



Alioli ROV Submarine Drone



Juanmi Taboada

Robótica Educativa

Málaga, 7 septiembre 2023



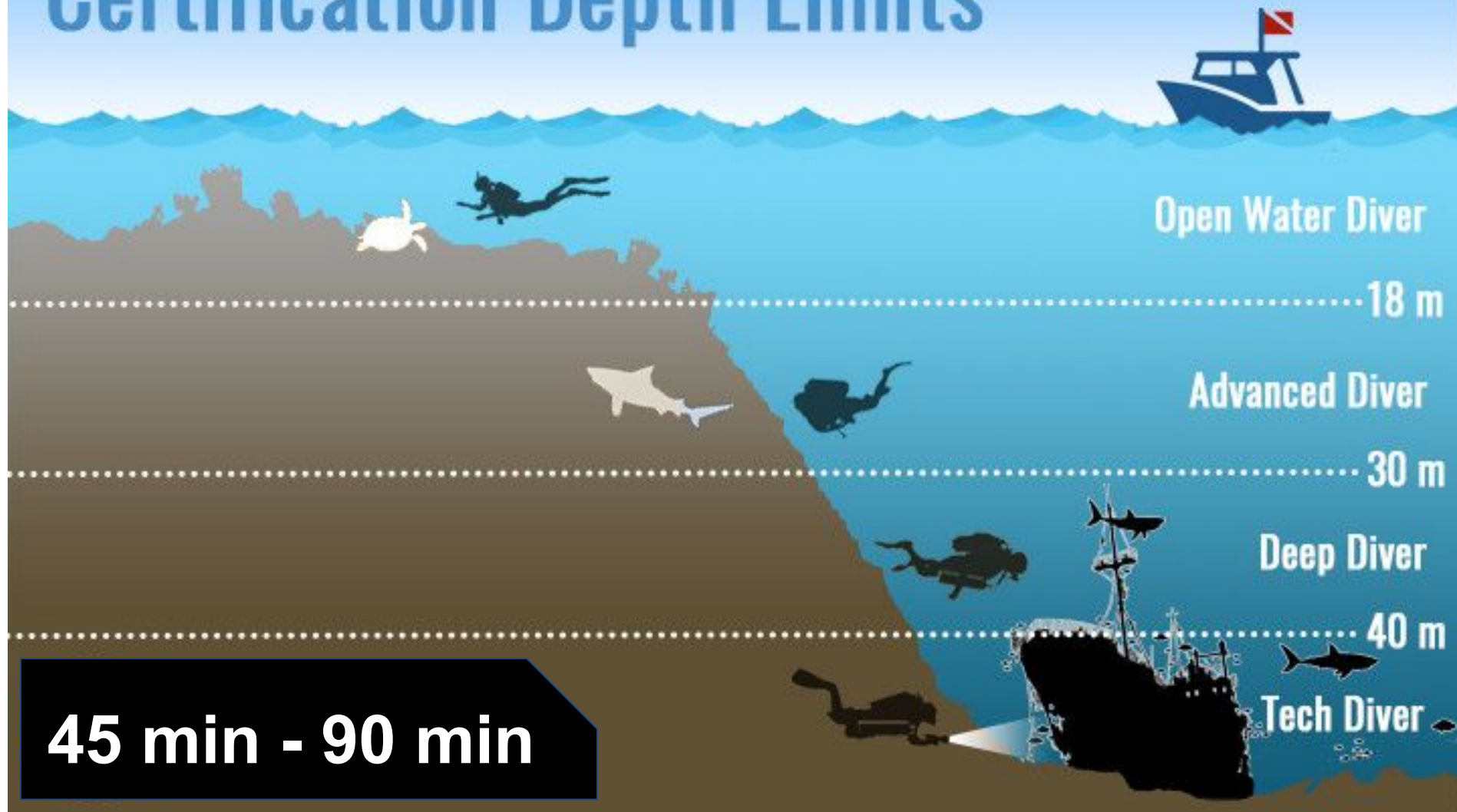
Juanmi Taboada

Pasión por el agua



Juanmi Taboada

Certification Depth Limits



45 min - 90 min







Pasión por el agua



Juanmi Taboada



Cluster de Computación openMosix

16 ordenadores

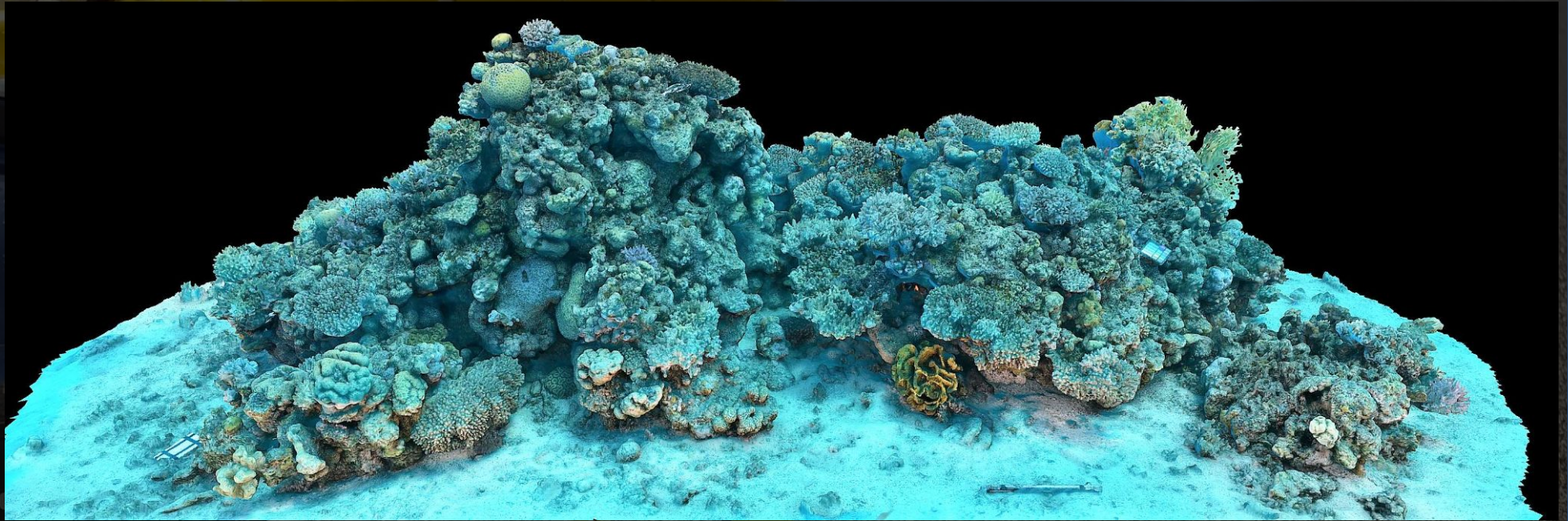
@GEB Universidad de Málaga

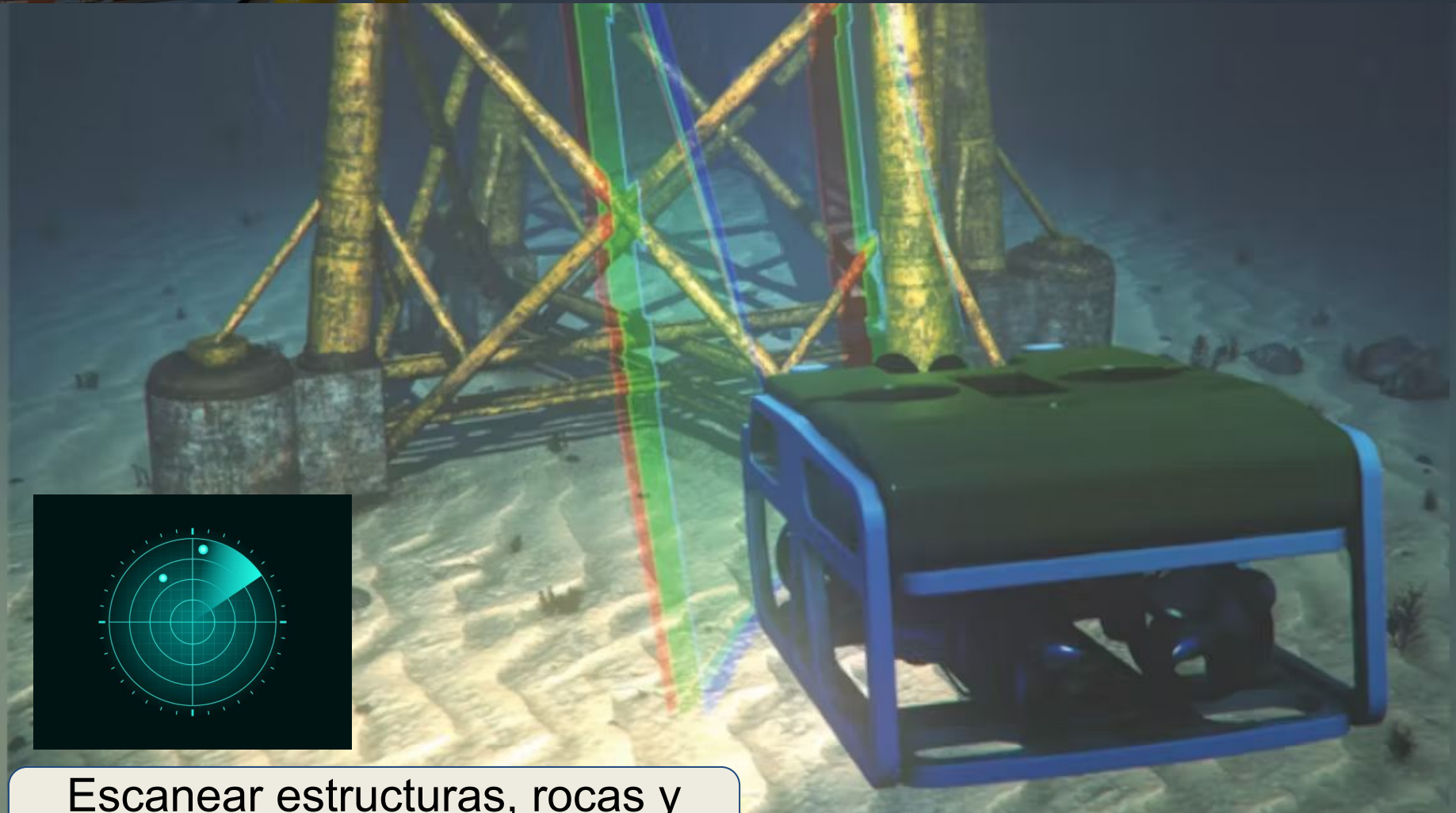




Málaga Wireless 2003 @ La Térmica
Investigar, Aprender y Compartir

La idea principal 💡

