

Autonomous Environmental Buoy/Regatta Beacon

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Introduction

Team 3

- Bennet Möller, International Purchases and Sales Engineering
- Emil Konrad Wlazlo, Mechatronics
- Mateusz Tarkowski, Mechanical Engineering and Applied Computer Science
- Toon Van den Bleeken, Building and Civil Engineering

Introduction

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THE PROJECT

Develop an electronic buoy with different functions

- Design a suitable steel structure that surrounds, but does not impair the hull
- Create an electronic environment that serves all necessary functions and features
- Ensure that all components are safely stored and protected against saltwater and UV radiation

State of the Art - Anchors



Danforth anchor [1]



Claw anchor [2]

State of Art - Sensors

Davis
Anemometer [3]



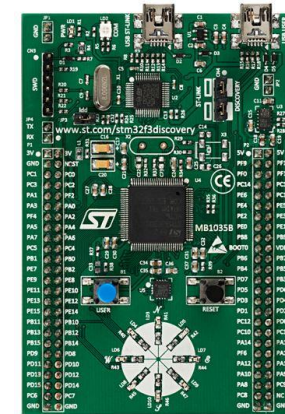
CTD



NovAtel
Superstar II -
GNSS
receiver [4]



STM32F3
Discovery [5]

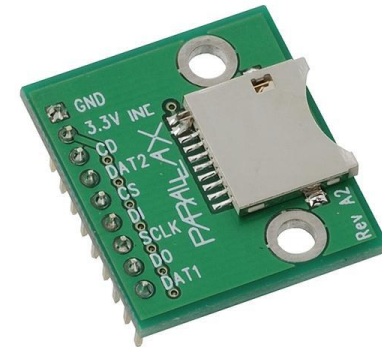


State of Art - Data Storage & Communication

MicroSD [6]



MicroSD socket



Wi-Fi



State of Art - Battery

Option 1: 12V Lithium-polymer [7]

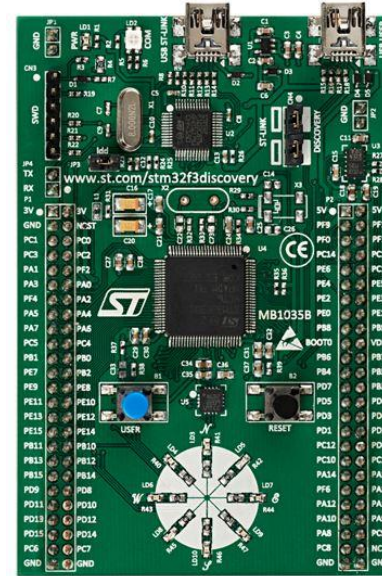


Option 2: 6V NiMH [8]



State of Art – Control unit & lamp

STM32F3 Discovery [5]

