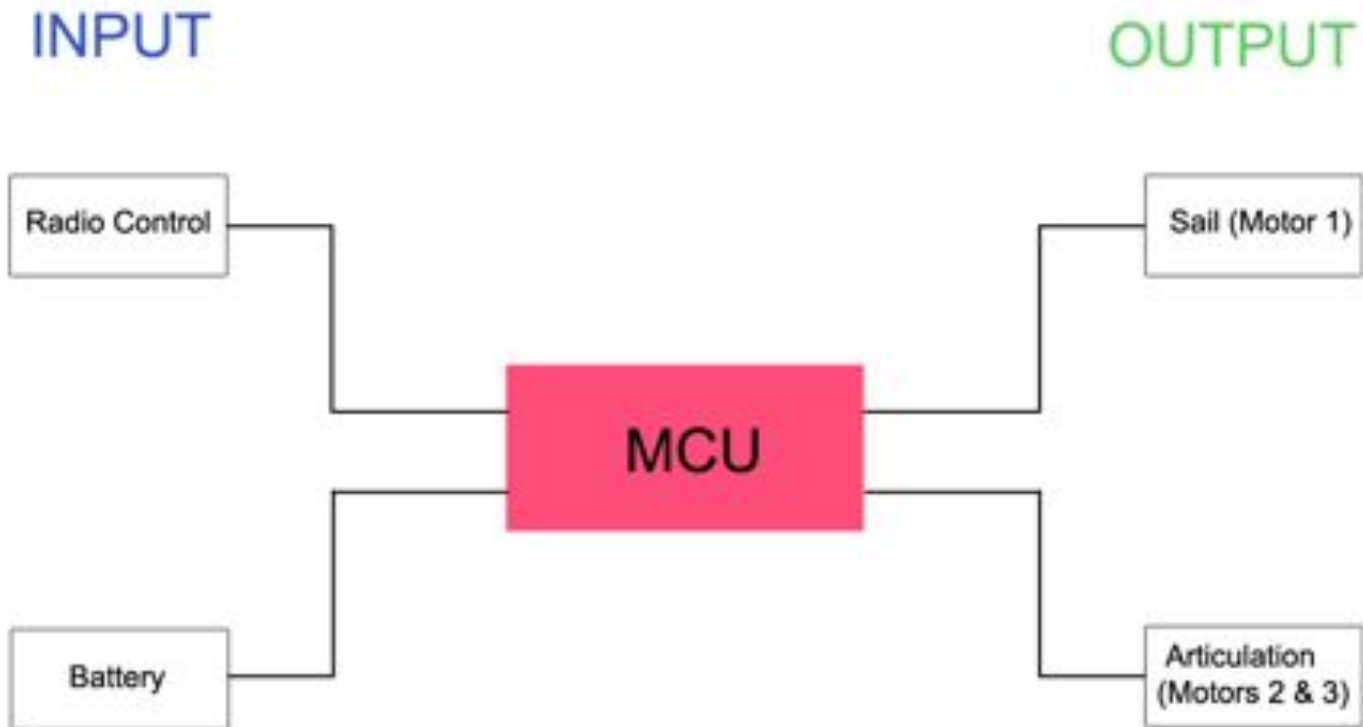


Typical Time Scales

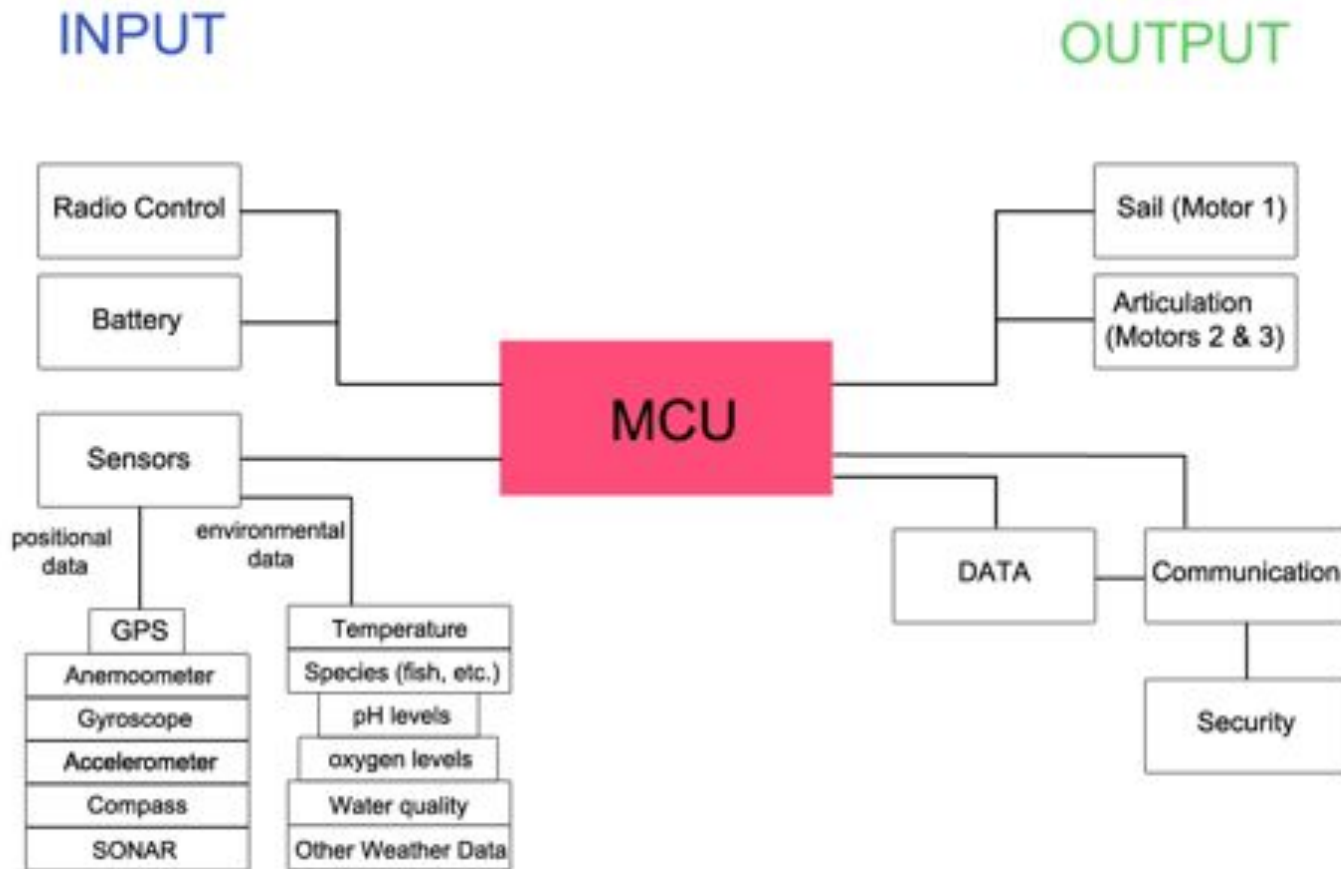
1. Owner (years)
2. Operator (months)
3. Mission rental (weeks)
4. Module rental (days)
5. Test (minutes)