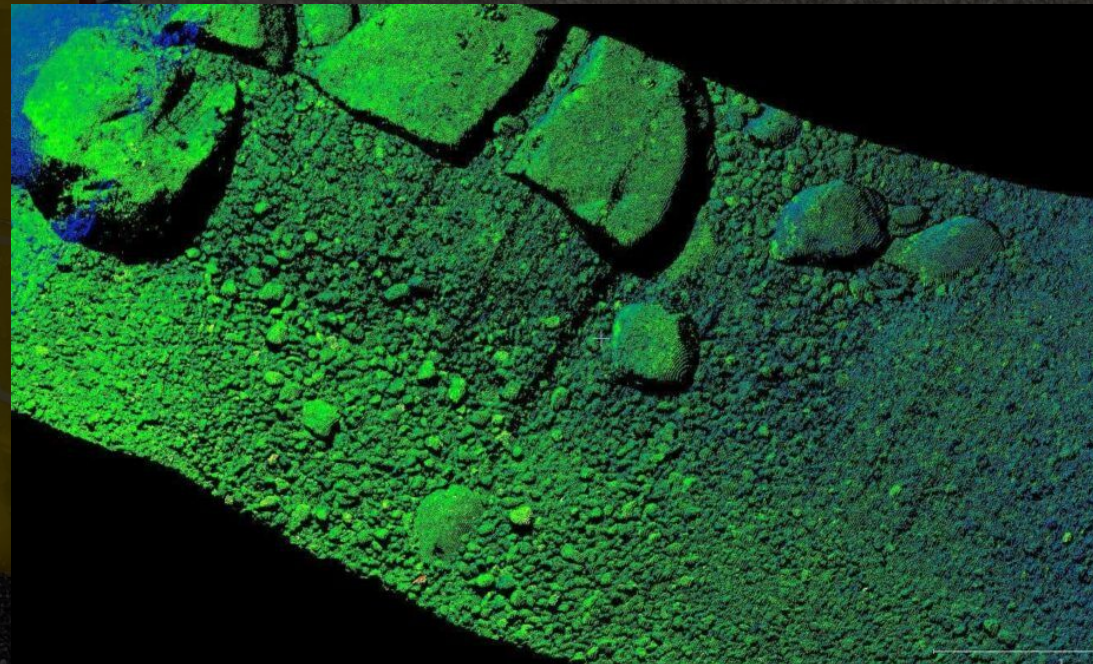
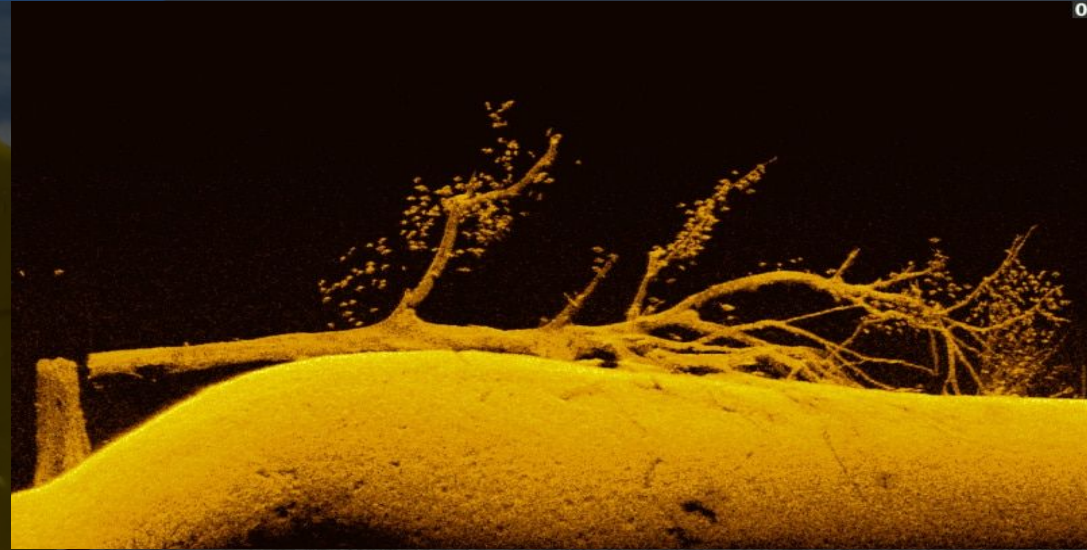
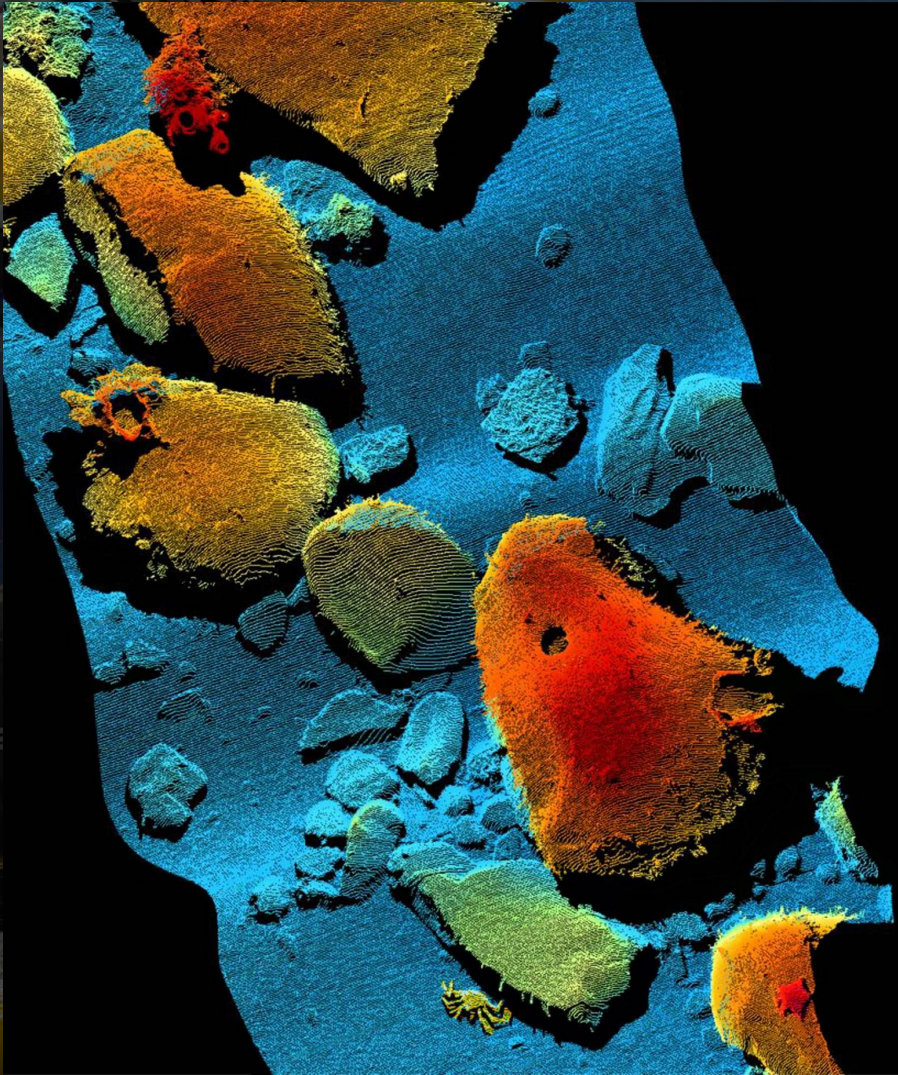




Escanear estructuras, rocas y montículos



SONAR y buscadores de peces



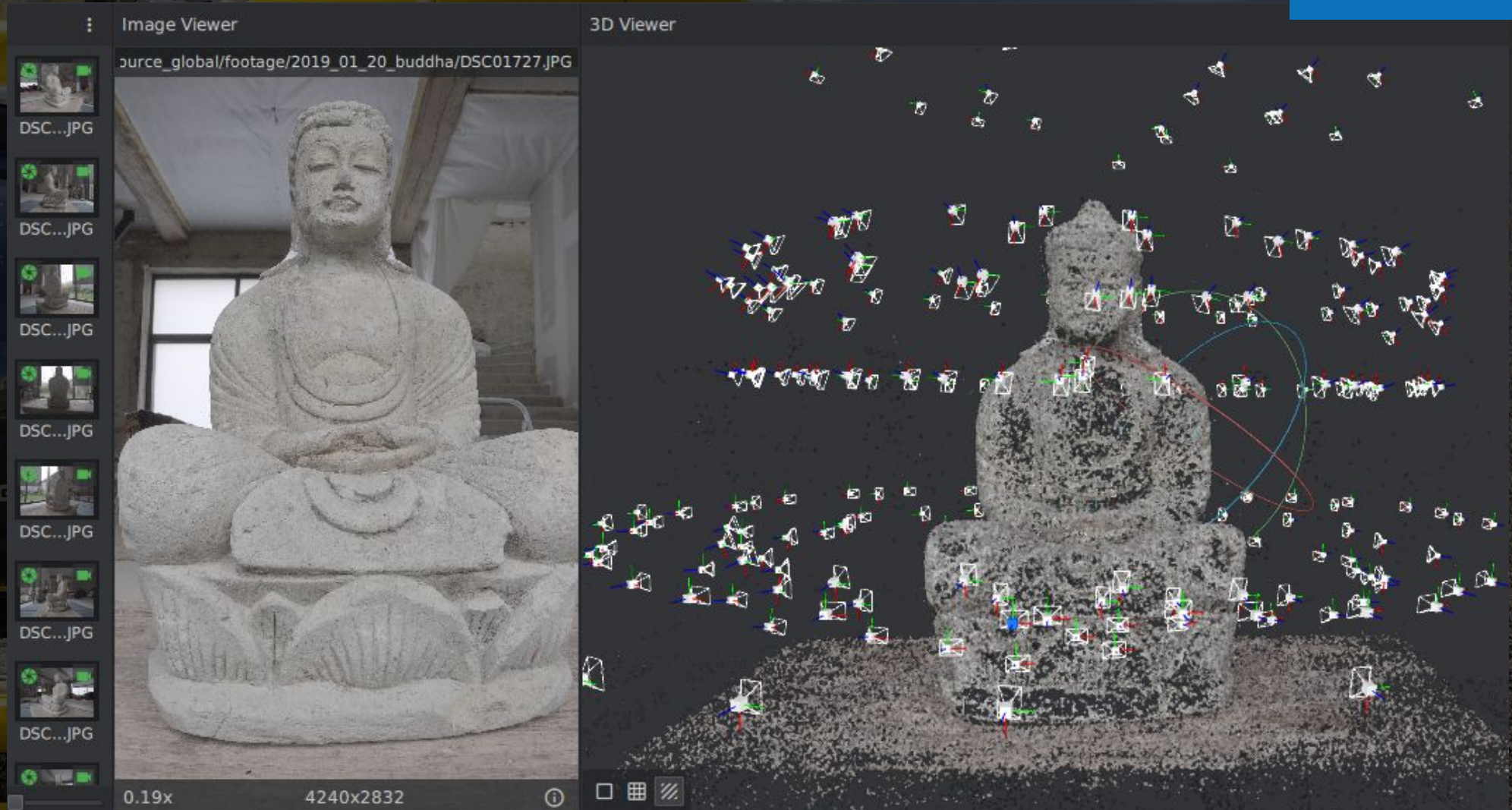
Meshroom

Meshroom es un software libre de código abierto para la Reconstrucción 3D basado en el entorno de fotogrametría de visión por computador **AliceVision**



MESHROOM

Open Source Photogrammetry Software



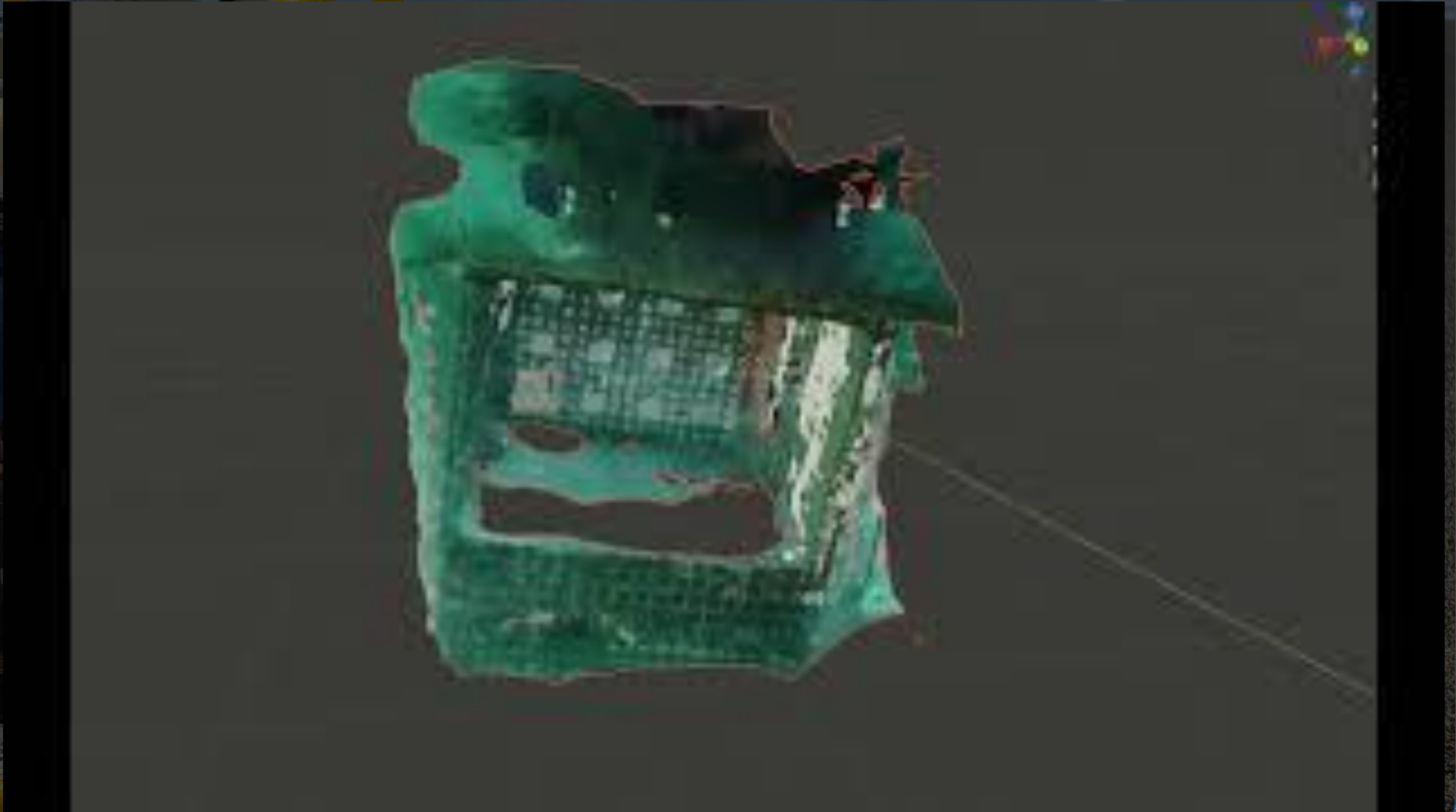
Fotogrametría



(Click on the image to watch the video)



