

WANDA: A Radically New Approach for Low-Cost Environmental Monitoring

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Overview

1. Environmental chemical sensing

- Current sensing approach
- Issues

2. Conventional sensing model

- Stand alone platforms or those within WSNs
- Disadvantages

3. Opportunity to introduce a new sensing model

- Proof of principle study
- Potential advantages

1. Environmental chemical sensing



- **Why?**

- Events such as the release of pollutants can have a negative effect on local wild life and/or an indirect effect on human life.

- **Bring the sample to the technology (labs)**

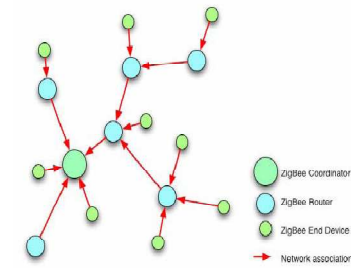
- Manual based
- Good reasons
- Expensive
 - State-of-the-art equipment
 - Highly trained personnel
- Not scalable

...A “Grand Challenge” posed for analytical chemistry is to develop a capability for sampling and monitoring air, water, and soil much more extensively and frequently than is now possible. Such goals will require improvements in sampling methodology and in techniques for remote measurements, as well as approaches that greatly lower per-sample and per-measurement costs...

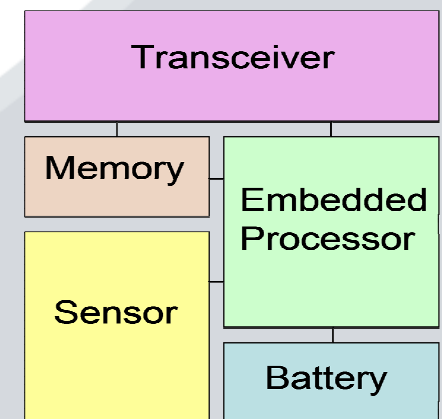
Editorial Anal. Chem., 2010, 82 (5), p 1569

2. Conventional approach

- Bring the technology to the sample
- Creation of deployable sensing platforms capable of performing analytical measurements 'in situ'
- Issues continue to persist:
 - Maintenance
 - Communications
 - Cost base
- Is there another way?