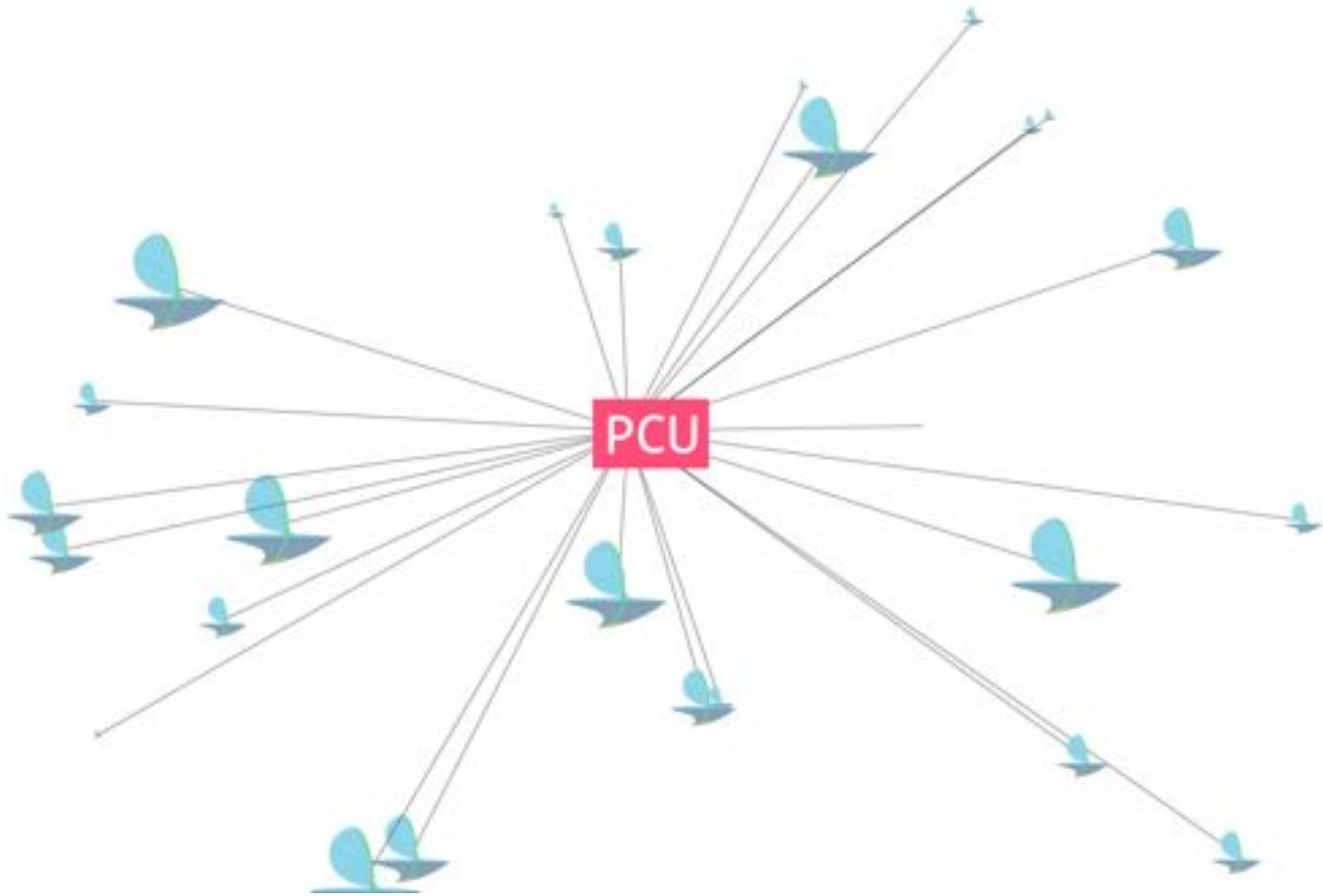
Swarm Robotics



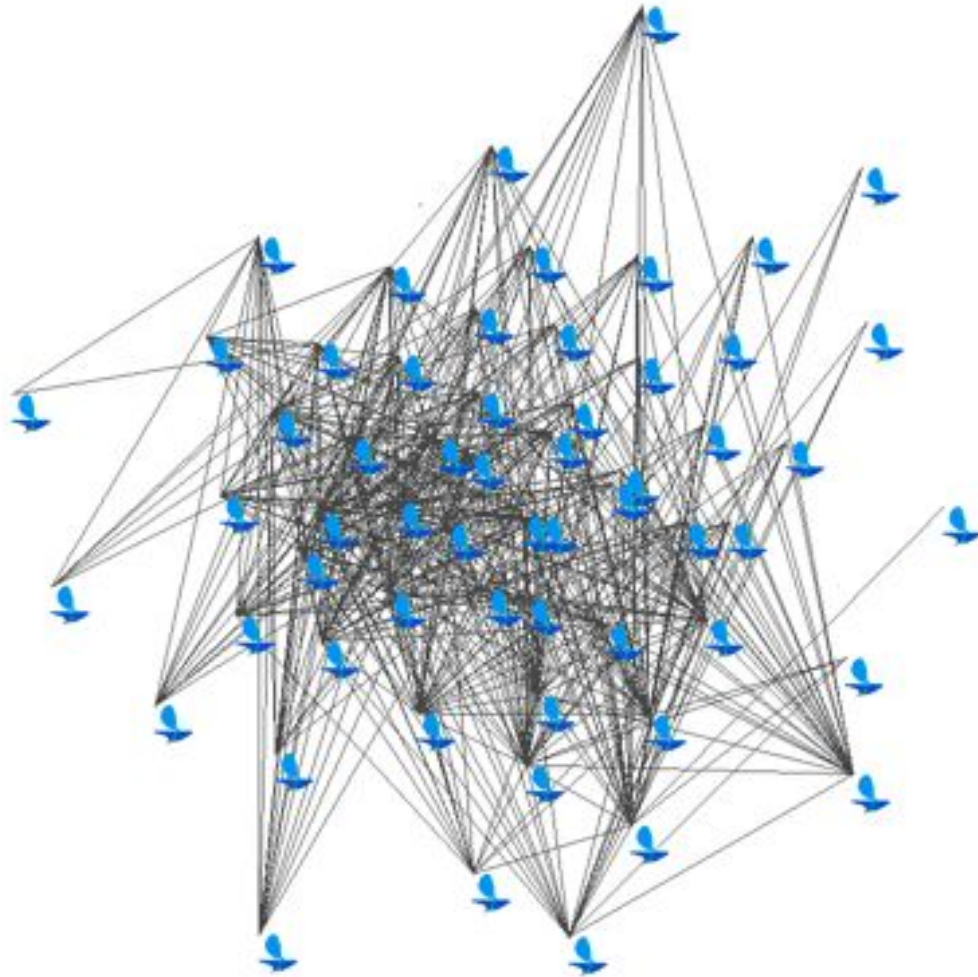
Swarm Robotics



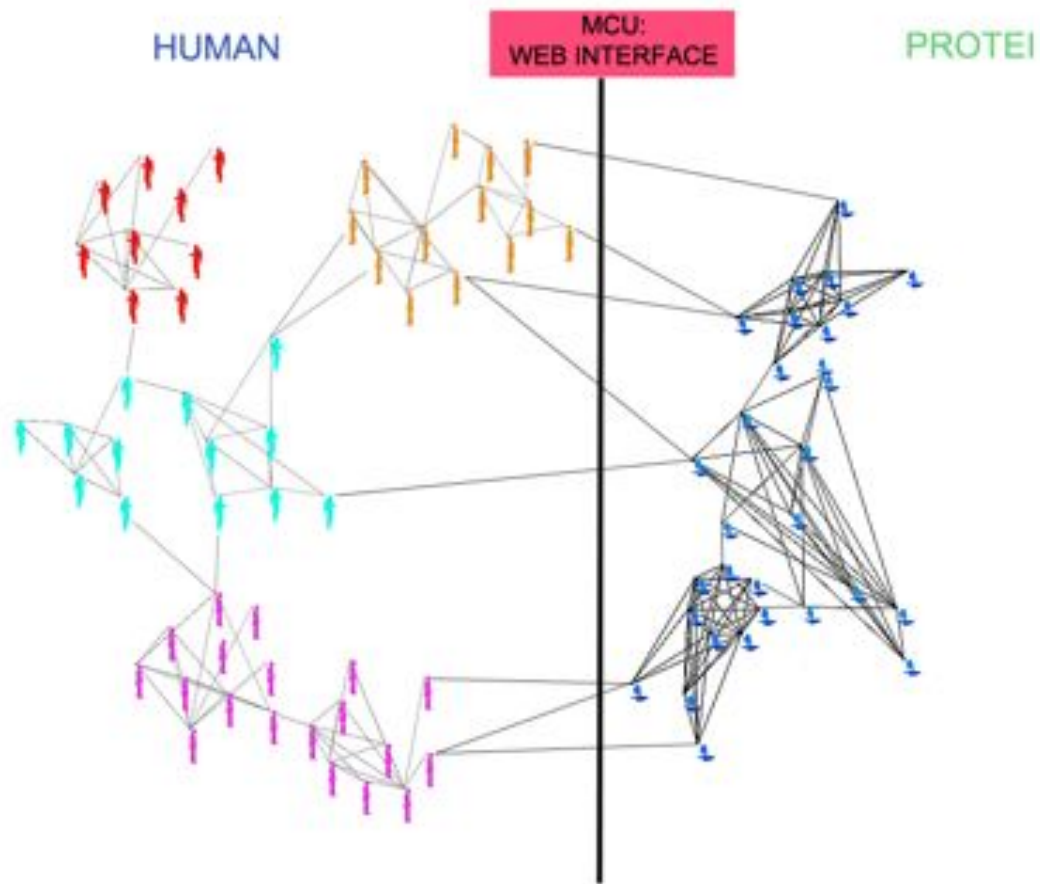
Swarm Robotics



Swarm Robotics



Swarm Robotics



Architectures