Fotogrametría



(Click on the image to watch the video)



Fotogrametría 📷



(Click on the image to watch the video)



Fotogrametría 📷💥



(Click on the image to watch the video)





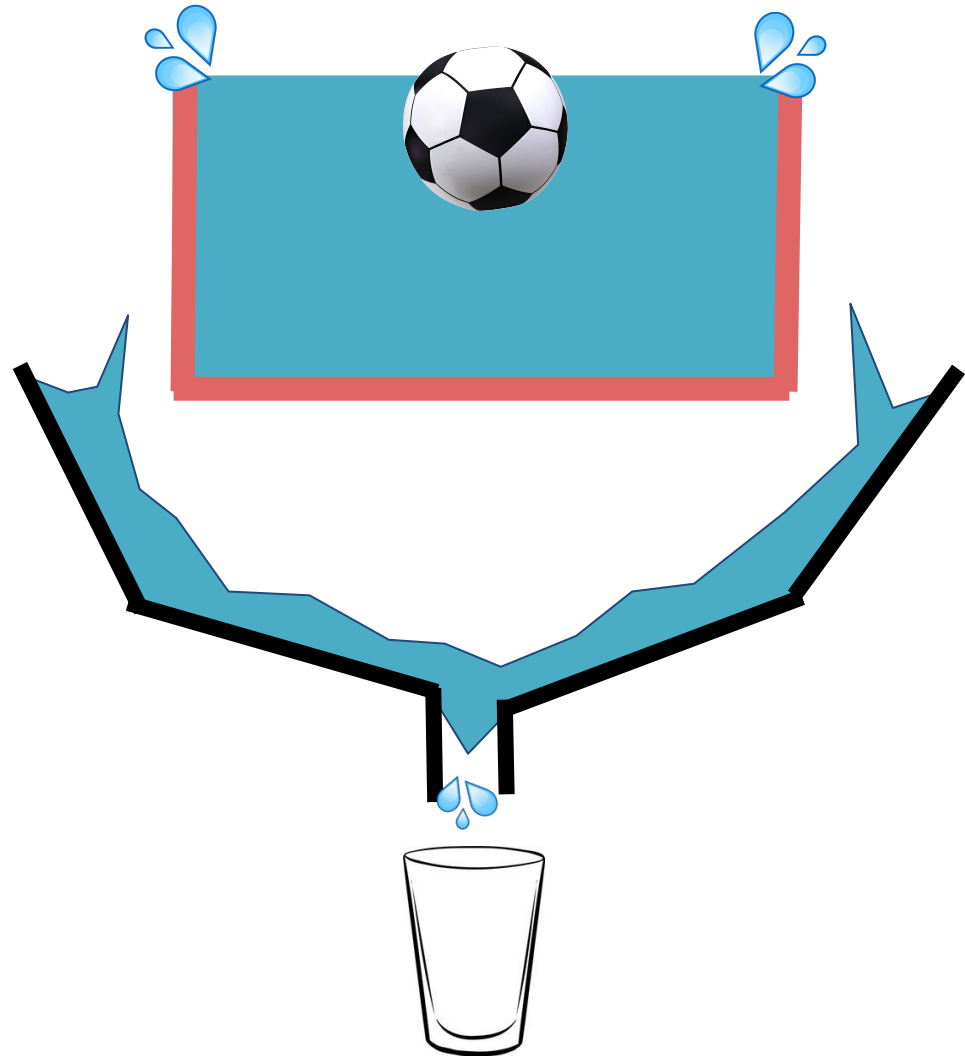
Any object, totally or partially immersed in a fluid or liquid, is buoyed up by a force equal to the weight of the fluid displaced by the object.

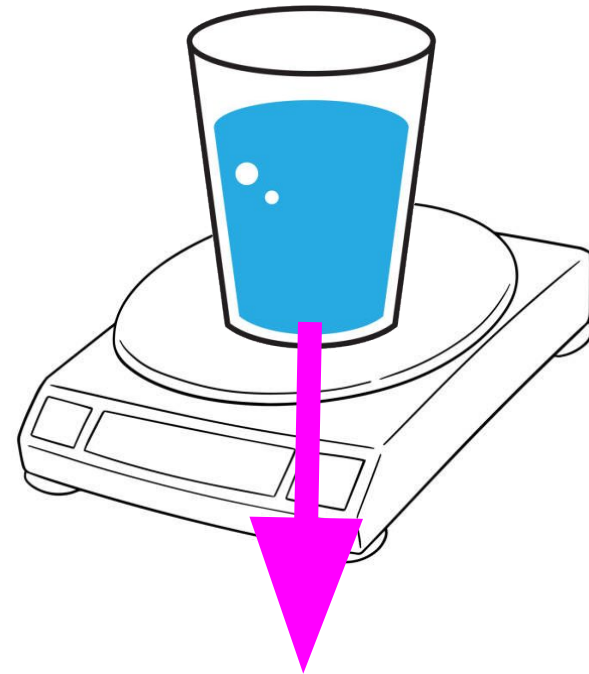
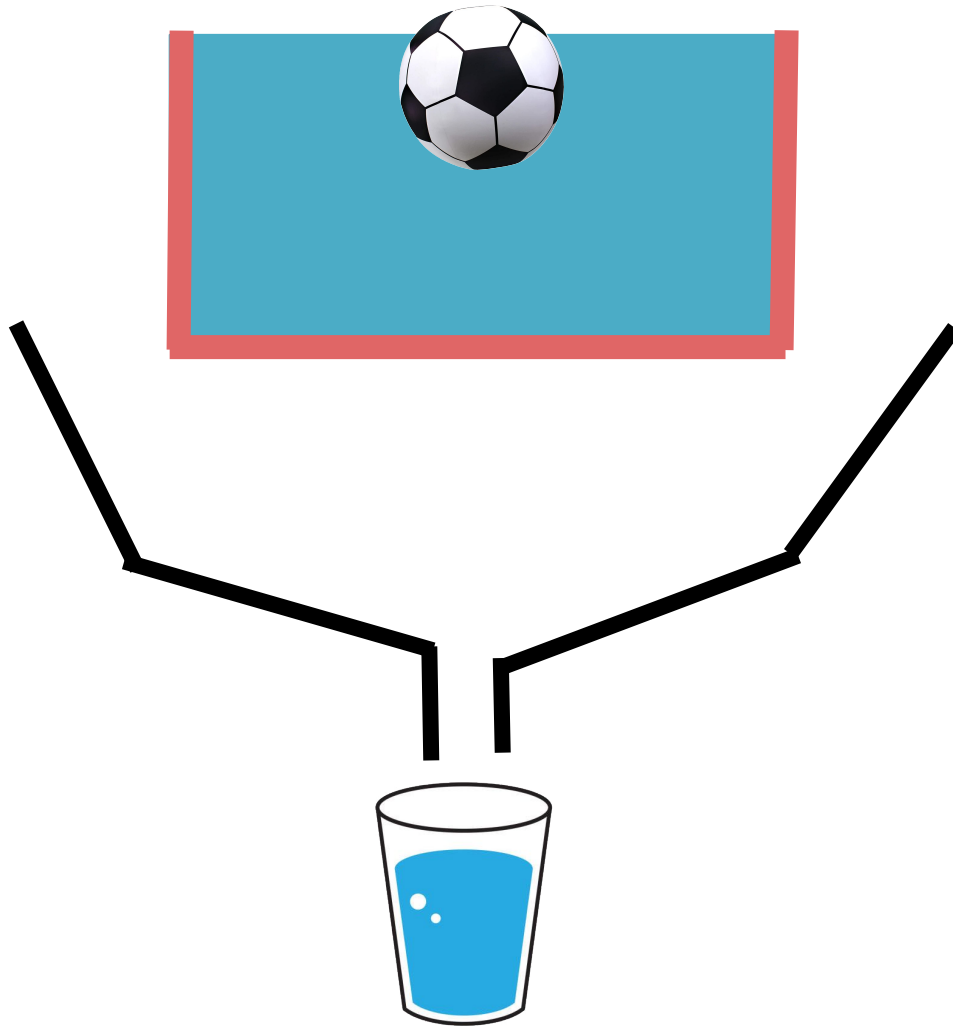


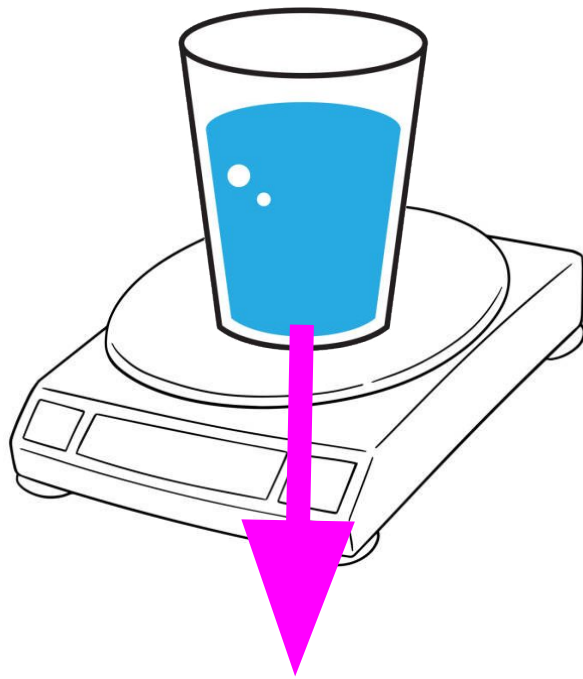
Todo cuerpo sumergido en un líquido experimenta una fuerza hacia arriba equivalente al peso del volumen desalojado



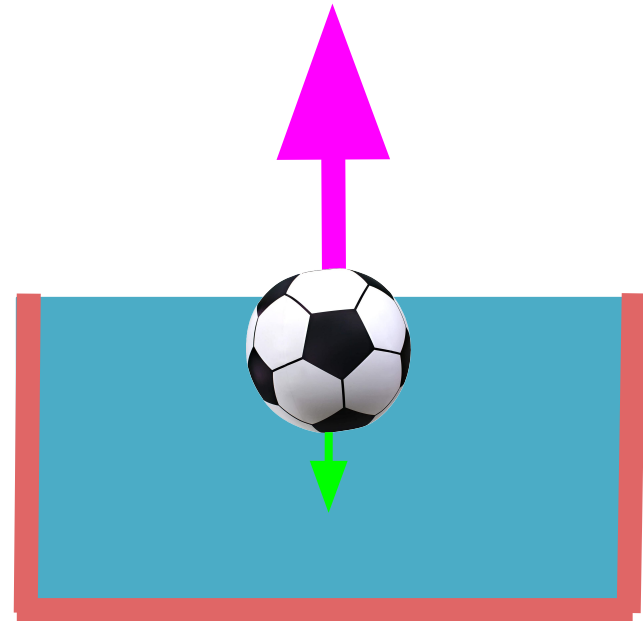
Die Auftriebskraft eines Objekts in einem Medium entspricht exakt der Gewichtskraft des Mediums, das durch das Objekt verdrängt wird.