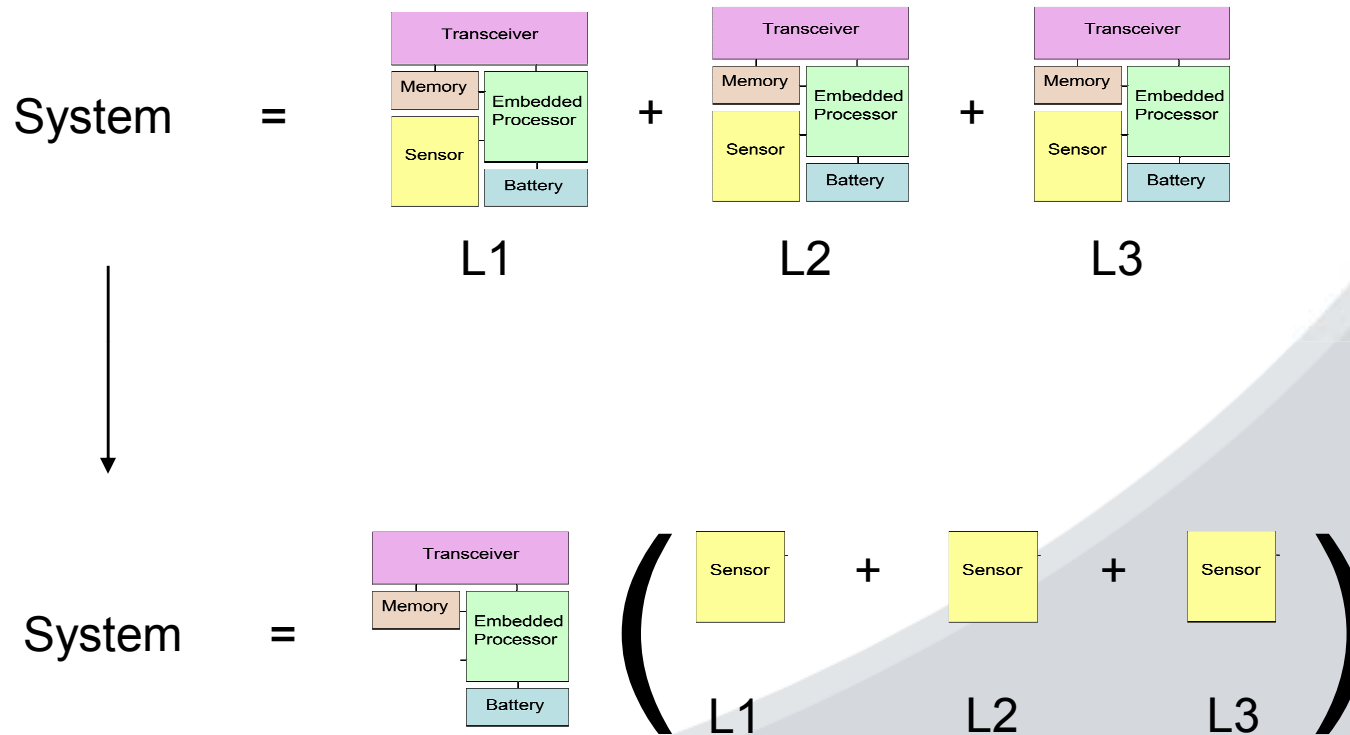
Wireless Sensor Network Architecture



Typical composition of a single sensing device

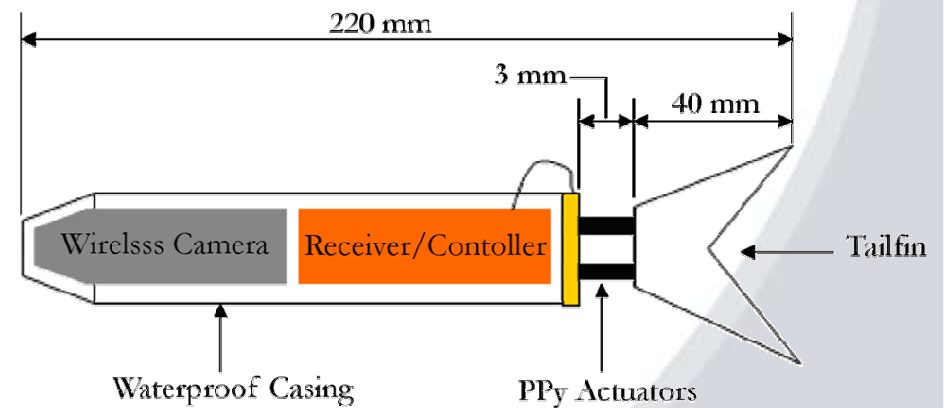
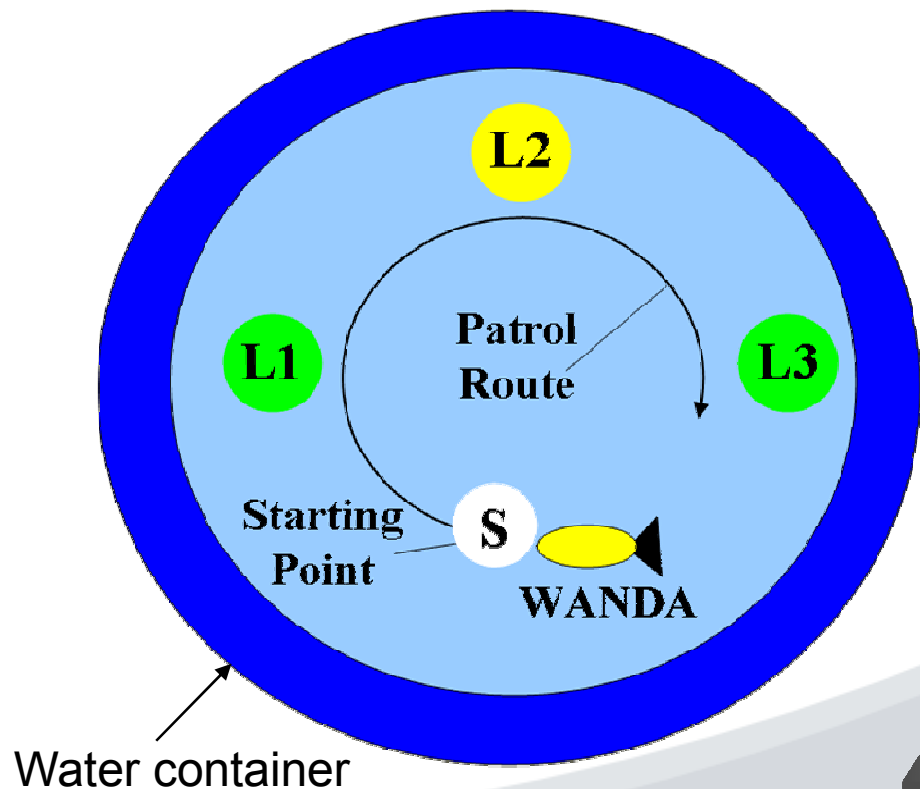
3. Proposed sensing model