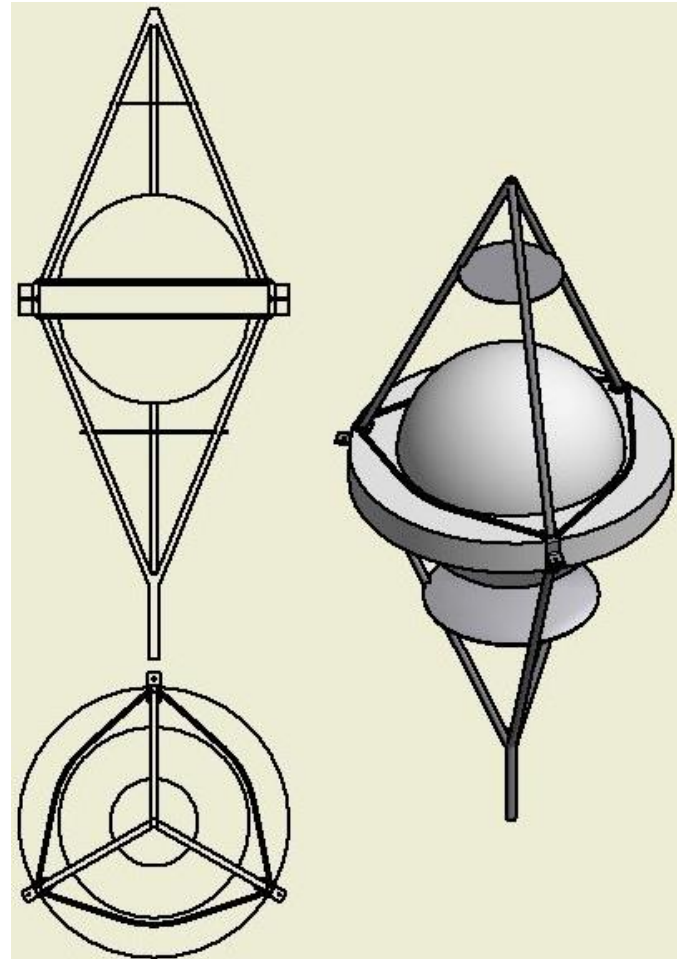


LED lamp [9]