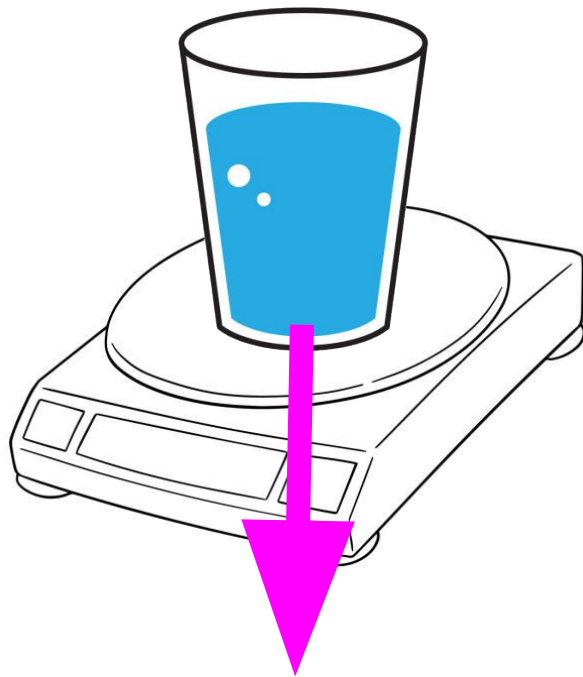




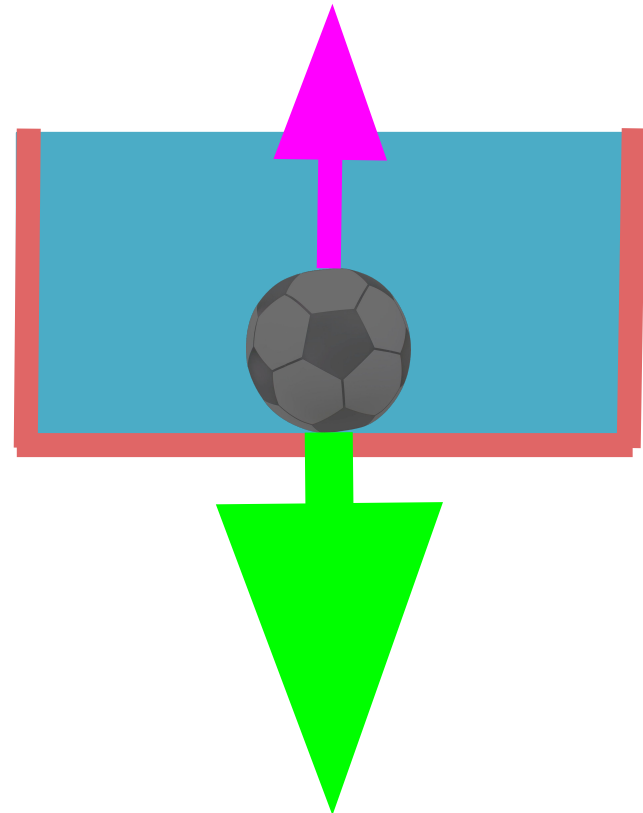


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At constant temperature (and low pressure) the volume V of a gas mass M is inversally proportional to its pressure p , i.e., $pV = \text{const}$

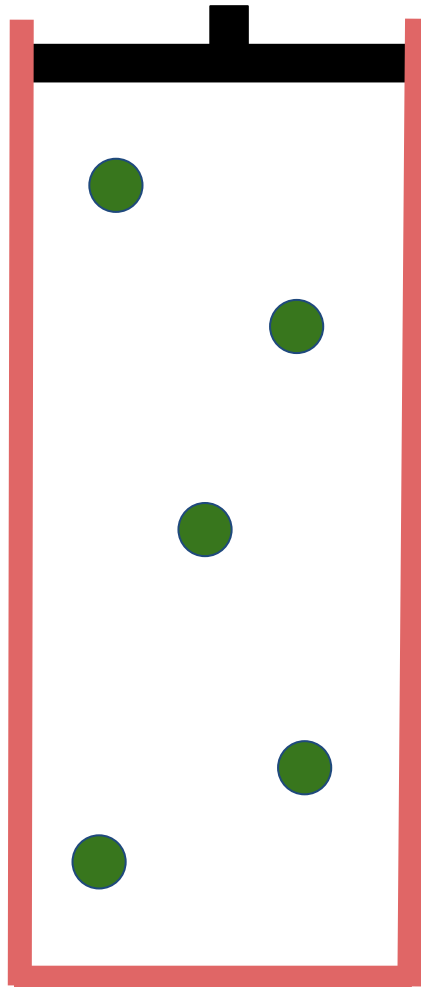


El volumen ocupado por un gas, a temperatura constante, es inversamente proporcional a su presión

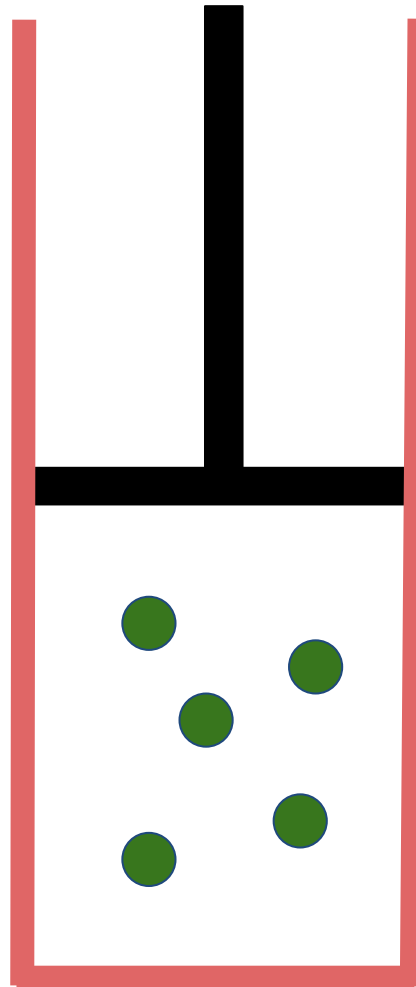


Der Druck idealer Gase bei gleichbleibender Temperatur und gleichbleibender Stoffmenge umgekehrt proportional zum Volumen ist

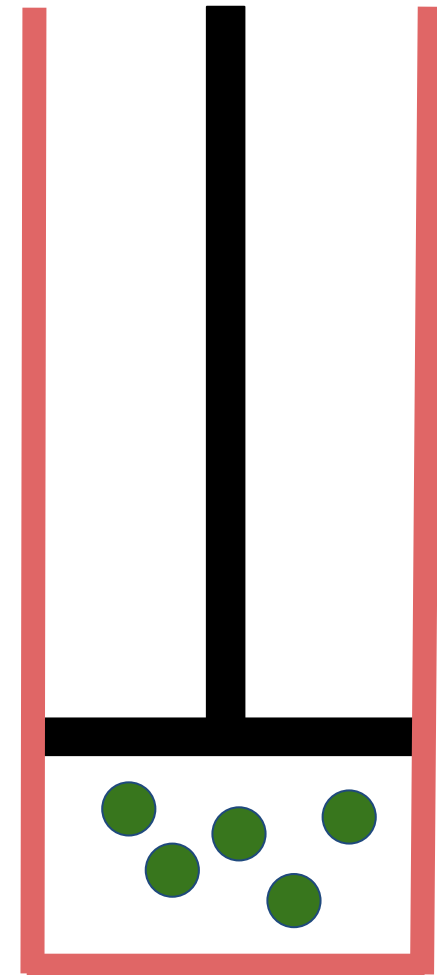




V=60 liters
P=0.5 atm

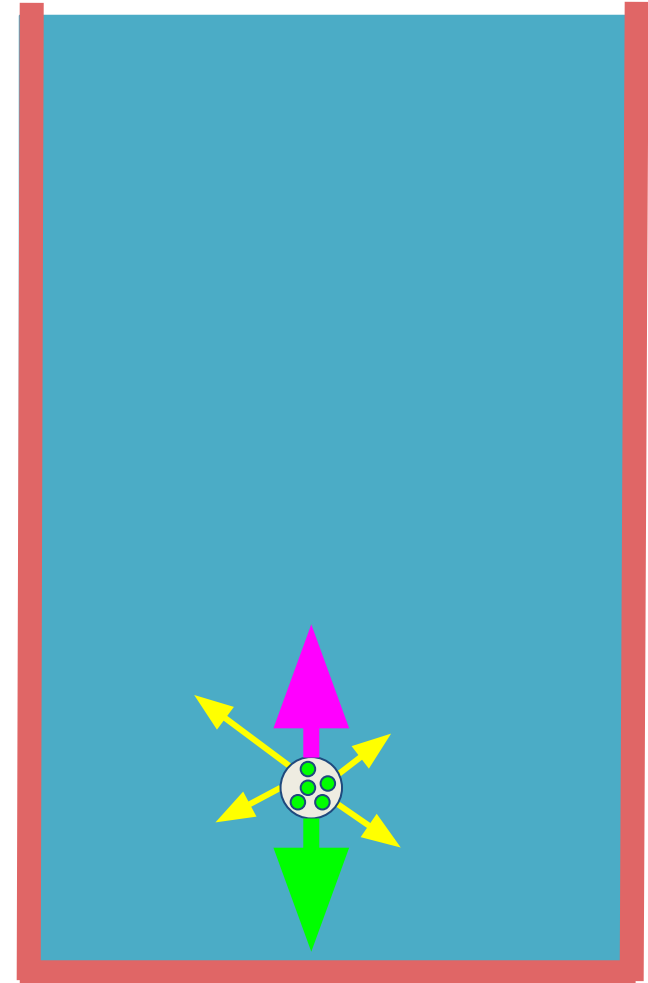
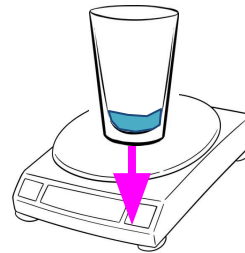
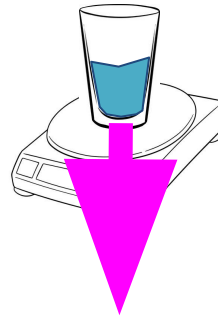
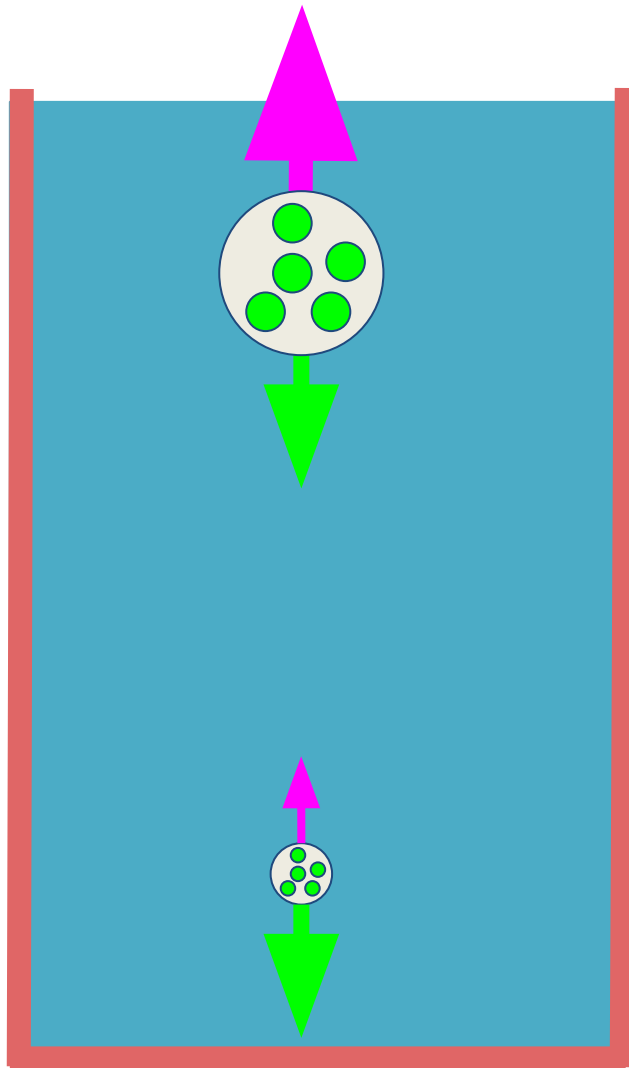