- **Concept:**

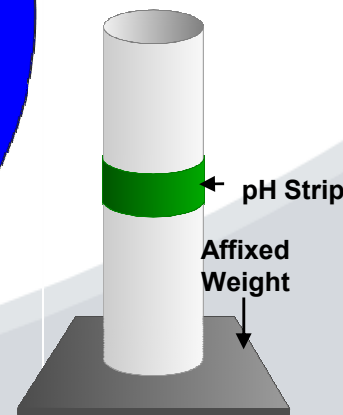


3. Proposed sensing model

- **Proof of principle**



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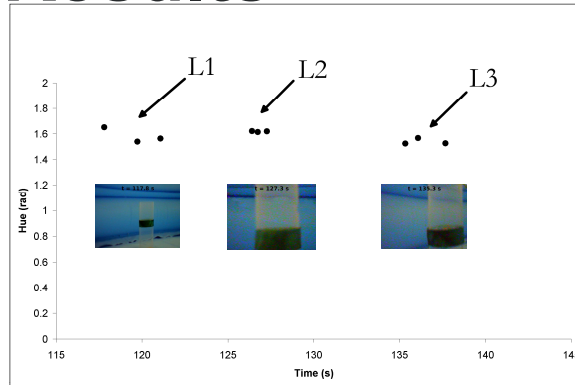


Procedure:

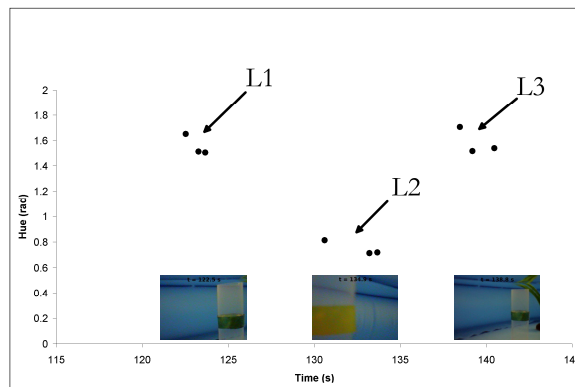
- A single patrol route with 'normal conditions'.
- An additional patrol with area surrounding L2 acidified.
- Camera interrogates the colour state of each station.
- Offline comparison of patrols i.e. camera results using the IHS colour space.

3. Proposed sensing model

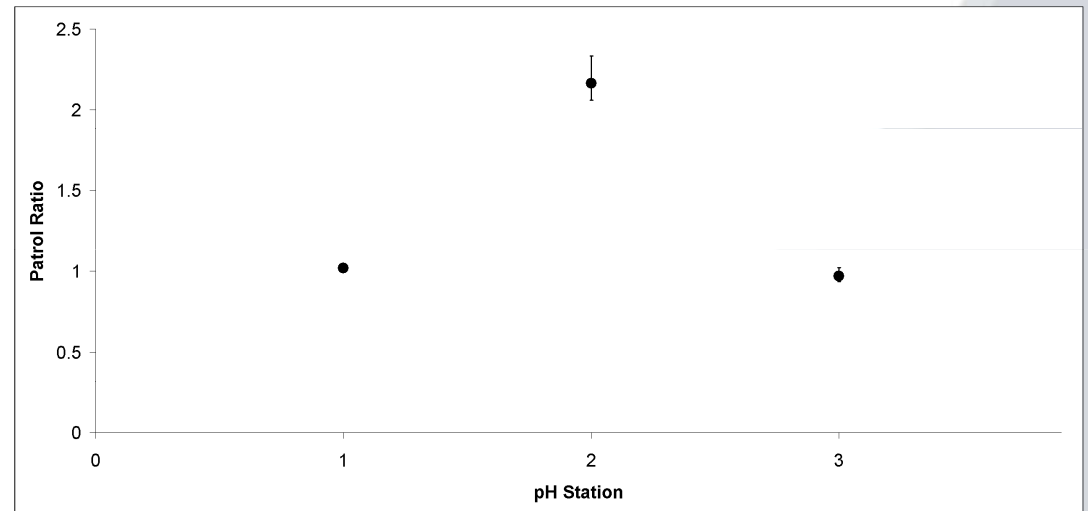
- **Results**



Patrol 1, Normal Conditions



Patrol 2, L2 Contaminated



Comparison of Patrols

Conclusions

- **Approach can eliminate common nodal elements**
 - Reduce cost base
 - Reduce maintenance e.g. battery changes
- **Detection**
 - Shown that the system can detect the presence of a chemical species
 - Demonstrated that it can localize the contaminant
- **Future work**
 - Progress to quantifying the concentration of a contaminant
 - Introduce multiple chemical colorimetric indicators

