Increasing the autonomy of an underwater ROV

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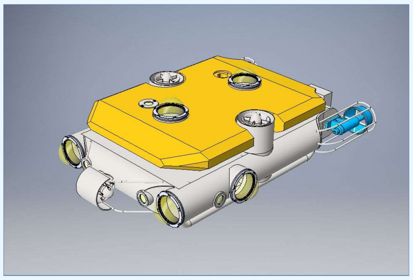
1 – Original ROV

- Very usable, lightweight, maneuverable underwater Remote Operated Vehicle (ROV)
- Diving down to 150 m depth
- Inspection of underwater electrical installation
- Umbilical cable is used to transfer data and electrical power
- Control by PS2 joystick console
- Developed by students and professors of the SOSS

2 – ROV under development

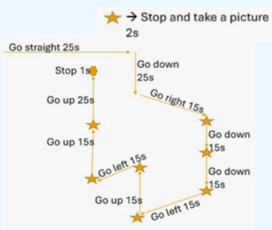
- Completely autonomous system (without cable)
- Battery powered - 2 x 625 Wh 36VDC
- Central control unit - ARK-1551-S6A1
- Dive control autopilot - Pixhawk 1
- Surface control system - computer, joystick, tether interface and screen
- Advanced communication to surface – Visible Light Communication (VLC) and ultrasound



3 – Optimizing energy footprint

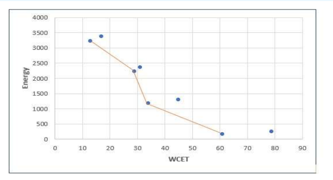
- Embed alternative hard/soft components for specific ROV mission achievement

Name	Task Type	Processor Name	Address Space	Capacity	Deadline	Start time	Priority	Blocking Ti
GPS	Periodic	cpu1	ad1	2	10	0	1	0
data_encrypt	Periodic	cpu1	ad1	5	10	0	1	0
data_send	Periodic	cpu1	ad1	5	10	0	1	0
down1	Scheduling	cpu1	ad1	25	50	50	1	0



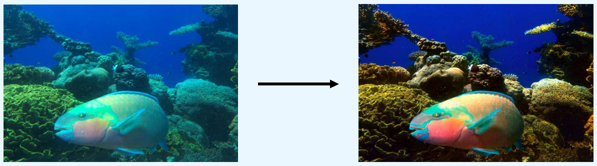
- Design Space Exploration : find trade-offs between schedulability (WCET) and energy for designs. *example of DSE options:* lights, object recognition, DVFS

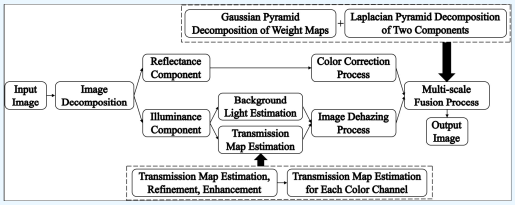
- Use a multi objective optimization tool (PAES) coupled with an architecture simulator (Cheddar) for DSE of tasks scheduling



4 – Payload: image processing

- Underwater images are highly degraded
- Underwater vehicles need sight for auto positioning
- Five algorithms for underwater image restoration are compared and the best one is optimized
- Minimal execution time for real time applications





The general procedure of objects visibility enhancement process

- Implementation of 360° VR view in real time

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