V = 30 liters
P = 1 atm



V = 15 liters
P = 2 atm





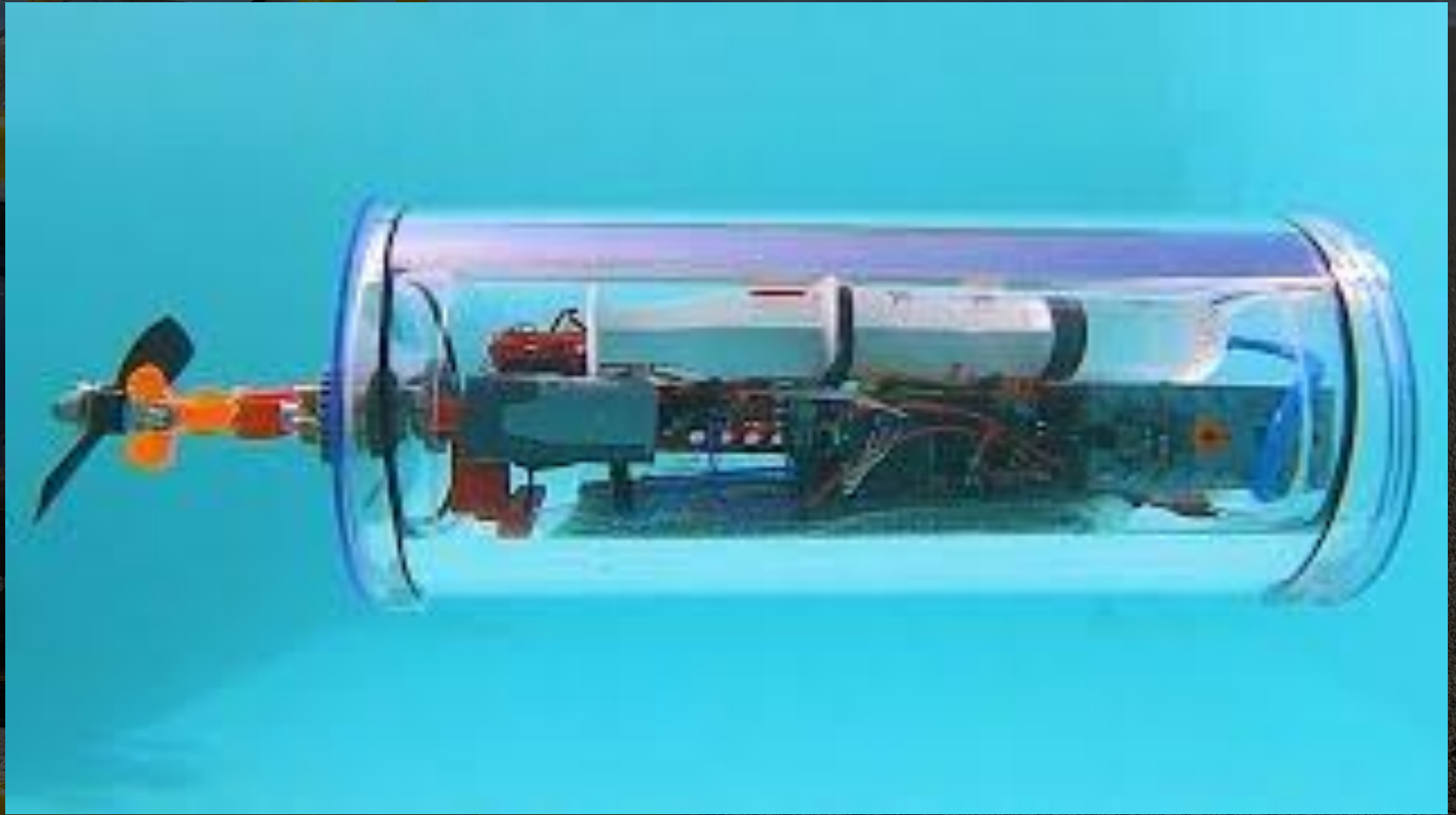
Vamos a romper el mito



(Click on the image to watch the video)



Juanmi Taboada



(Click on the image to watch the video)



Boyles law (Volume and Pressure Changes) at Depth

Depth	Pressure	Relative Volume	Volume
Sea level	1 ATA	1 or 100%	20 l 
10 M	2 ATA	1/2 or 50%	10 l  ✓
20 M	3 ATA	1/3 or 33 %	6.7 l 
30 M	4 ATA	1/4 or 25 %	5 l  ✓
40 M	5 ATA	1/5 or 20%	4 l 
90 M	10 ATA	1/10 or 10%	2 l 



NB: Change in volume with pressure is the greatest nearer the surface



A man in a black wetsuit and diving mask is underwater. He is holding a black rebreather with 'rebel mares' written on it. A thought bubble above him contains the text '¡Estamos listos!'. The background is a clear blue ocean. On the left, a yellow and black structure is partially visible. On the right, a sandy beach is visible.

¡Estamos listos!



Juanmi Taboada

¿Qué lo hace novedoso?

Totalmente digital
Comunicación inalámbrica
(control inalámbrico y video inalámbrico)

Satellite
GPS / GPRS

GPS
GPRS
Alioli Buoy

Base
Station 1
Boat
GPRS

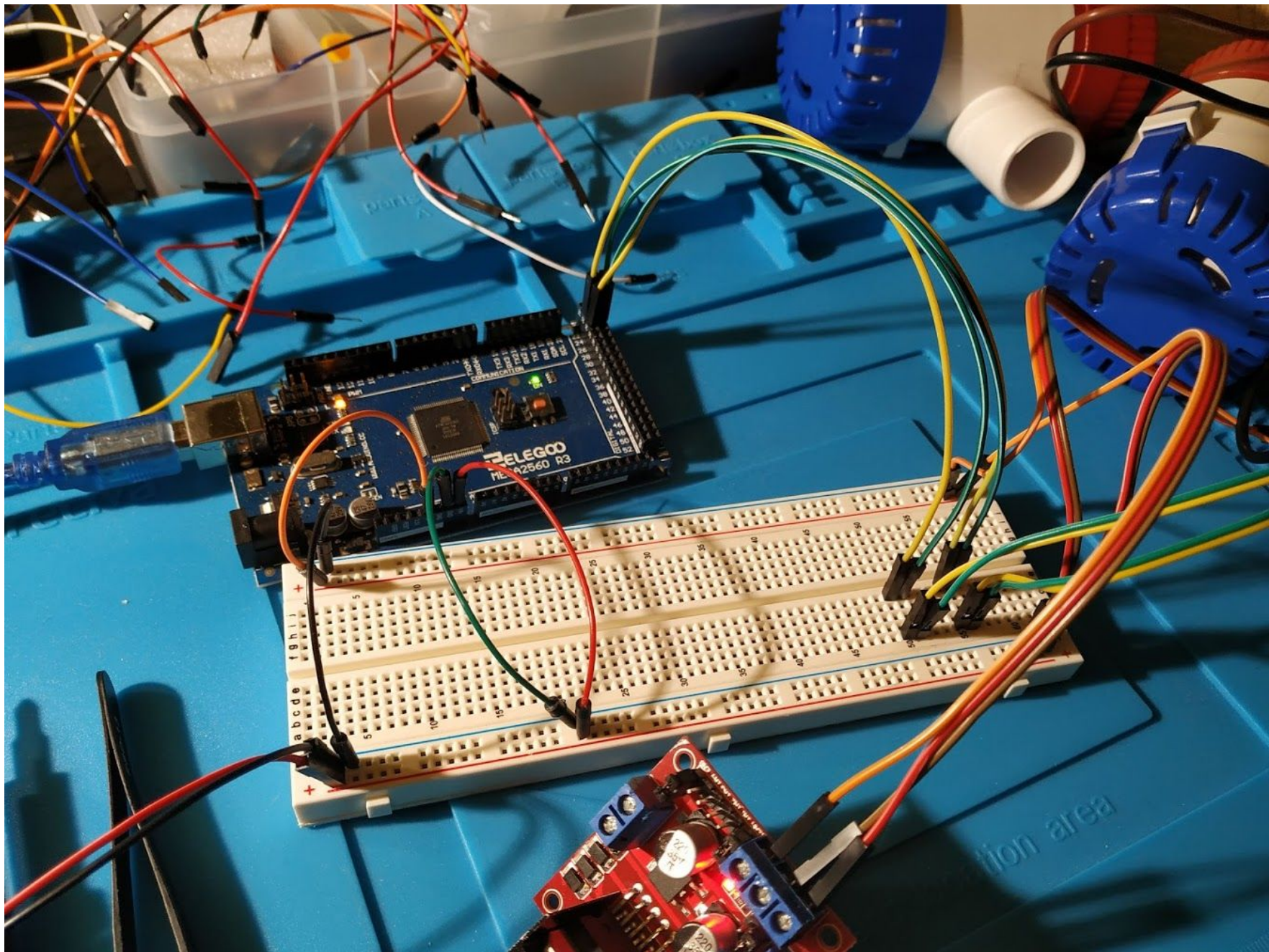
GPRS
Base
Station 2

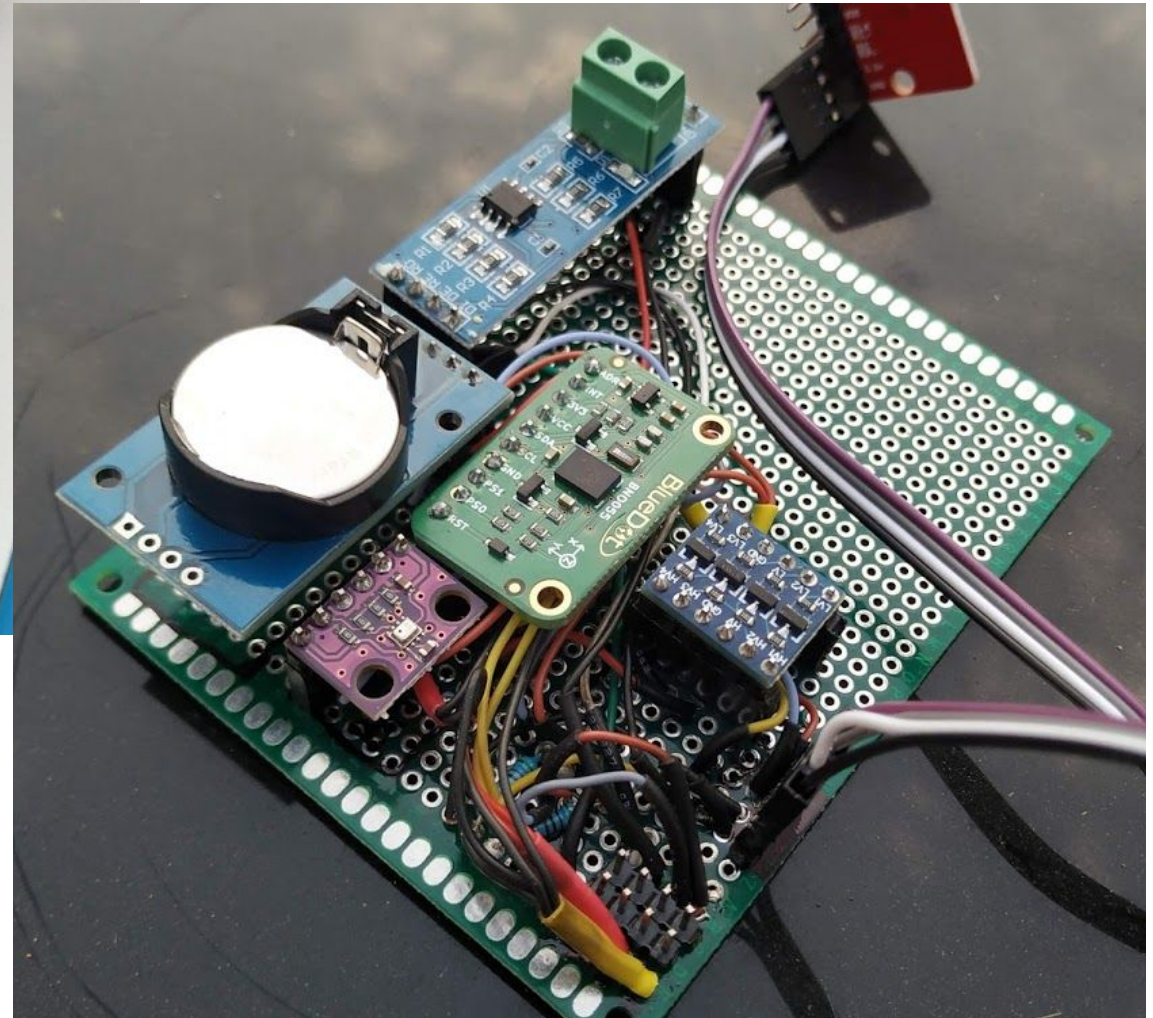
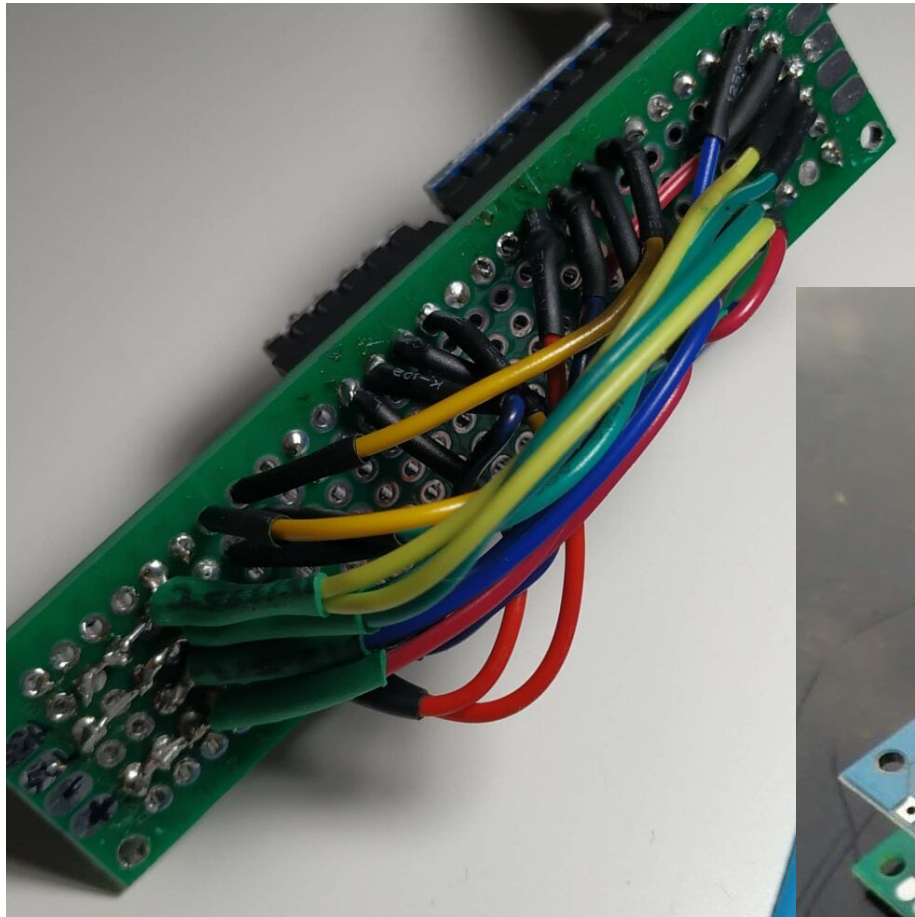
Alioli ROV