Project Development - Structure

Steel structure
and fibreglass hull



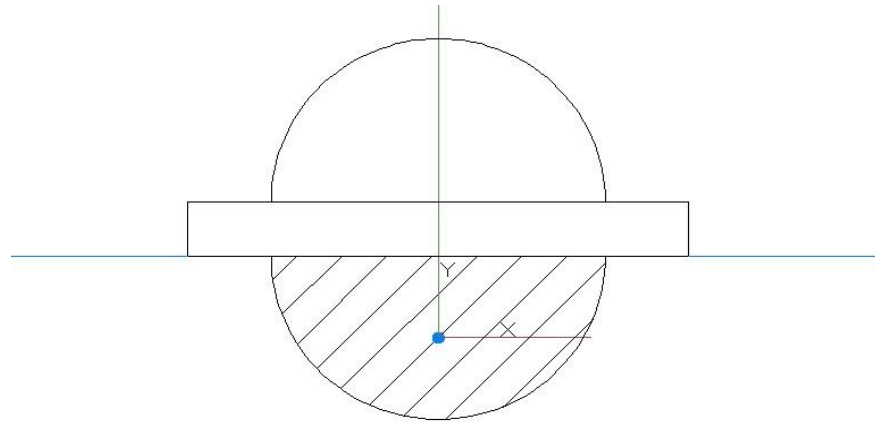
Project Development - Structure

Mooring system



Project Development - Structure

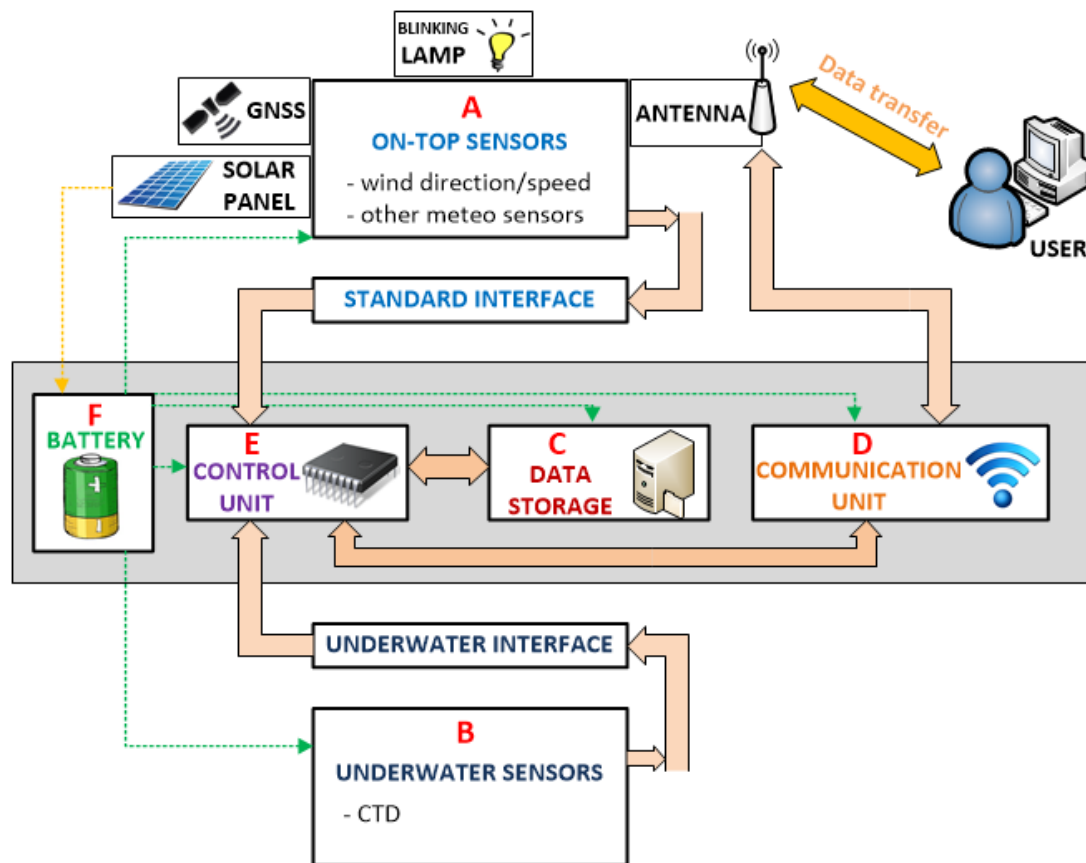
Buoyancy



$$\begin{aligned}\text{Force of buoyancy} &= \rho_{\text{water}} \times V_{\text{submerged}} \times g \\ &= 1000 \text{ kg/m}^3 \times 0,0565 \text{ m}^3 \times 9.81 \text{ m/s}^2 \\ &= 554,27 \text{ kg} \cdot \text{m/s}^2 = 554,27 \text{ N}\end{aligned}$$