Autonomous : one agent senses & makes decisions

Swarm robotic : multiple agents collaborating

Timeframe : Short real-time navigation

Timeframe : Long strategic timeframe

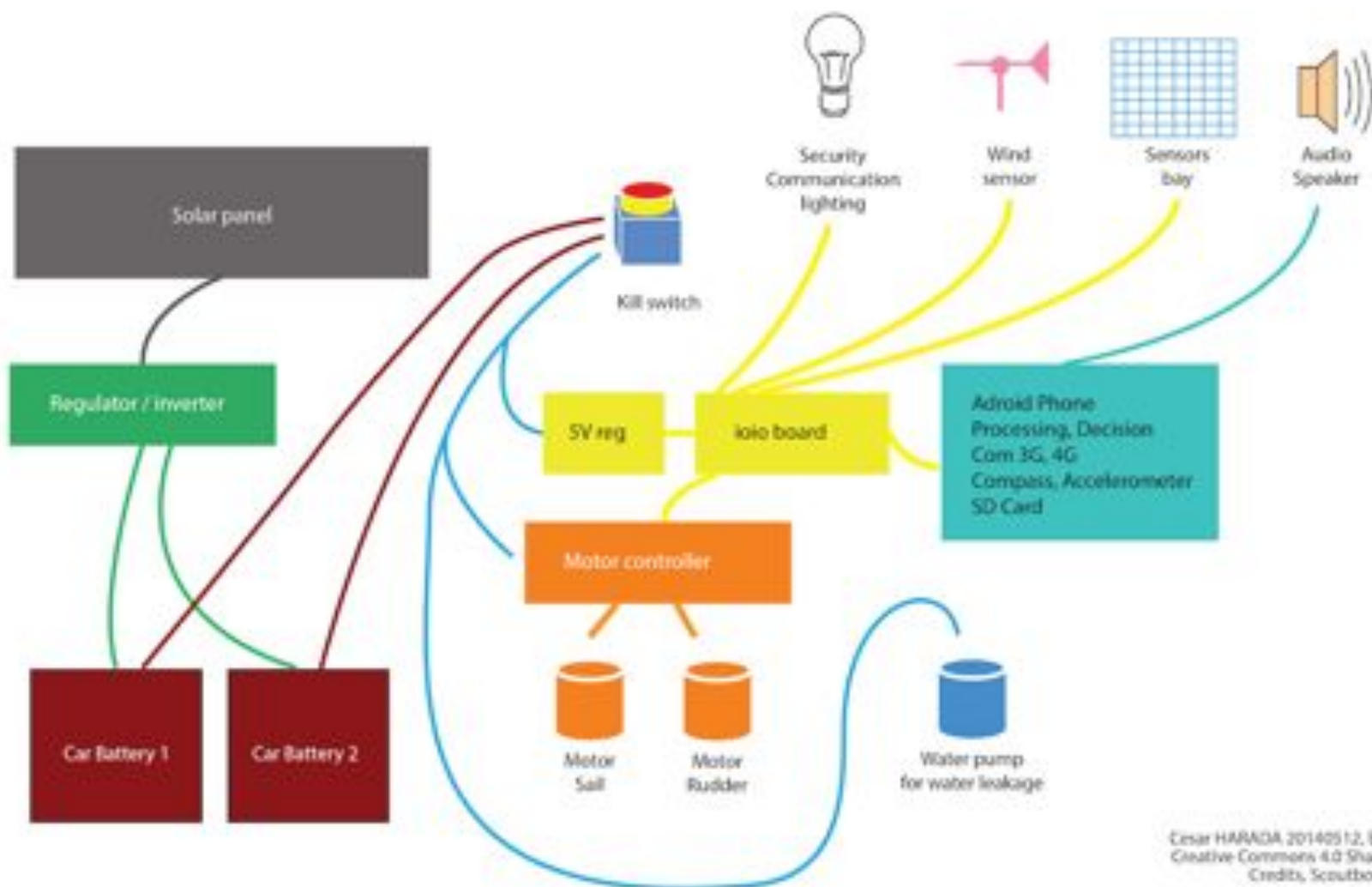
App on board

Web interface

Science, apps, gaming



Panthalassa 000.1



Architectures

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Web interface

Science, apps, gaming



Architectures

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Timeframe : Long strategic timeframe