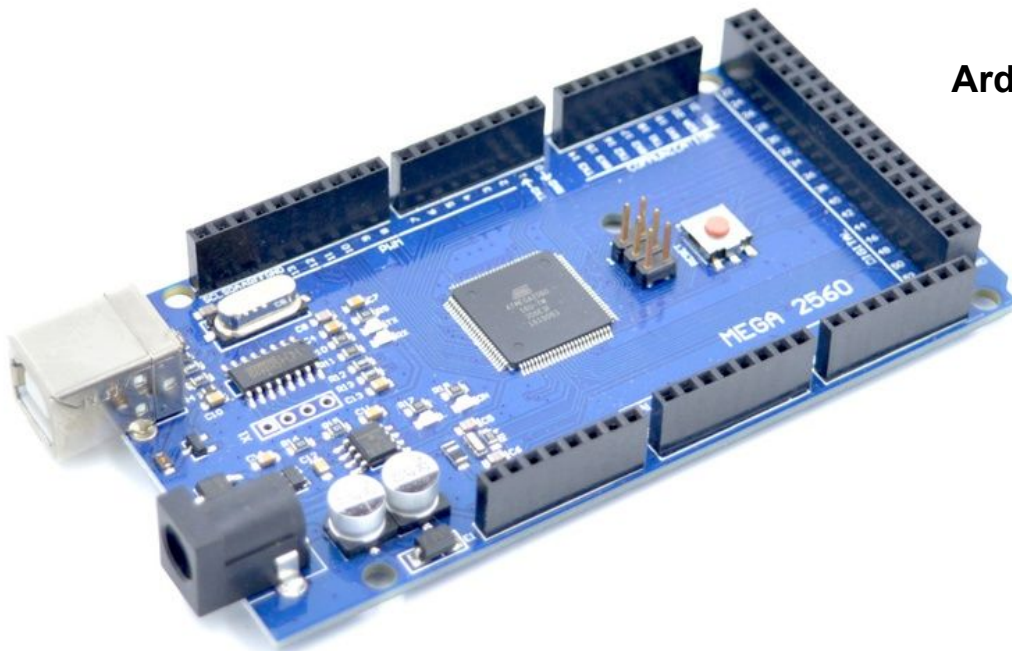
Juanmi Taboada



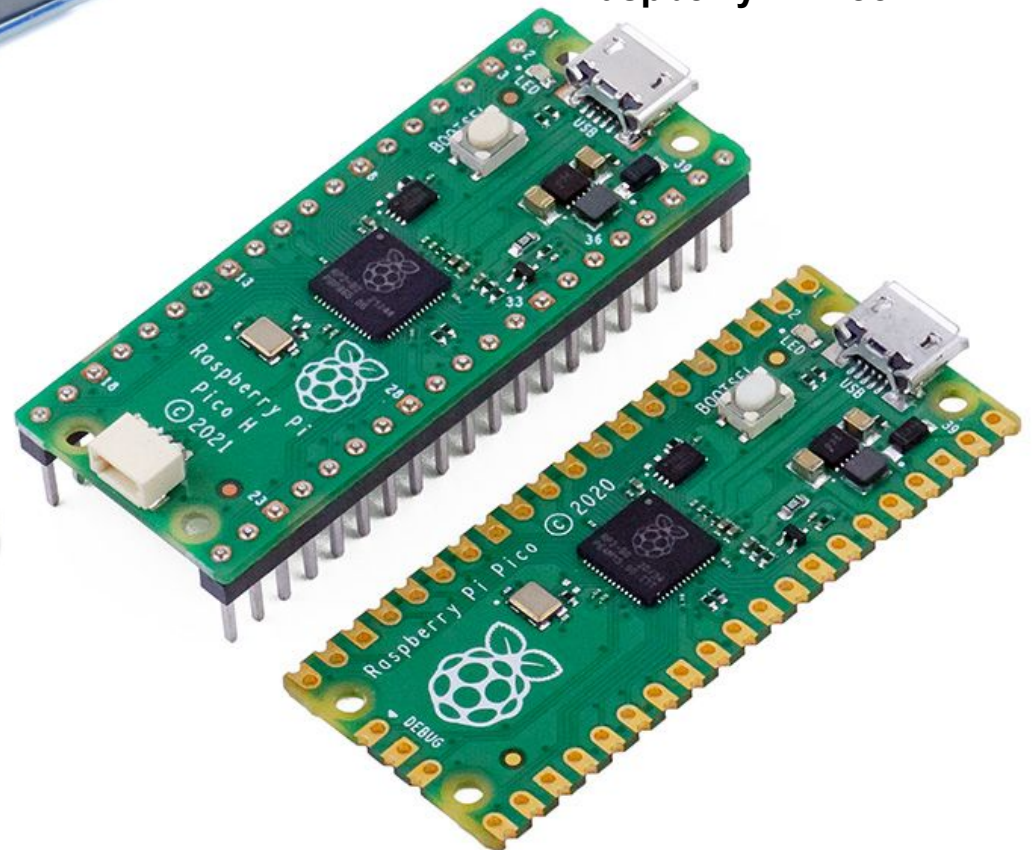




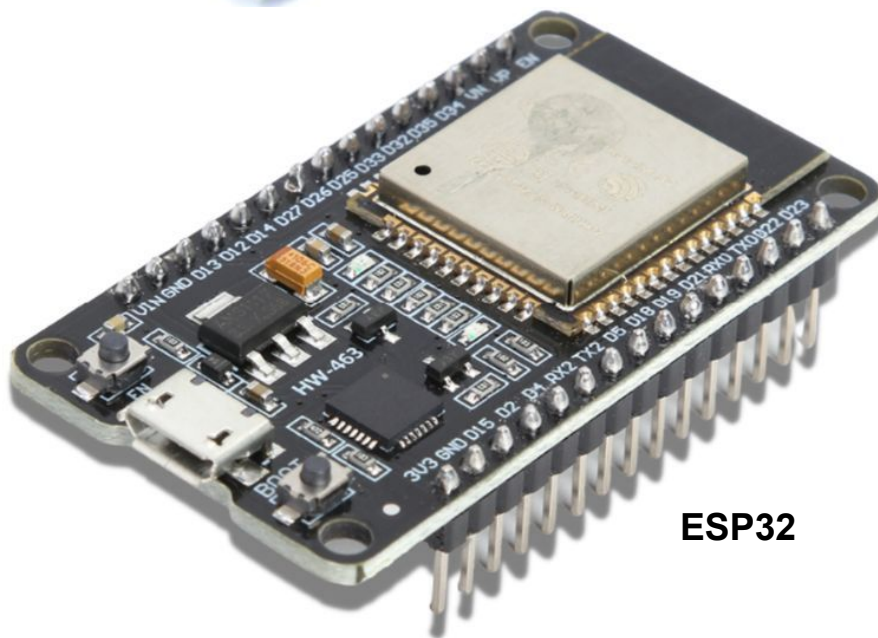
Arduino Mega 2560



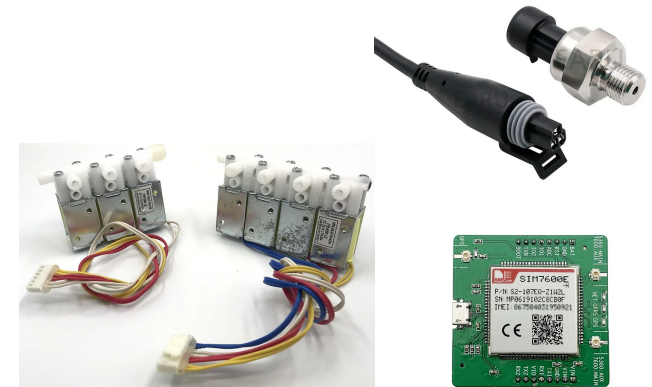
Raspberry Pi Pico



ESP32



- Hardware y Software Libre
- Bajo coste
- **Bajo consumo**
- Comunicación fluida para un funcionamiento adecuado
- Telemetría en tiempo real y posicionamiento
- Visualización en tiempo real sin consumo de ancho de banda
- Refrigerado por agua



06-12-2022 15:05:37
(1670335537)

2.140.120.239 : 3814
(2.140.120.239)

Buoy v1.1
(20220329100623CEST)

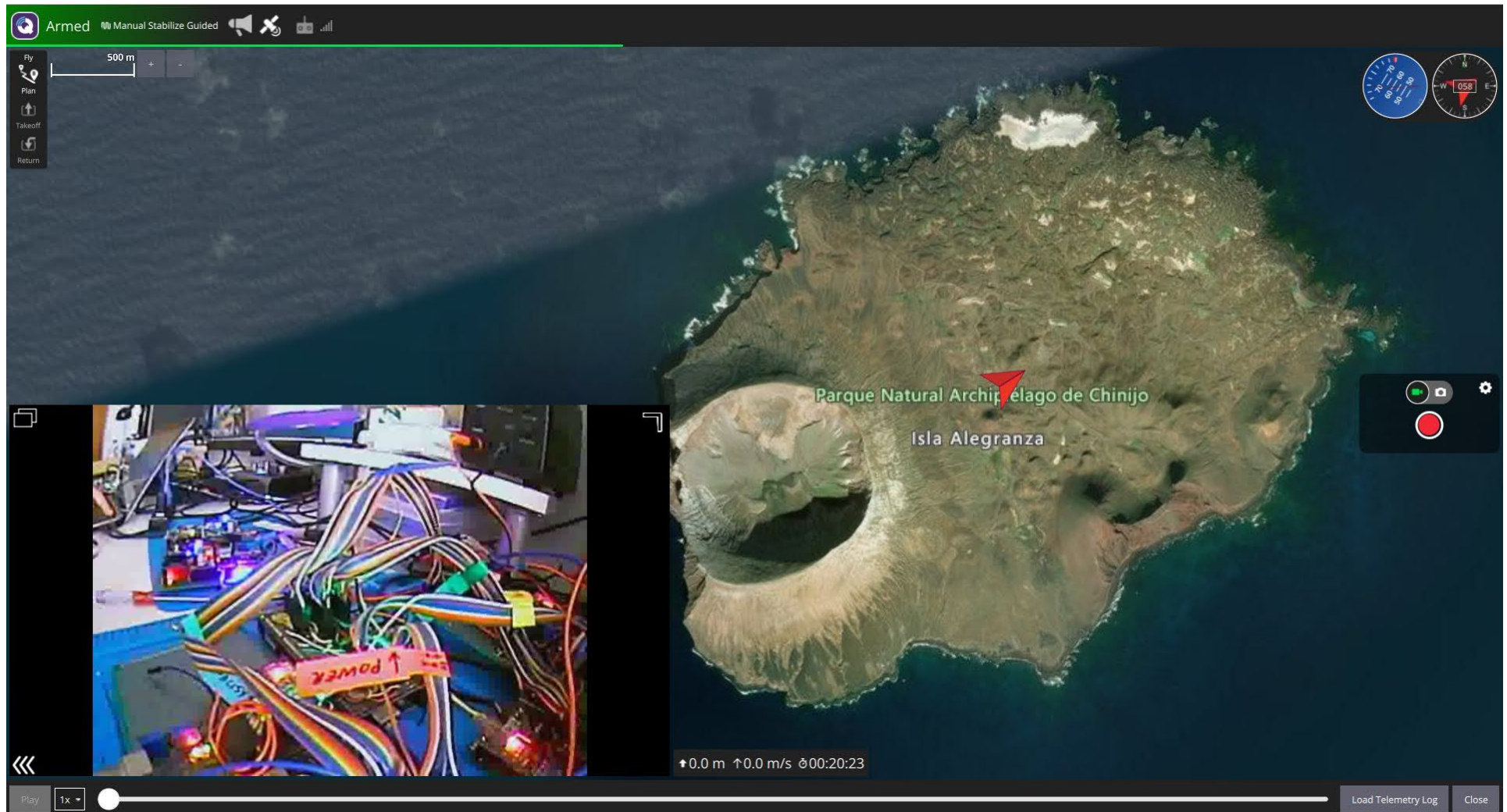
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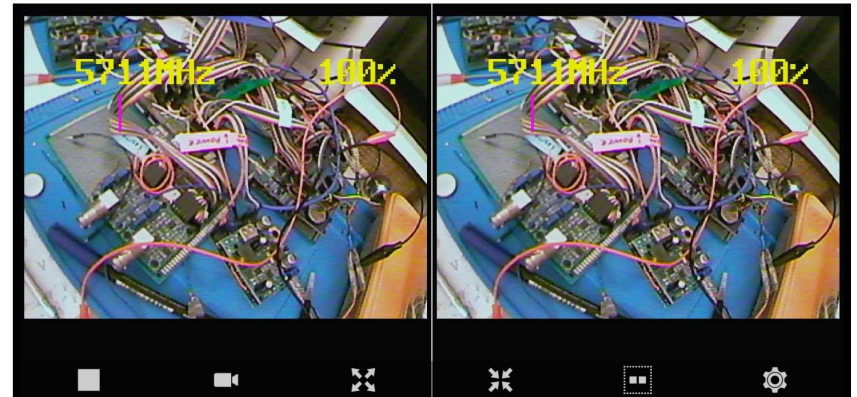
Online for:
49 minutes