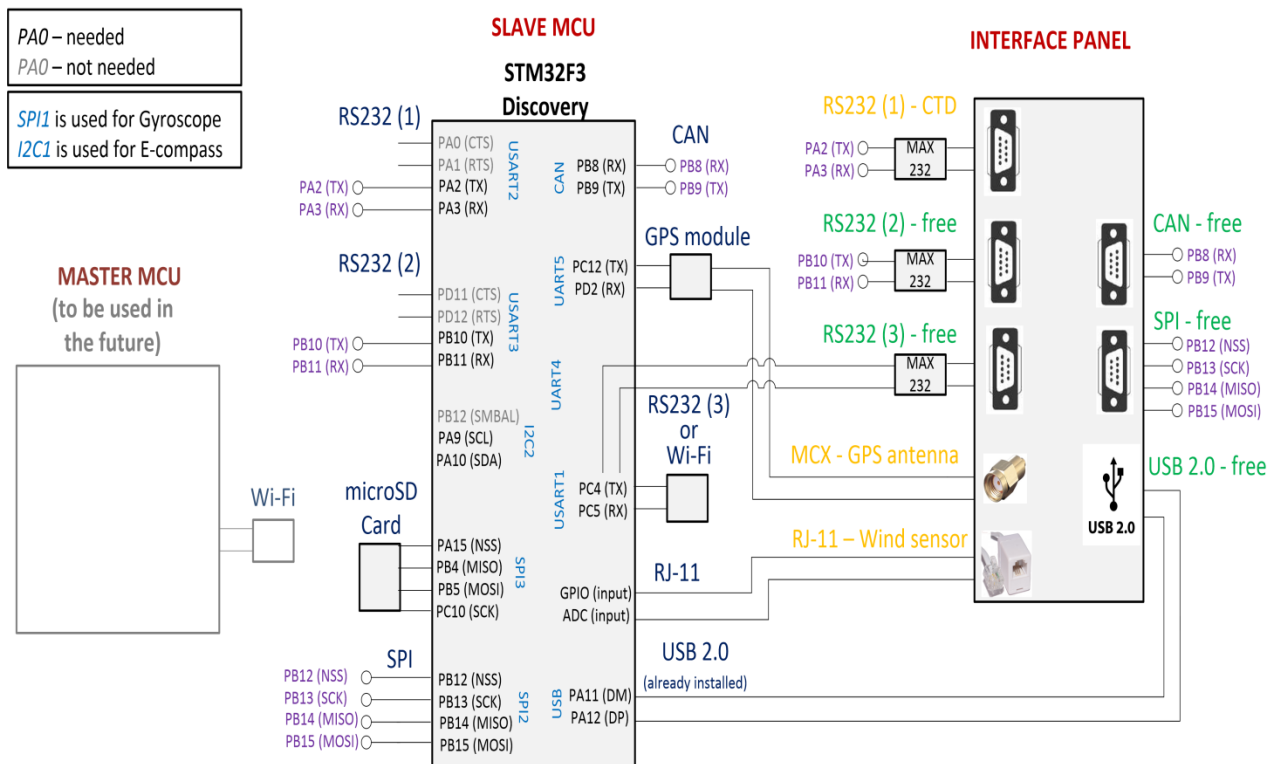
Project Development - Electronics

Architecture



Project Development - Electronics

Connection of signals and use of interfaces



External interfaces: 3x RS232, CAN, SPI, USB, RJ-11, MCX

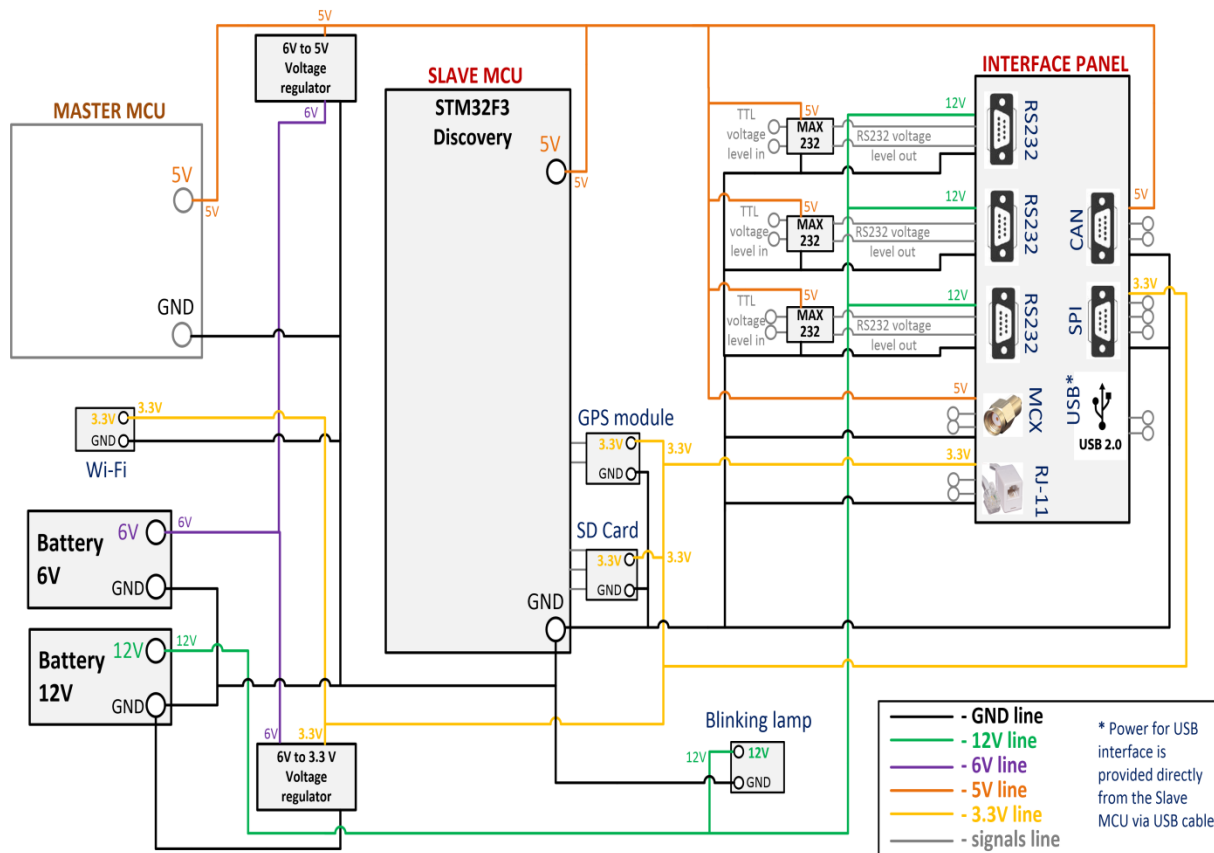
Project Development - Electronics

- Power supply
- Batteries: 6V NiMH 4,8 Ah
- 2 voltage regulators
- Total current load of the system: 680mA

Device	Voltage needed	Voltage regulator used
CTD	12 V	None
Blinking lamp		
STM32F3 Discovery	5 V	6V to 5V linear regulator
2nd MCU (optional)		
MAX232 converters		
GNSS antenna (MCX connector)		
Wi-Fi module	3.3 V	6V to 3.3V linear regulator
microSD card socket		
GNSS receiver		
Wind sensor (RJ-11 connector)		

