



# Implemented Wireless Sensor Network Applications

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# Monitoring of Greenhouse

- Concentration of CO<sub>2</sub>, Conductivity of soil, humidity and temperature are monitored with help of WSN
- Easy and affordable, no cabling
- Enables more measurement points





# Monitoring of laboratory incubators

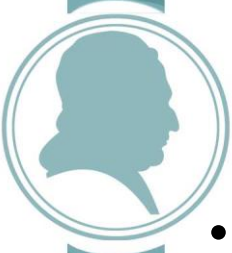
- Simple automatized temperature reading
- WSN Networked laboratory incubators in several locations
- High benefits with simple application
  - Automatic reports
  - Alarms



# Weather station

- Vaisala WXT510 weather station connected to the same WSN than e.g. the noise nodes
- Moisture, pressure, wind direction and speed, rainfall and temperature





# Enviromental Noise Measurement

- Concurrent and real-time measurement in several locations
- Concurrent measurement in several clusters
- Measured
  - Ambient noise in Kokkola city center
  - Kokkolarock-happening online noise values of neighbourhood available
  - Office noise values from several points concurrently
- Basic affordable microphone as a sensor
- Working time from days to weeks even months depending on the measurement frequency





# Real Time Noise Level Measurement in a Mine and Surrounding Areas

- Mining and surrounding areas several tens of square kilometers
- Open-pit mine itself  $\sim 2\text{-}3 \text{ km}^2$
- Several clustered measurement points/areas
- Online noise information 24/7
- What exactly caused the noise?
- How different workflow tasks are affecting noise level
- Temporal combination of exact weather condition information and noise level information





# Measuring of Strain of Composites

- Measuring and observing of deformation of large composite objects
- Strain gauges connected in WSN
- Enables multipoint sensing without excess wiring
- E.g windmill wings, stress points of boat frames, ceiling rafters etc...
- Also intelligent casts (mould) ideas are presented



# Monitoring of structures of large halls

- Stretch of structures are monitored in long run (several months)
- All together 40 sensing points
- With the same WSN also temperature, moisture and also dominant outer weather conditions are measured





# Measurement of Strains of Turbine Wings

- Development of new turbine made of carbon fiber was in trouble
- Strains and vibrations had to be measured
- However no easy conventional method was available
- Turbine wings were networked with WSN and measured while rotating in full speed.





# Other implementations

- Level Alert of Flowing Waste Water
- Measurement of Ground Water Level
- Greenhouse light "waste" measurement
  - Problem for fox houses
- Fox house environmental parameters like lightness, temperature, etc...
- Revolving road salt heating and drying funnel temperature measurement
- Cowhouse air circulation and temperature measurements on different heights



# Contacts

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