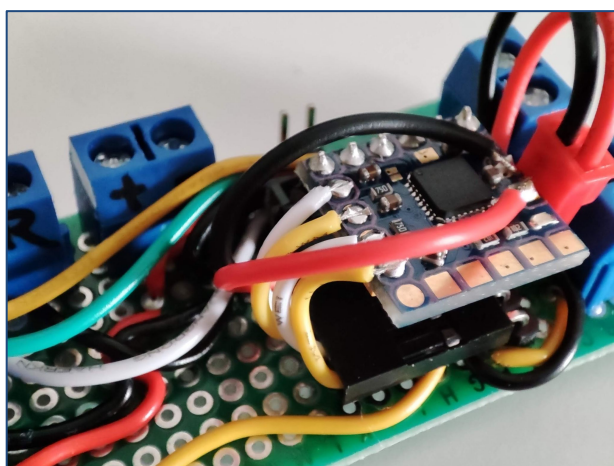
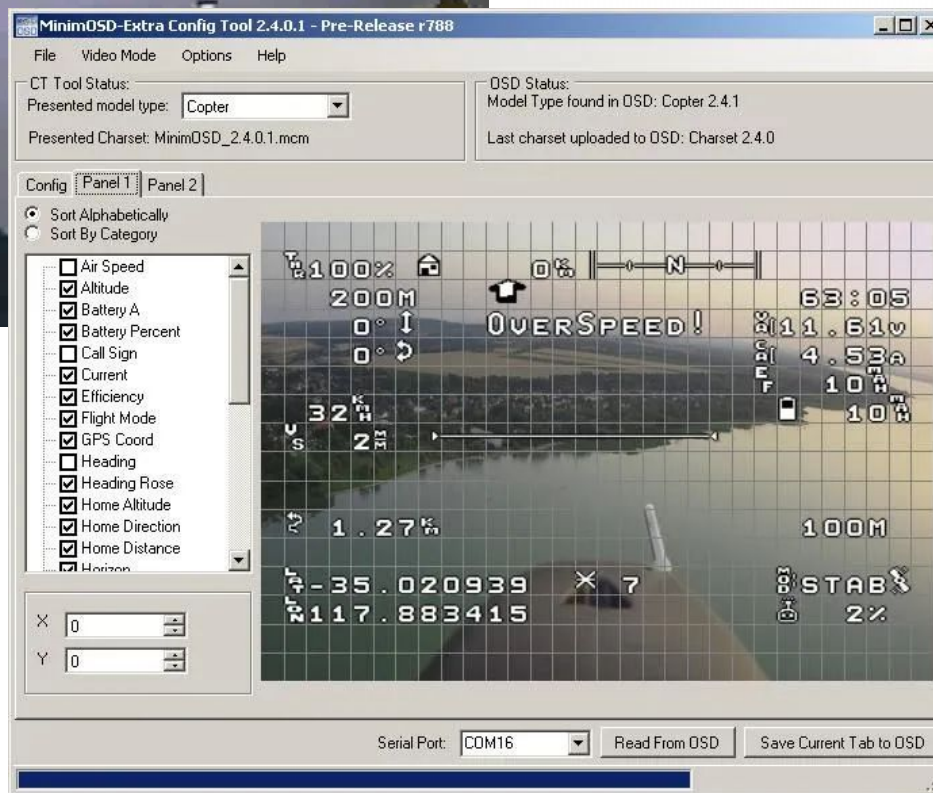
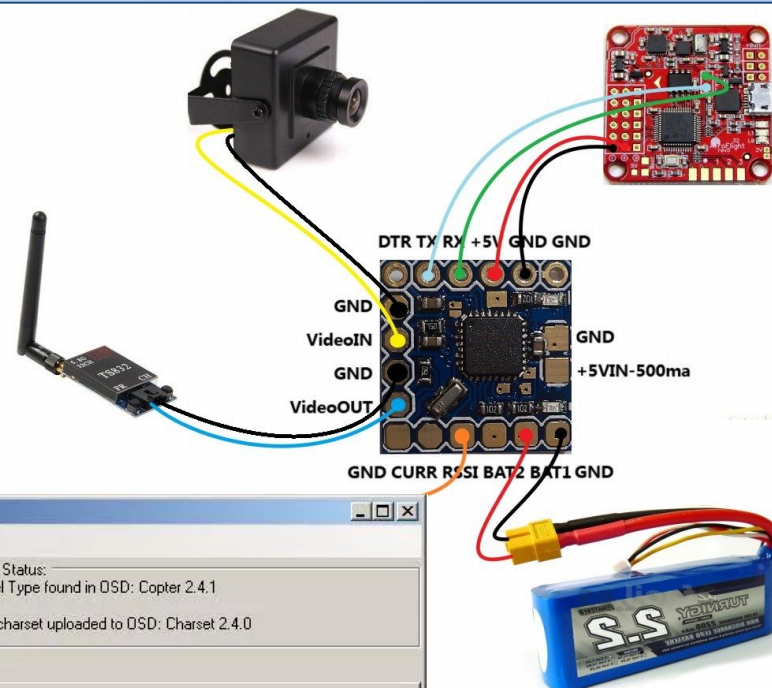
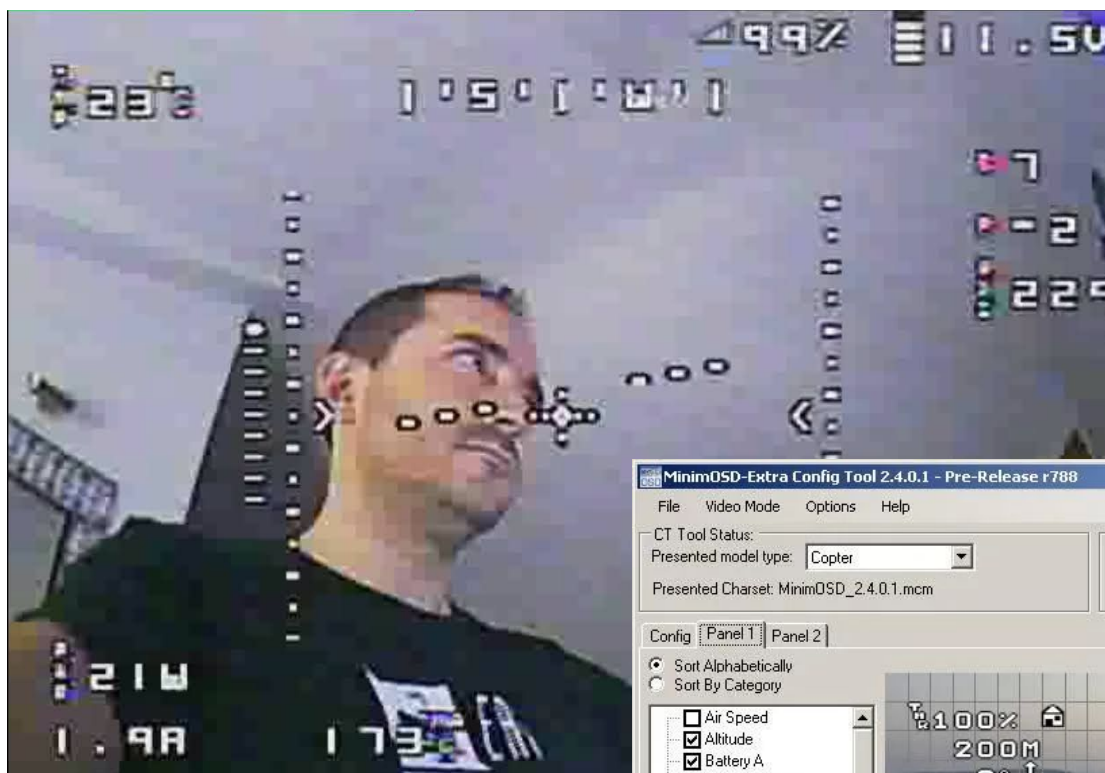
Buoy Millis:	3013929	2963649	2913518	2863399	2813217	2763058	2712886
Buoy Latitude:							
Buoy Longitude:							
Buoy Main Amperage:	1083.3	988.9	1180.3	954.2	1101	1184.6	1014.8
Buoy Main Voltage:	11.6	11.7	11.8	11.7	11.7	11.8	11.7
Buoy Temp Main Battery:	25.2	25.3	25.2	25.3	25.3	25.2	25.1
Buoy Temp Sea Water:	15.6	15.6	15.8	15.8	15.8	15.5	15.6
Rov Altitude:	21.5	20.8	19.2	16.4	14.1	10.9	12.3
Rov Engines Amperage:	0	0	0	0	0	0	0
Rov Engines Voltage:	8.6	8.6	8.6	8.6	8.6	8.6	8.6
Rov Main Amperage:	183	192.3	188.5	189.3	182.8	190.3	183.9
Rov Main Voltage:	11.8	11.8	11.8	11.8	11.8	11.8	11.8
Rov Pressure:	-2.6	-2.5	-2.3	-2	-1.7	-1.3	-1.5
Rov Ready:	1	1	1	1	1	1	1
Rov Temp BMP:	23.8	23.9	24.1	24.2	24.3	24.4	24.5
Rov Temp Engines Battery:	19.1	19.2	19.5	19.9	20.2	20.9	21.1
Rov Temp Gyro:	28	28	28	28	28	28	28
Rov Temp Main Battery:	23.9	23.9	23.9	23.9	23.9	24	24
Rov Temp Sea Water:	15.6	15.7	15.7	15.6	15.8	15.8	17.1



QGround Control y el protocolo Mavlink



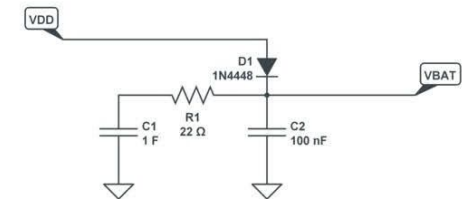
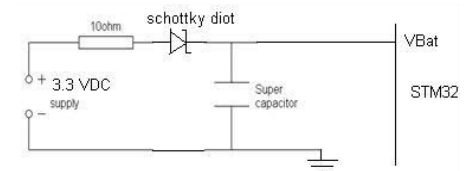
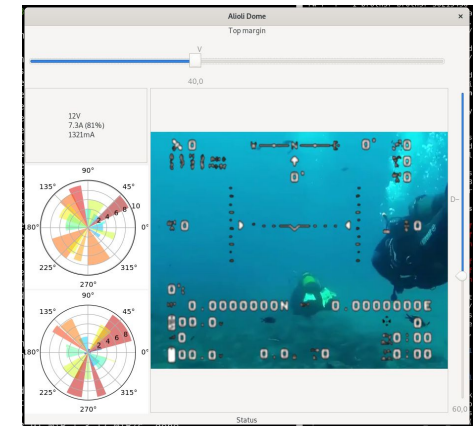
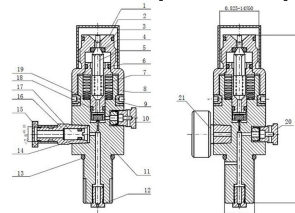






¿Qué es lo que no funcionó en el primer sitio?