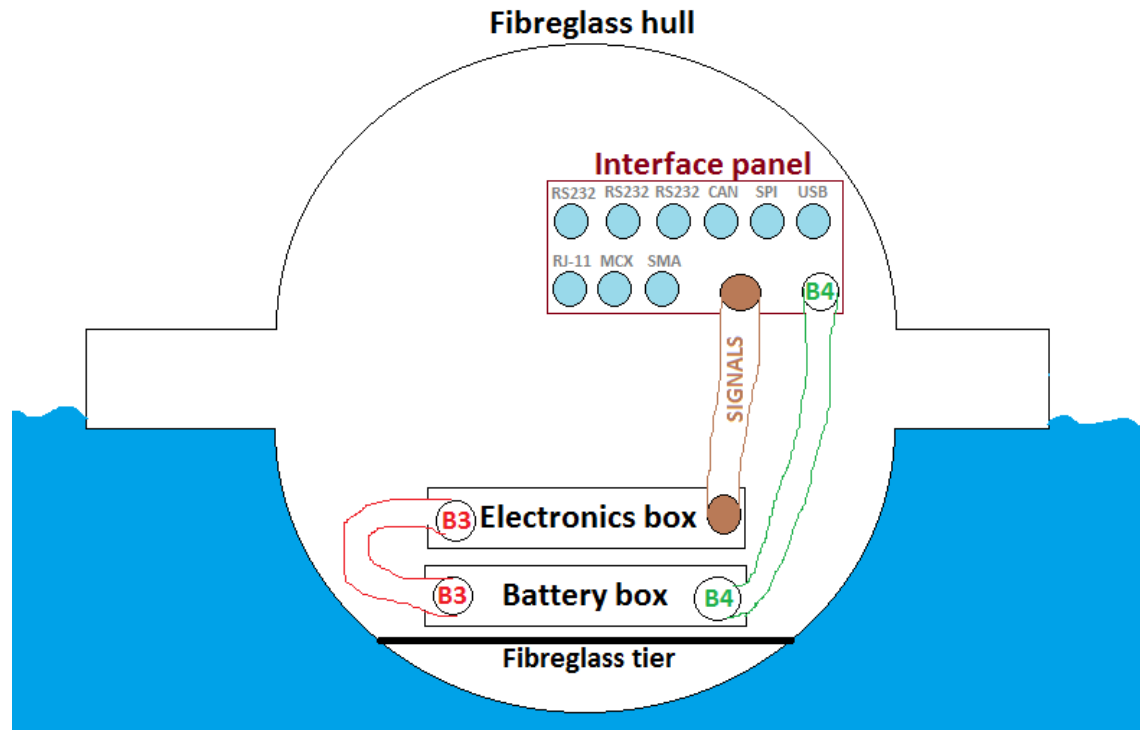
Project Development - Electronics

Schematic of the power supply

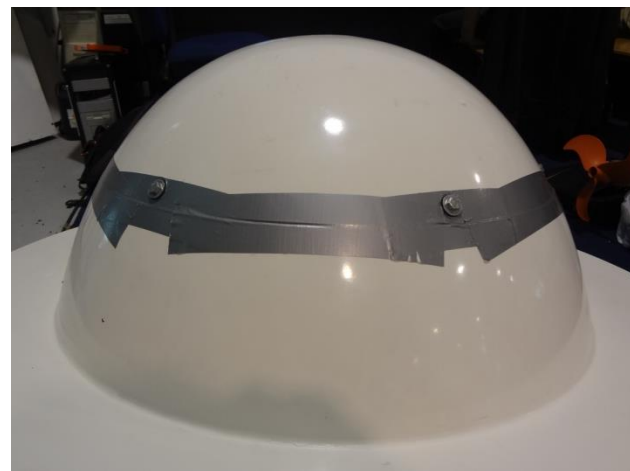


Project Development - Electronics

Layout of electronics and interfaces



Project Development – Water resistance



Tests

Buoyancy



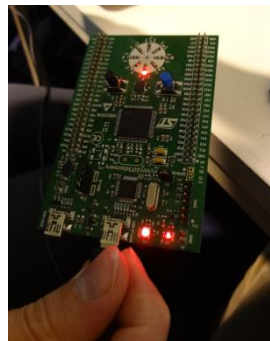
Watertight hull



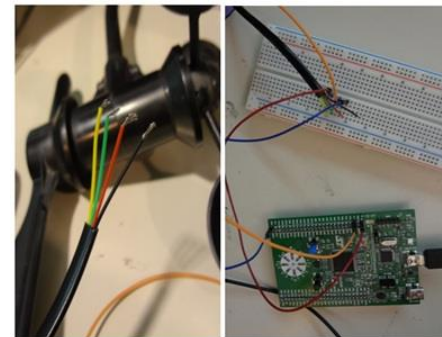
Communication



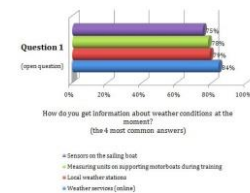
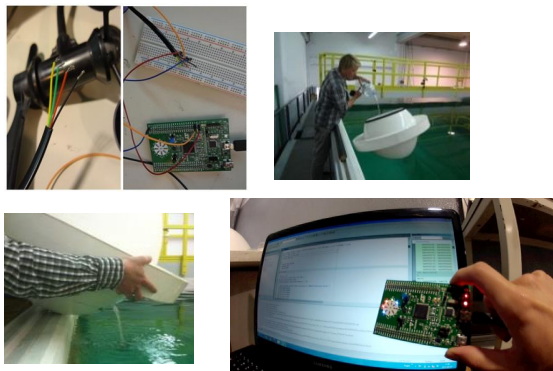
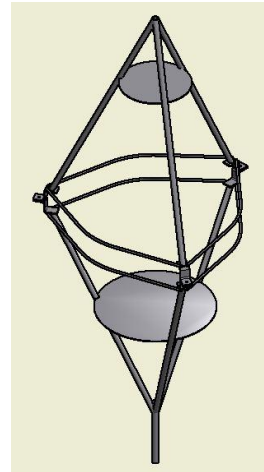
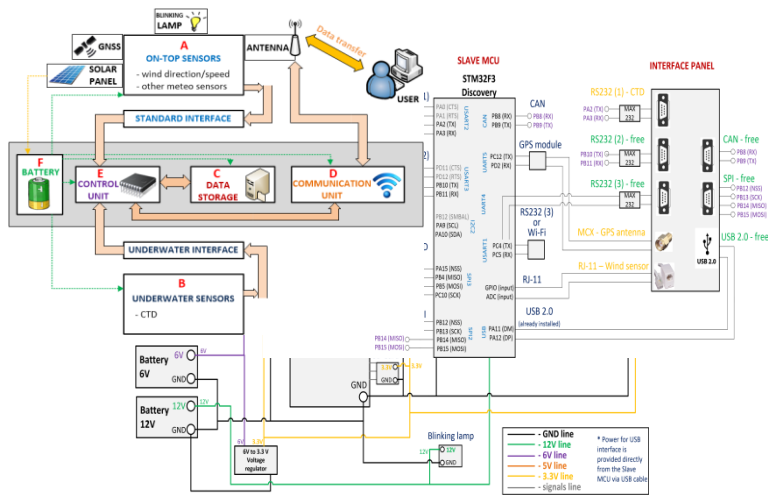
Gyroscope and E-compass



