Development of a complete solution of wireless data sending, powered up by a system of vibrations energy harvesting

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Project context | Applications

- Wireless Sensor Network
- Internet of Things

energy

issues

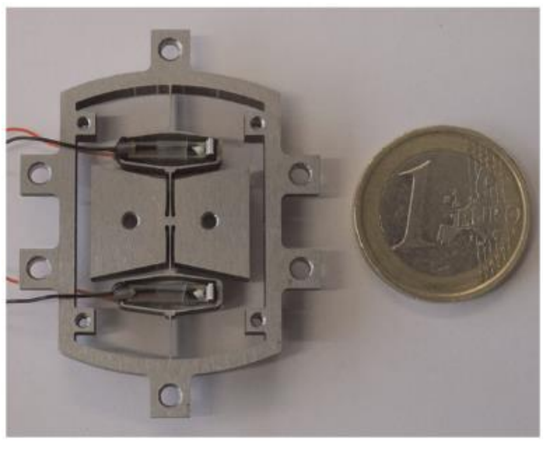
Ambiant energy harvesting system

Application Field	Example
- Area monitoring	Geo-fencing of gas or oil pipelines.
- Health care monitoring	Collect information about an individual's health and energy expenditure
- Environmental / Earth sensing	Air pollution monitoring, forest fire detection
- Industrial monitoring	Machinery maintenance

Energy harvesting system and its performances

Figure 1 : Two piezoelectric devices around an inertial mass under physical tension (which induces buckling)

Advantage of the buckling : It allows a larger bandwidth of use compare to others.



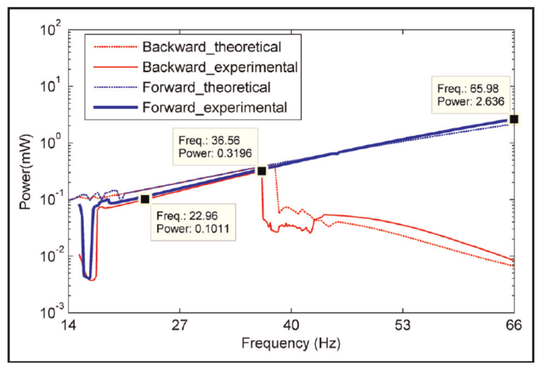


Figure 2 : Performance compared to the vibration frequency

Comparison of the performance between this system and a traditional battery

System	Functioning time under an outpup power of 1 mW
A Typical AA-type Battery 3000 mAh, 1.5 V	6 months
The energy harvesting system	∞ as long as the vibrations are

Schematic of the complete solution

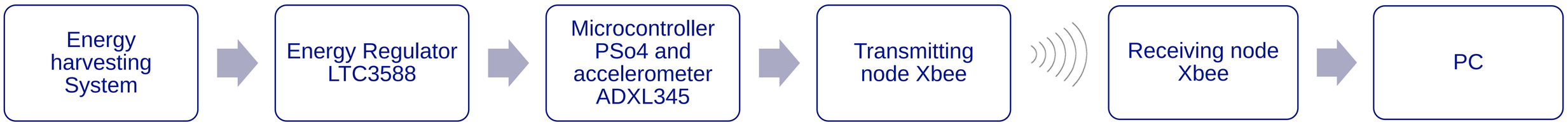
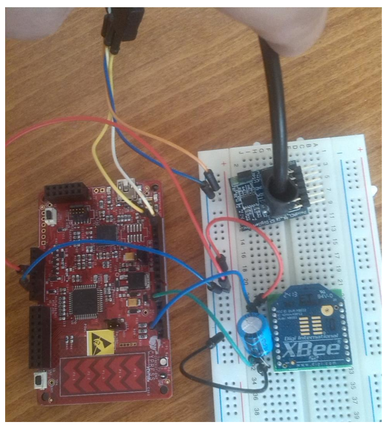
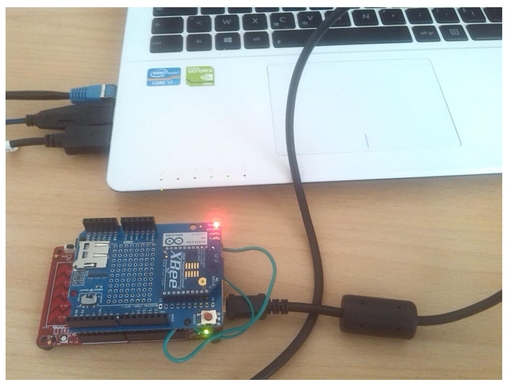


Figure 3 : The transmitting system



Ultra low power consumption requirement
→ optimal use of active and sleep modes

Figure 4: The receiving system connected to the PC



Current consumption of the transmitting system

Sleep consumption: 2 µA under 3,3V

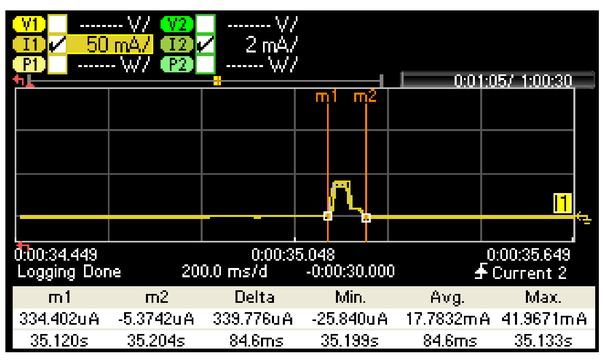


Figure 5 : current consumption of the transmitter only (under 3,3V)

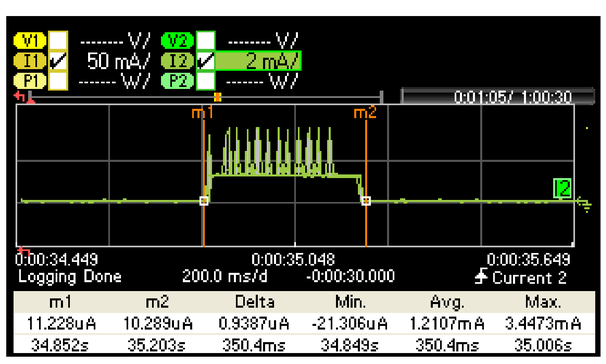


Figure 6 : current consumption of the microcontroller and the accelerometer (under 3,3V)

Conclusion

- The whole system is a complete solution for an increasing tremendous amount of applications.
- It is the proof that it is possible to send wirelessly data powered up by an energy harvesting system.
- This project allows sending the 3-axis efficient acceleration acquired on 10 values every 6 seconds.
- This system can be easily changed to perform the sending of temperature, gas concentration, messages, …
- It opens so the floodgates to a lot of applications!

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