- Mi propio software de visualización (GTK)
- Flotabilidad automática
- Alimentación de módulo GSM/GPRS/GPS
- Distribución de la masa y el volumen (Archimedes)
- Aislamiento
- Sistema de gestión del umbilical
- Tamaño del ROV
- Aerodinámica (vértices)
- Tamaño de las hélices, fuerza de los motores y empuje

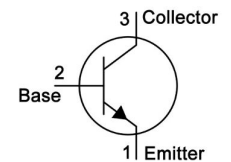


2N2222 Transistor Pinout

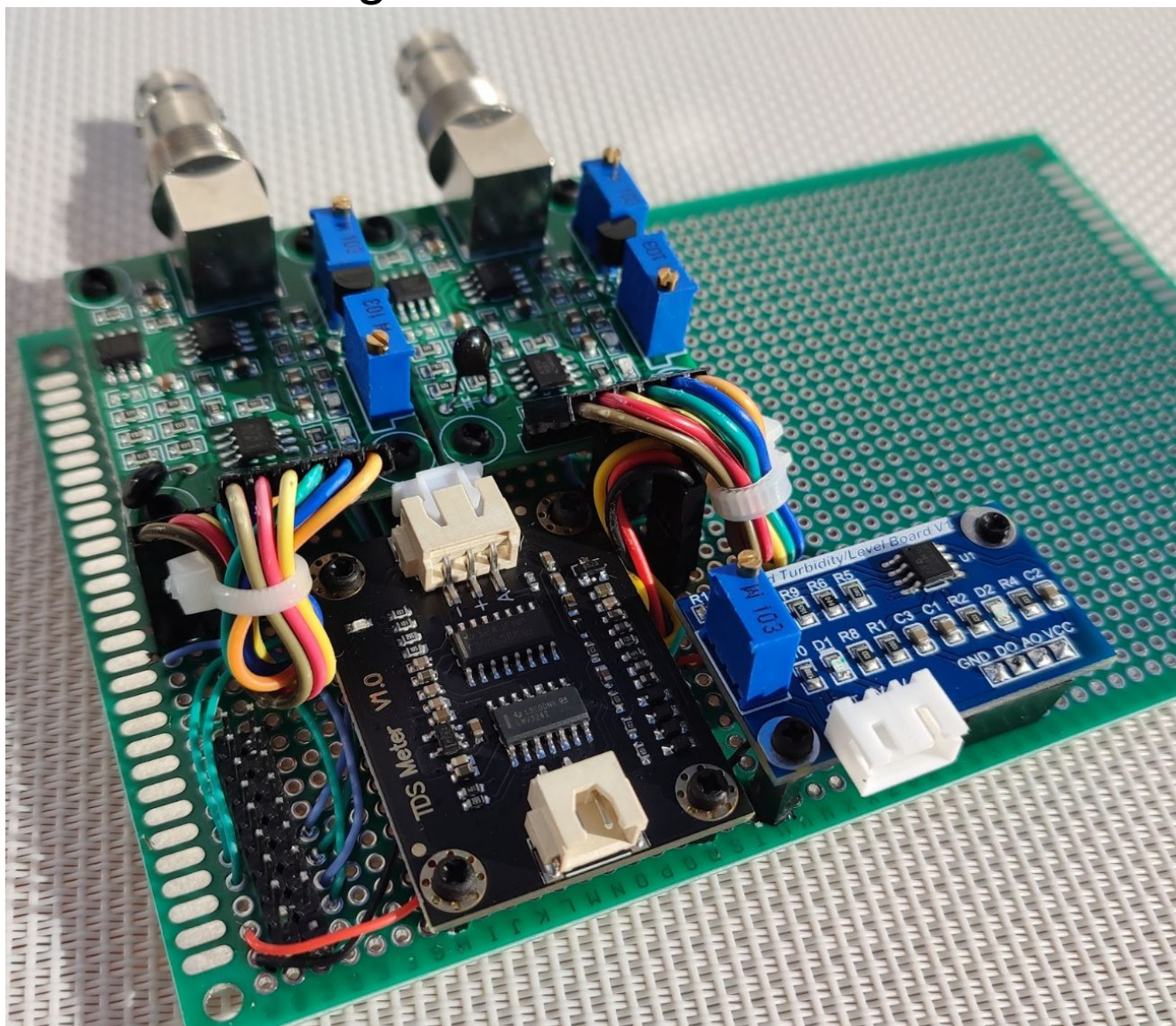
TO-92 Package



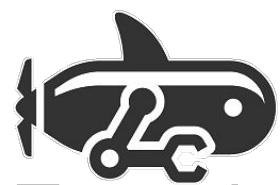
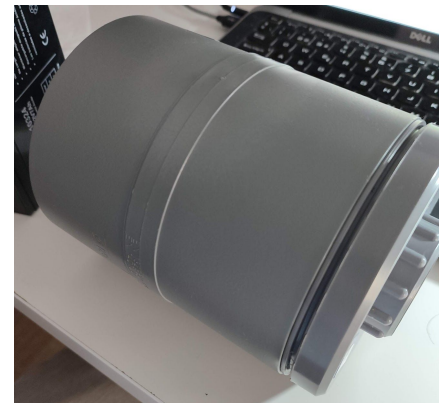
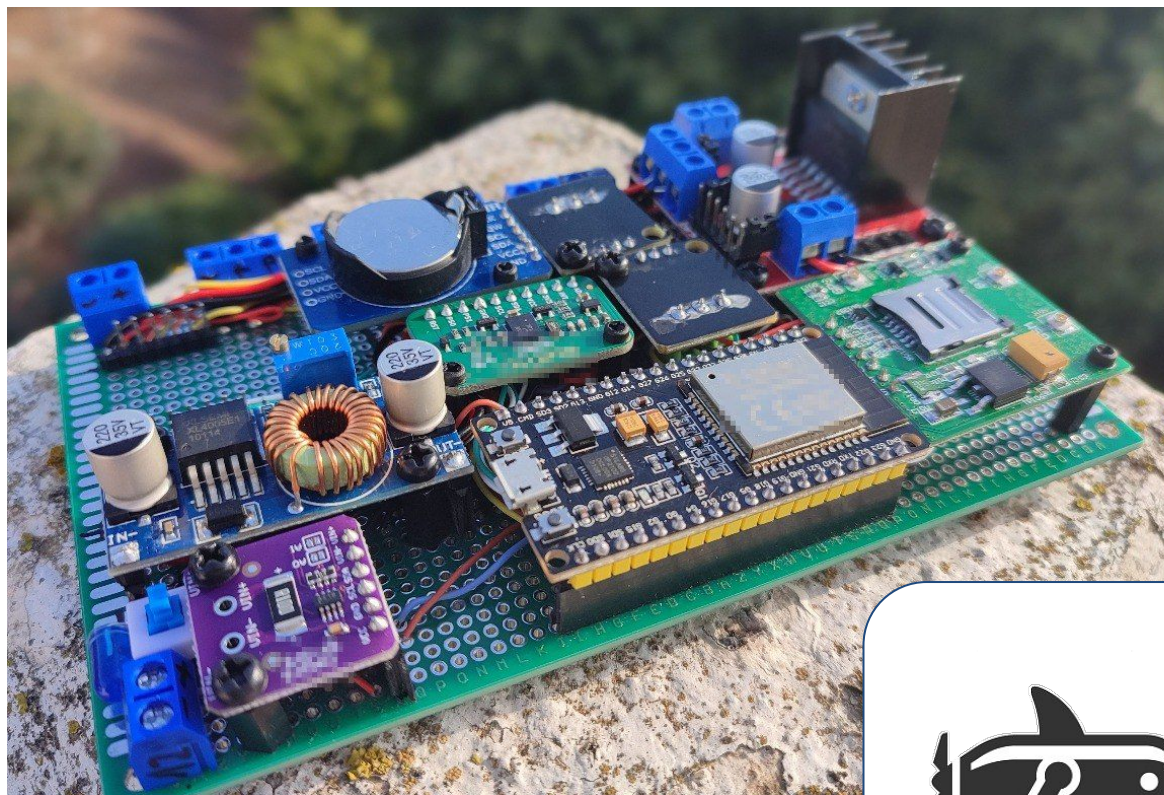
NPN



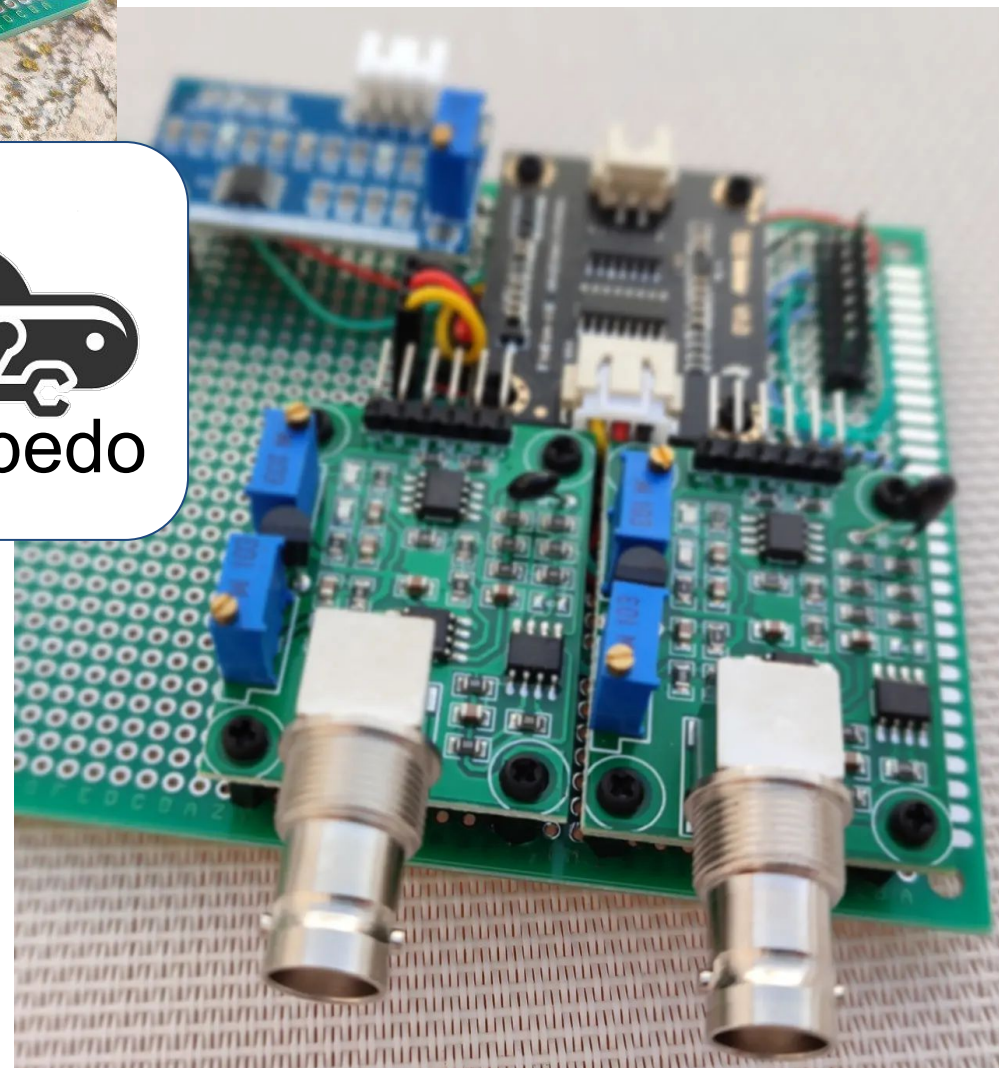
- Command and conquer (juego español, divide y vencerás) ✨
- Placa de analítica de aguas



- Torpedo (Micropython) - Fast and Furious! 🚤



Torpedo



- Fotografía submarina
- Búsqueda de cuerpos
- Estudio y actuación sobre especies invasoras
- Arqueología
- Acompañamiento en submarinismo
- Minusvalías y enfermedades bajo el agua
- Simulación de juegos (carreras, batallas y competiciones)
- Batimetría barata



- Aprendiendo (electrónica y micronctroladores)
- Sí puedo
- No abandonar
- Usando hardware y software libre y compartirlo con el resto del mundo para que en el futuro tengamos un Google Maps del fondo marino.

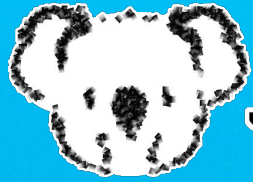


Este es Alioli ROV



(Pulsa en la imagen para ver el video)

Alioli ROV Submarine Drone



Juanmi Taboada



Gracias - Thank you

Robótica Educativa

Málaga, 7 septiembre 2023