Internet of Things Course
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Department of Computer, Control & Management Engineering, Università di Roma La Sapienza
Anno Accademico 2020-2021

Dr. Roberto Bruzzese

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Group Project Fish Farming Water Monitoring
Course of Internet of Things
Prof.: Ioannis Chatzigiannakis
Prof.: Andrea Vitaletti

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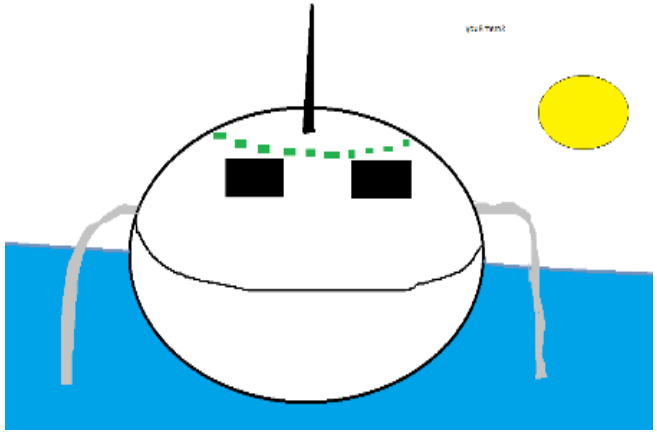
Fish Farming Water Monitoring

Performances Presentation – Estimation of consumption

Architecture and Devices

Smart Buoy



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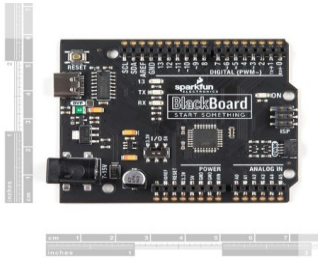
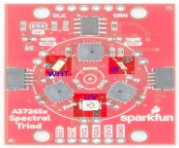
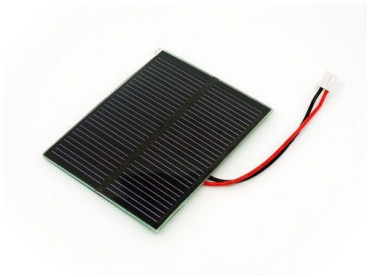
Architecture & Devices







Instruments , Devices and energy consumption

- **A)b-l072z-lrwan**

  Trasmitting/Receiving Mode > consumption of Tx (38mA) and Rx (11mA)

  Sleep Mode consumption 1mA (down to about 4 uA with right settings)

- **B) Arduino uno blackboard**

  With the last innovations **power consumption** of the **Arduino** Uno is reduced by 88.37% from 98.43mA to 11.45mA. Using on-board circuit changes, selective replacement of components and the use of microcontroller sleep mode can reduce the continuous idle power usage of an Arduino UNO to only **5%** of the default draw (6 micro ampere).

Instruments , Devices and energy consumption

- **C) LED**

  Consumption is 2mA

D) Small Solar Panel 55x70mm 0.5W.

Typical current: 100mA, Typical voltage: 5.5V

- **E) Lithium Ion Battery - 400mAh**

- **F) ILS - Due bit tre vie Elettrovalvola valvola controllo elettronico Piccolo scarico valvola sfiato DC 5V DC6V**

  The nominal current:<60MA
  The nominal power : 0.4-0.7W
  Pression: 0-350mmhg
  Velocità: <3S (100cc from 300mmHg to 15mmHg time)

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Instruments , Devices and energy consumption

- G)

  DC 3-12V Mini autoadescante Pompa ad ingranaggi Pompa di pompaggio ad acqua Pompa elettrica con motore RS-360SH,
  Current 5 V - 2 A (indication not precise)
  Pump motor RS-360SH . Maximum raise 1,5 meters.

- H)

  AS7265x Spectrometer

  UV Led 20 mA

  IR LED 20 mA

  White LED 30-60 mA

  Operating current 5mA

Consumption in sleep mode

- **Performances**

1) **Full Sleep mode**

The performance of the whole system in sleep mode is consumption of 4 micro ampere, plus 6 micro ampere. Total 10 uA. 1.0mAh can last about 400 hours with 400 mAh battery. That means more than 16 days in sleep mode. That is making the hypothesis that battery solar recharging has not taken place for this period.

Consumption in normal mode

- **Performances**

1) **Normal Mode**

- The performance of the whole system in normal mode, making the hypothesis of 6 daily water measurements (one every 4 hours) , and real time transmissions of data , also taking into consideration that we must enclose in this calculation 6 pump water loads, and 6 pump water drains, and also consumption of 10 LEDs for nocturne buoy visibility, is :

Consumption in normal mode

- **Performances**

1) **Normal Mode**

- Consumption
- 6 x Tx (38mA) x 2 sec 2b-1072z-lrwan
- 11.45mA x 1 minute BlackBoard Arduino board
- 6x2 x 20mA x 1 sec 2 LED AS7265x
- 6x1 x 45mA x 1 sec 1 LED AS7265x
- 5 mA x 1 minute operating current AS7265x
- 6 x 2A x 10 sec pump loading water
- 6 x 60mA x 10 sec pump drain water
- 10 x 2mA x 6/2 hours Buoy Night Leds

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Consumption in normal mode

- **Performances**

1) **Normal Mode**

- Power (Watt) = voltage (volt) x current (Ampere)
- Power (Watt) = 3.3 v x current (Ampere)

1. 3.3 v x 6 x Tx (38mA) x 2 sec
2. 3.3 v x 11.45mA x 1 minute approx
3. 3.3 v x 6x2 x 20mA x 1 sec
4. 3.3 v x 6x1 x 45mA x 1 sec
5. 3.3 v x 5 mA x 1 minute approx
6. 3.3 v x 6 x 2A x 10 sec
7. 3.3 v x 6 x 60mA x 10 sec

8 3.3 v x 10 x 2mA x 6/2 hours

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Consumption in normal mode

- **Performances**

1) **Normal Mode**

- 3600 sec x 24 = 86400 sec
- 1 sec = 1 day/ 86400 = 0.00001157407
- 1 sec = 1 hour/ 3600 = 0.00027777777

Consumption in normal mode

1.	76 mA x 0.00001157407=	0.00087962932 mAday
2.		0.00069444 mAday
3.	240 mA x 0.00001157407 =	0.0027777768 mAday
4.	270 mA x 0.00001157407 =	0.003125 mAday
5.		0.03472221 mAday
6.		1.388888 mAday
7.		0.041666 mAday
8.		2.5 mAday
•		----------
•		0.397 A / day

That is total consumption of 3.3 v x 0.395 A = <u>1.30 watt / day</u>

Capacity Planning

- It seems that they will be necessary 4 solar panels and 4 lithium ion battery for the actual normal mode.

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Grazie per la Vostra Attenzione!

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