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Introduction

Food Export industry is worth approximately $30.633 million NZ dollar [1]. To maintain food quality during transportation environmental factors like temperature and humidity need to be closely monitored. More direct quality related measurement like pH or water content offers better precision for monitoring the quality[2]. Wireless Sensor Network (WSN) offers the ability to constantly monitor these food items during the various post harvesting stages[3]. WSN nodes are small and battery operated. Operating WSN nodes with battery, constraints its duration of operations. The power consumption of the node depends on its state of operation (Transmit, Receive, Idle, Sleep). This research looks at the possibility of increasing the node longevity through finding a balance between the process requirements and node’s operational capability. Different Off the shelf nodes are tested here. Data aggregation is also being investigated to optimise the transmission duration and save power.

Applications

- Fruits and Vegetables
- Meat
- Milk Products Monitoring
- Sea Food

Potential industrial application are fresh fruits and vegetables, meat, milk and sea food. WSN is used to detect any early decay by monitoring temperature, pH, humidity, water loss and other environmental and chemical parameters. The product storage life varies from few days to few months. Supplier are alerted such that the product that has gone bad can be isolated.

Modelling Tools and Preliminary Results

- Zigbee Node Parameters
- Measurements of Node Power Consumption
- Network Modelling tools, ONET and OMNET++ are used for to test the deployment scenario. Virtual nodes are designed with the use of the physical nodes parameter and tested on these simulators.

Research objectives

This research aims at extending the node lifetime in providing periodic update on the condition of food and related environment.

- Characterise Power modes for Off the shelf nodes such as Microduino and TI CC2538.
- Characterise the radio transmission through the specific food product to configure radio power and determine battery life of node.
- Create physical and virtual simulated sensor network to establish a low power transmission protocol for periodic data collection.
- Big data aggregation scheme for data transfer to the cloud for analysis.

Data Cloud

Ongoing & Future work

As part of ongoing work we are establishing a physical network and characterising the radio of the node for related media.

- For future work we will be looking at the following:
  - Create a scenario for 3D modelling of radio propagation on OMNET++
  - Design a low power transmission protocol for periodic data collection.
  - Investigate a scheme that reduces cross pallet communication
  - Investigate a scheme to aggregate multi-sensor data to remove redundancy before forwarding to the cloud.
  - Big data aggregation scheme to transfer to the cloud for analysis.

References