App on board

Web interface

Science, apps, gaming

Real-type, immersive



Architectures

Autonomous : one agent senses & makes decisions

Swarm robotic : multiple agents collaborating

Timeframe : Short real-time navigation

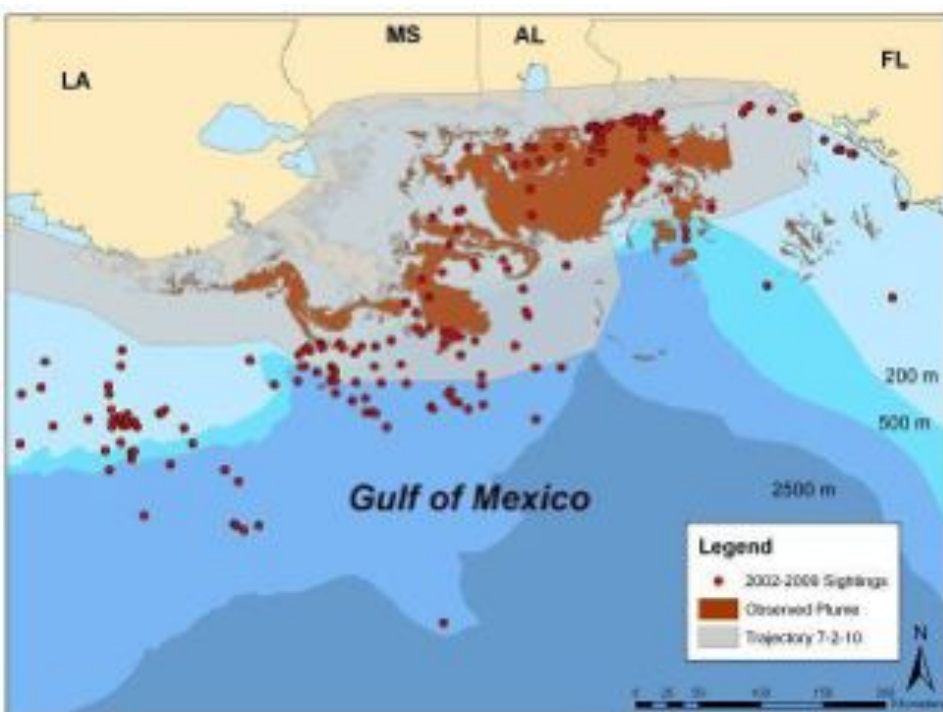
Timeframe : Long strategic timeframe

App on board

Web interface

Science, apps, gaming

Long term, strategic



Architectures

Autonomous : one agent senses & makes decisions

Swarm robotic : multiple agents collaborating

Timeframe : Short real-time navigation

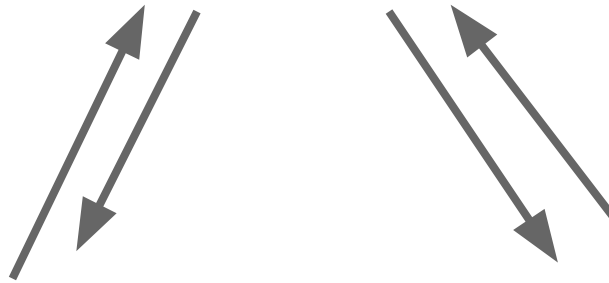
Timeframe : Long strategic timeframe

App on board

Web interface

Science, apps, gaming

Server app



Robot app



User app

Architectures

Autonomous : one agent senses & makes decisions

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Timeframe : Short real-time navigation

Timeframe : Long strategic timeframe

App on board

Web interface

Science, apps, gaming



Live Map

Vessels

Ports

Gallery

MarineTraffic.com

World Map

Cover your Area

Frequently Asked Questions

Services



Ships Map

Australia	W
Go To Port	W
Go To Vessel	W

Station & Display options:

- Show Ship Names
- Ports Stations
- Passenger Vessels
- Cargo Vessels
- Tankers
- High Speed Craft
- Tug, Pilot, etc
- Yachts & Others
- Navigation Aids
- Unspecified Ships
- Ships Underway
- Anchored/Moored



Actix Google

Activate All
 Show Ship
 Show Colors
 Live Tracking

Anchor Vessels

Jobs
 Check at the anchor
 vacancies Match
 vacancies with your

Auto refresh in: 17' [Refresh now!](#)

Vessels displayed: 71.

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Vessels in Range: 7678.