Wind sensor

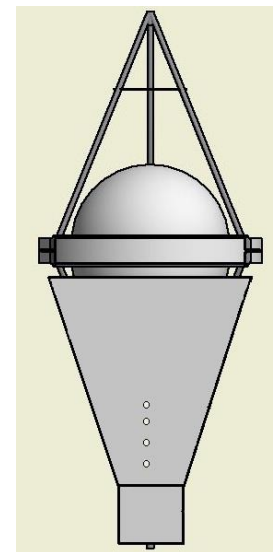
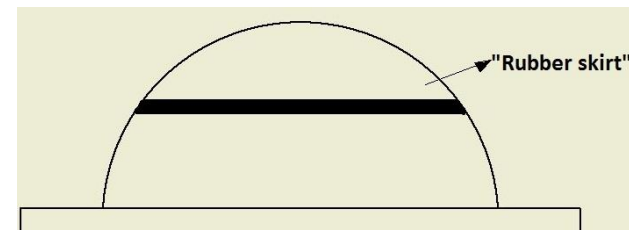


Achievements



Future Development

- Watertight hull and connectors
- Remaining components
- Software/Programming
- Fibreglass cover
- Box for electronics
- Solar panels
- Additional sensors
- Handles



Conclusions

- Complex project
- Educational value
- Progress of our work
- Team work

References

- [1] Defender, “Danforth Anchors,” [Online]. Available: <http://www.defender.com/product.jsp?path=-1|10391|33872|68830&id=68815>. [Accessed 7 April 2013].
- [2] Lewmar, “CLAW - Galvanised,” 2013. [Online]. Available: <http://www.lewmar.com/products.asp?id=7447&type=3&channel=1>. [Accessed 4 April 2013].
- [3] Davis instruments, “Anemometer 7911,” [Online]. Available: http://oceancontrols.com.au/datasheet/ocean/kta250_7911_spec_Rev_E.pdf. [Accessed 7 May 2013].
- [4] NovAtel, [Online]. Available: <http://www.novatel.com/assets/Documents/Papers/SUPERSTAR.pdf>. [Accessed 6 April 2013].
- [5] STMicroelectronics, „STM32F3 Discovery kit firmware package,” 2013. [Online]. Available: <http://www.st.com/web/en/catalog/tools/PF258154>. [Accessed 24 May 2013].

References

- [6] Sandisk, “Difference between Speed Class, UHS Speed Class, and Speed Ratings (performance) for SD/SDHC/SDXC cards,” 2013. [Online]. Available: http://kb.sandisk.com/app/answers/detail/a_id/1996/~difference-between-speed-class,-uhs-speed-class,-and-speed-ratings. [Accessed 8 April 2013].
- [7] Deben, “Danforth Anchors,” [Online]. Available: <http://www.deben.com/tracer-battery-packs/12v-22ah-lithium-polymer-battery-pack.html>. [Accessed 7 April 2013].
- [8] RobotShop, “CBAT-05 6V / 2800 mAH Ni-MH Rechargeable Battery” 2013. [Online]. Available: <http://www.robotshop.com/bat-05-6v-2800-mah-ni-mh-rechargeable-battery-2.html>. [Accessed 9 April 2013].
- [9] Nautic expo, “Signalling light for lighthouses and marker buoys (LED),” [Online]. Available: <http://www.nauticexpo.com/prod/osculati/signalling-lights-for-lighthouse-and-marker-buoy-led-23340-230712.html>. Accessed 7 May 2013].

Thank you for your attention!

Video