Energy-autonomous Window Sensor

1 Features

- Registration of window states
  - Open
  - Closed
  - Tilted
- Estimation of open angle
- Batteryless operation
- Average consumption 9.3 μW with 24 transmissions per day and 20 false activations
  This leads to a lifespan of approximately 8.5 years using a common CR2032 button cell (230mAh)
- With the utilised supercapacitors having a leakage current of 3.5 μA the sensor needs an average of 25.05 μW
- With around 8 hours of illumination the sensor will need around 1,187 Lux on average every day to function
- Based on 3-Axis geomagnetic sensor
- Contact less recognition
- Usage of Energy Harvesting

2 Applications

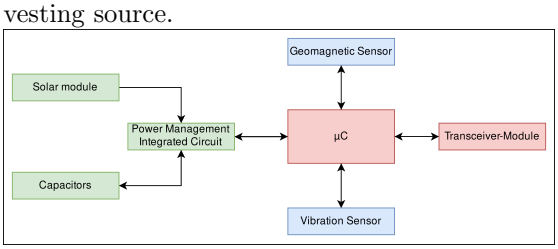
- State detection
- Heating control
- Ventilation system
- Alarm system

3 Methodologies

- Energy harvesting
- Event based measuring
- Send on Delta approach
- Hibernating

4 Description

The Ultra Low Power Energy-autonomous Window Detector is a wireless sensor node based on hardware specifically designed to be able to be powered only by a solar cell as an energy harvesting source.



By using a geomagnetic sensor it is able to detect the state of the window without needing a secondary piece of hardware as regular contact based sensors do.
The sensor node uses an event driven approach. Thus it does not have a sampling interval but only samples the sensor when a change is detected. This allows the sensor to be basically shut off most of the time. The change in position is detected by using a finely tuned vibration sensor.
Before first use the sensor needs only to be charged, placed on the window and the three window states need to be trained.
Since the sensor relies only on solar energy as an energy source and super capacitors as an intermediate power storage no replacement of a battery is needed. This results in a long life cycle without maintenance.