Architectures

Autonomous : one agent senses & makes decisions

Swarm robotic : multiple agents collaborating

Timeframe : Short real-time navigation

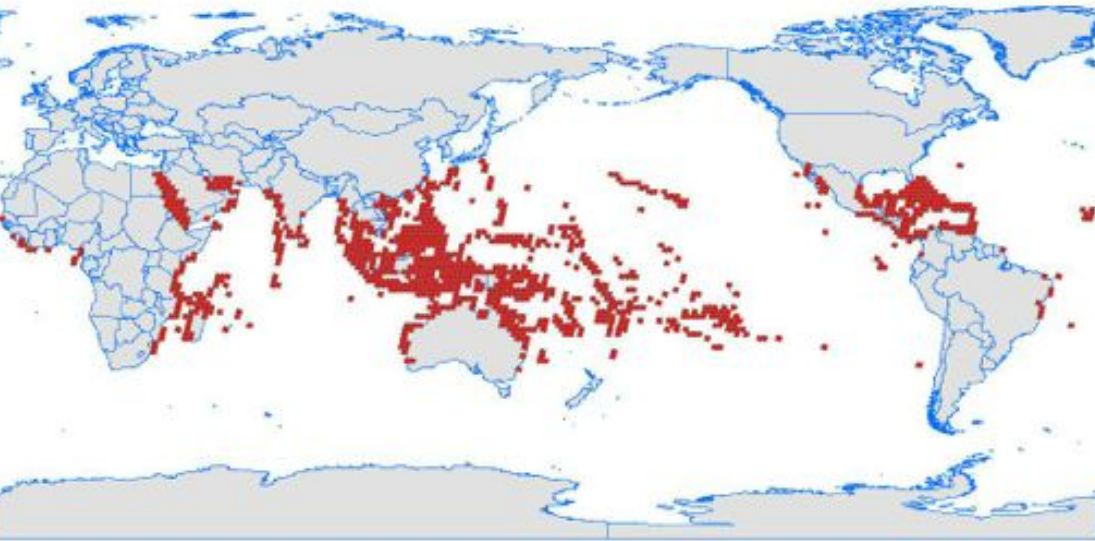
Timeframe : Long strategic timeframe

App on board

Web interface

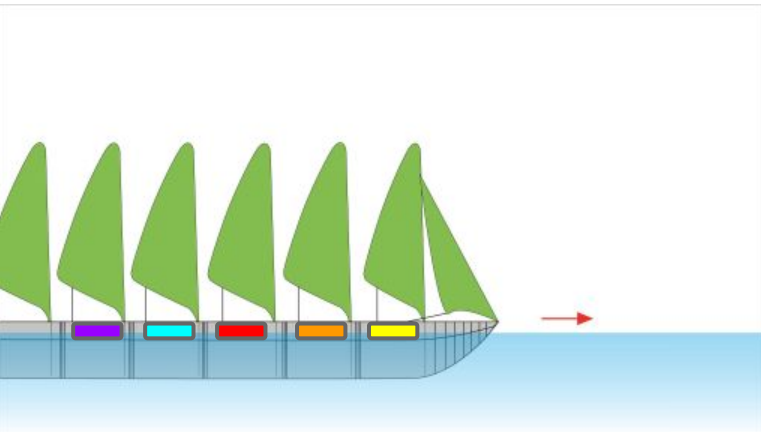
Science, apps, gaming

Coral reefs



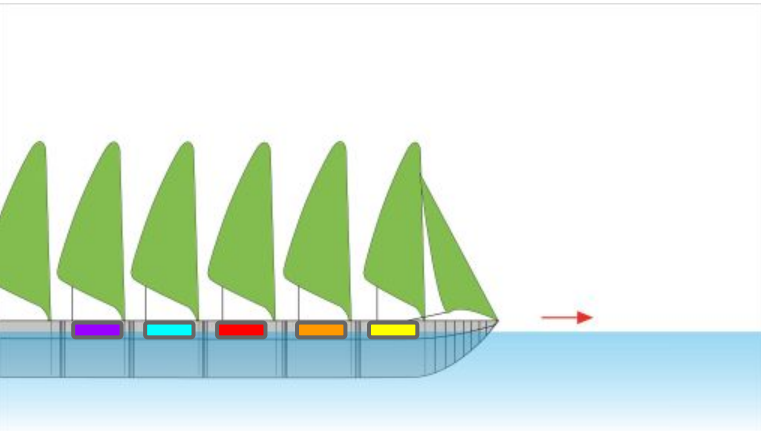
Style

1. Competition
2. Cooperation
3. Team VS Team
4. Survival



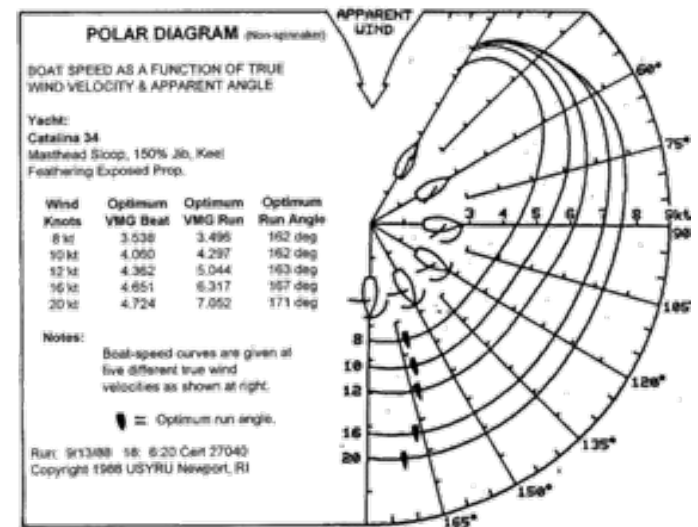
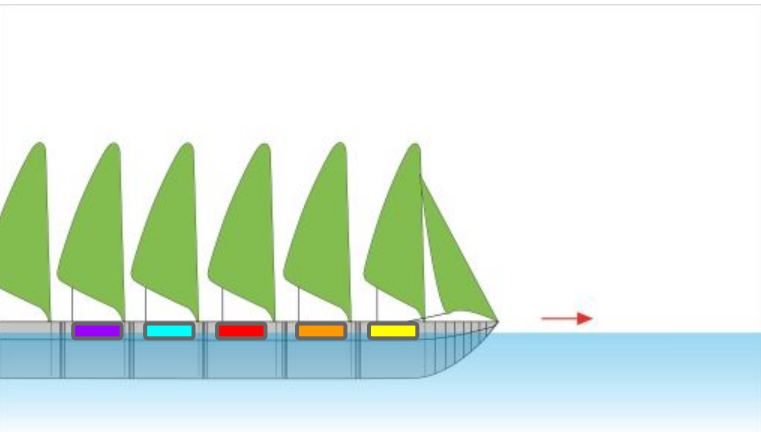
Incentives

