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|  | Message/Goal | Similarities | Interesting |
| 1 | Design Control architecture for navigation  Allow long endurance autonomous missions | - All sensors connected to Arduino (simple)  - GPS, wind sensors, compass | -windsock sensor  -Software uses two loops external for high-level (navigation). Inner loop for control (interrupts)  -Control simulated in MATLAB |
| 2 | First successful long running robotic sailboat  -Maritime Research missions | -Use 3 solar panels for power  -Sensors  - compass, GPS receiver  -weatherstation is primary sensor unit  -backup power direct methanol fuel cell | -based off of the shelf yacht model  -remote control software  -many redundant sensors incase of failure  -give suggestions to lower power consumption  Missing: collision avoidance, has negative energy balance, specific control to boat |
| 3 | low power, operate over range of conditions | -microtransat  -final year engineering group design project  -solar panels  -use direct methanol fuel cell for backup power | -self-righting design  -redundant system for two linearly actuated control surfaces(rudders) designed incase 1 fails |
| 4 | Further research and development in area of unmanned autonomous robotics exposed to heavy environmental conditions  - robust mechanical design and optimal navigation | -microtransat  -Solar power stored in four lithium-manganese batteres.  -backup direct methanol fuel cell | don’t use ropes that generate knots or jims (rig)  -controller switches between different modes of sailing depending on wind shifts  -use path planner  -angular mounted twin-rudders (better control at high-heeling angles)  -use GPS with IMU accurate positioning  -collects position and velocity data from other boats (VHF)  -simulated in Matlab |
| 5 | Flexible and powerful hardware for computerized control  Execute high-level control algorithms and provide a readable and modular implementation environment for algorithms | -embedded computerized control  -high level control navigation  -low level sensor modular expandable  -Actuators and sensors connected as nodes to an internal bus | -accelerometer, magnetometer, GPS, wind direction sensor  - use roll and pitch, heading  Four modes of control of operation   * Semi manual, heading hold, waypoint tracking, path following |
| 6 | Can be used for wide variety of ocean applications  Measuring ocean and atmospheric parameters, tracking oil spills, acting as communication  -act as a buoy |  | -internal autopilot batter pack holds enough energy to navigate for 6 months without charging  -not dependent on solar power  - |
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| 1 | Santos D, Silva Junior AG, Negreiros A, Vilas Boas J, Alvarez J, Araujo A, Aroca RV, Gonçalves LMG. Design and Implementation of a Control System for a Sailboat Robot. *Robotics*. 2016; 5(1):5. <https://doi.org/10.3390/robotics5010005> | <https://www.mdpi.com/2218-6581/5/1/5#cite> |
| 2 | Stelzer, R.; Jafarmadar K. The Robotic Sailing Boat ASV Roboat as a Maritime Research Platform. In Proceedings of the 22nd International HISWA Symposium on Yacht Design and Yacht Construction, Amsterdam, The Netherlands, 12–13 November 2012 |  |
| 3 | Ganoulis, Elettra, et al. "Peruagus-a Transatlantic Autonomous Surface Vessel for the Microtransat Challenge." *11th International Robotic Sailing Conference*. IRSC 2018 Southampton, UK, 2018. |  |
| 4 | H. Erckens, G. Beusser, C. Pradalier and R. Y. Siegwart, "Avalon," in *IEEE Robotics & Automation Magazine*, vol. 17, no. 1, pp. 45-54, March 2010, doi: 10.1109/MRA.2010.935792. |  |
| 5 | Henning Seeberg Stenersen,  Construction and Control of an Autonomous Sail Boat,  IFAC-PapersOnLine,  Volume 49, Issue 23,  2016,  Pages 524-531,  ISSN 2405-8963,  https://doi.org/10.1016/j.ifacol.2016.10.489.  (https://www.sciencedirect.com/science/article/pii/S2405896316320791) | <https://www.sciencedirect.com/science/article/pii/S2405896316320791> |
| 6 | http://sailbuoy.no/ |  |
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