1. Mapping (data, science)
2. Clean (collecting stuff, industrial)
3. Transport
4. Communication
5. Money?
6. Warfare?



Character Design

- Small & Fast
- Big & Slow
- Colorful
- Stealth



Collaborate with Protei

A large yellow satellite dish antenna is positioned on a blue ocean surface. The dish is oriented vertically, and its reflection is visible in the water. The background shows a clear blue sky and a horizon line.

- **Community Website Development**
- **Android robot Development, server app**
- **Plastic Sensor Development**
- **Radioactivity Sensor Development**
- **Help sea testing**

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Shape-Shifting
Sailing Robot
to Explore & Protect
the Oceans

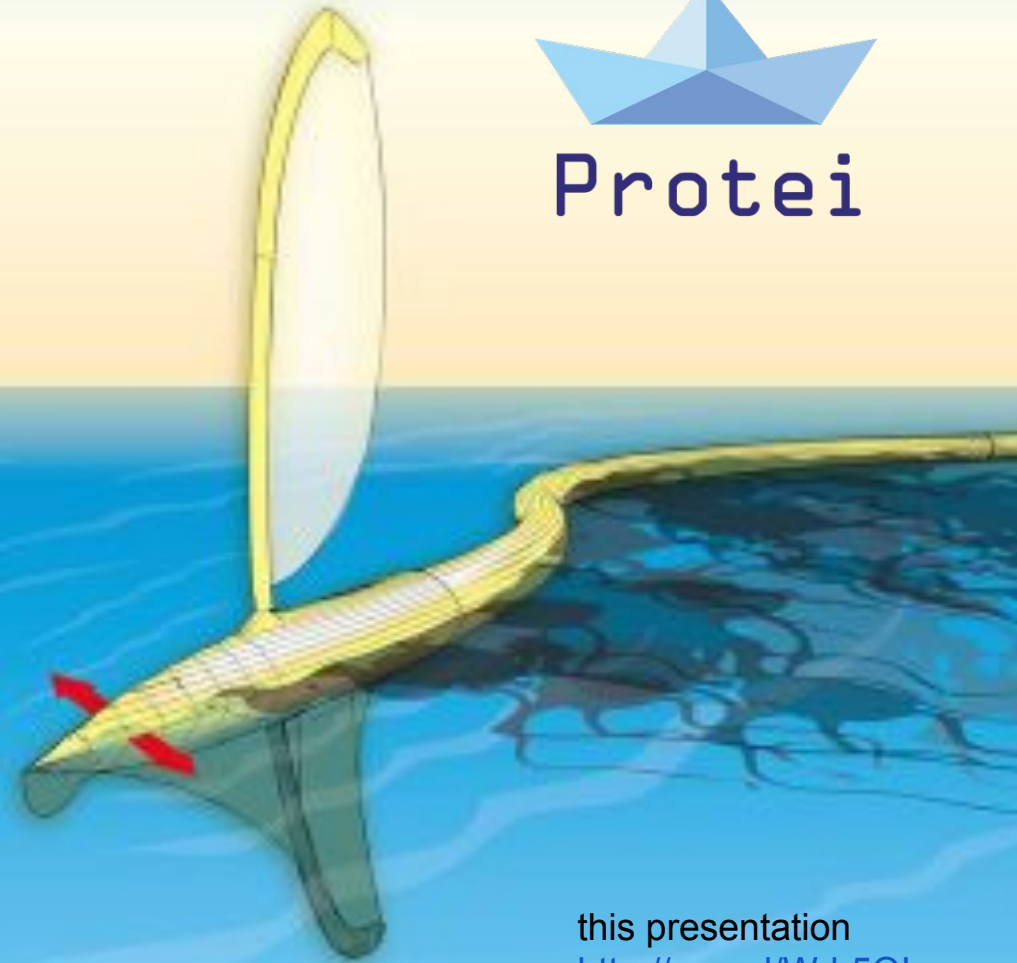
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Protei



this presentation
<http://goo.gl/Wrb50I>