



WiFi Based Wireless Imaging and Positioning for WSN

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Goals

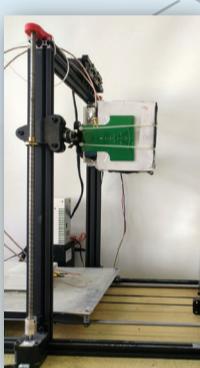
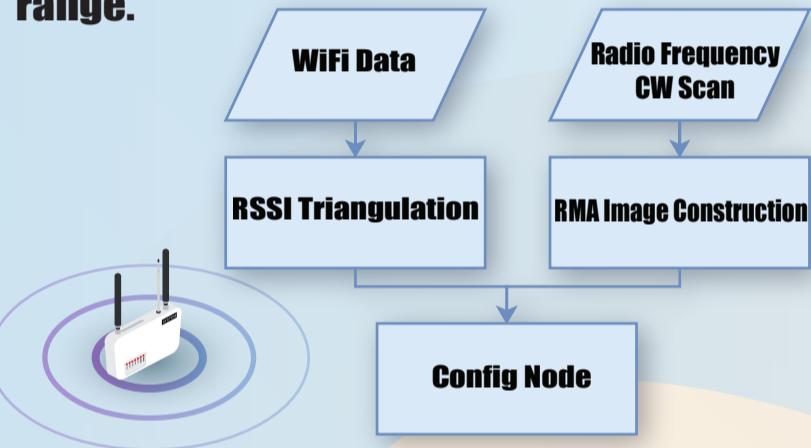
Create the ability for a sensor deployed in a sensor network to gain knowledge of:

- Its physical position.
- Objects in its vicinity.

Concept

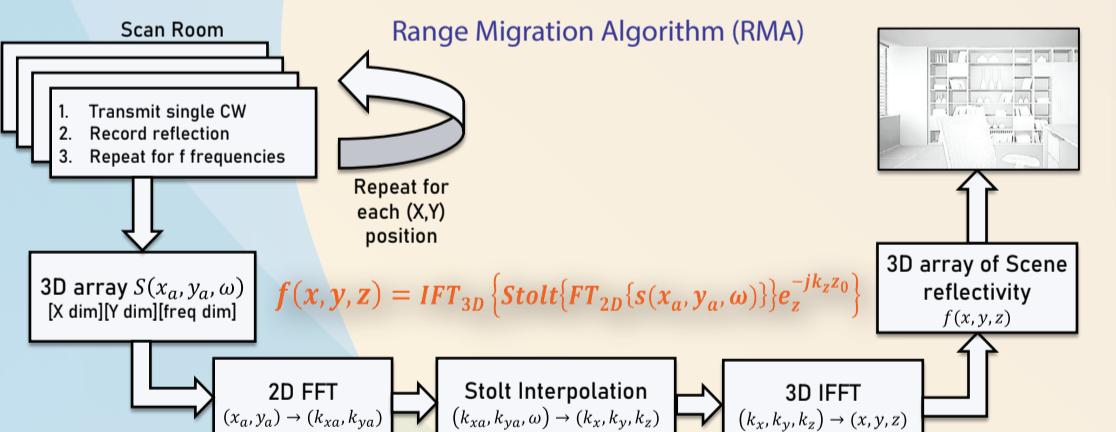
When the sensor node is idle, it can use its radio to initiate an RF scan of its surroundings and generate a reflectivity image of its environment.

When the sensor is active and its radio is employed in favor of WiFi communication, it can use the Beacon and RSSI of the intercepted frames and triangulate its position in space using a propagation model from all APs in range.



3D Imaging Algorithm

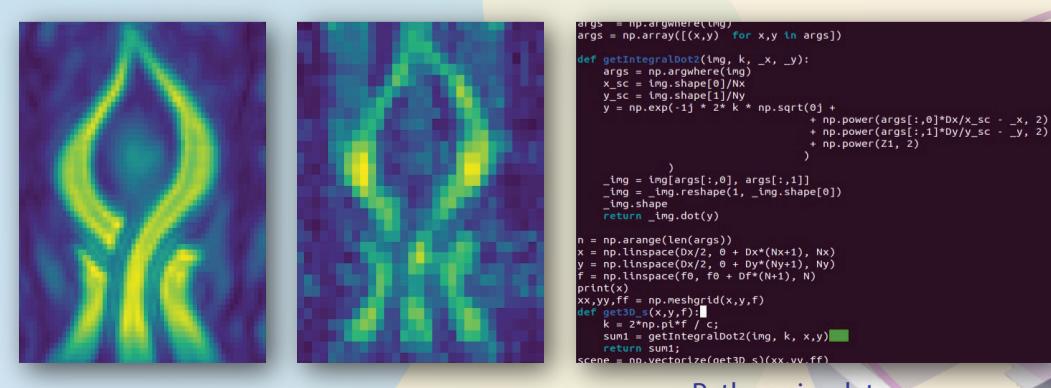
Using Range Migration Algorithm to construct a 3D image of the sensor's environment from the sampled scene matrix



Simon Scott. "Three-Dimensional Microwave Imaging for Indoor Environments". In: UCB/EECS-2017-191 (Dec. 2017). url:<http://www2.eecs.berkeley.edu/Pubs/TechRpts/2017/EECS-2017-191.html>.

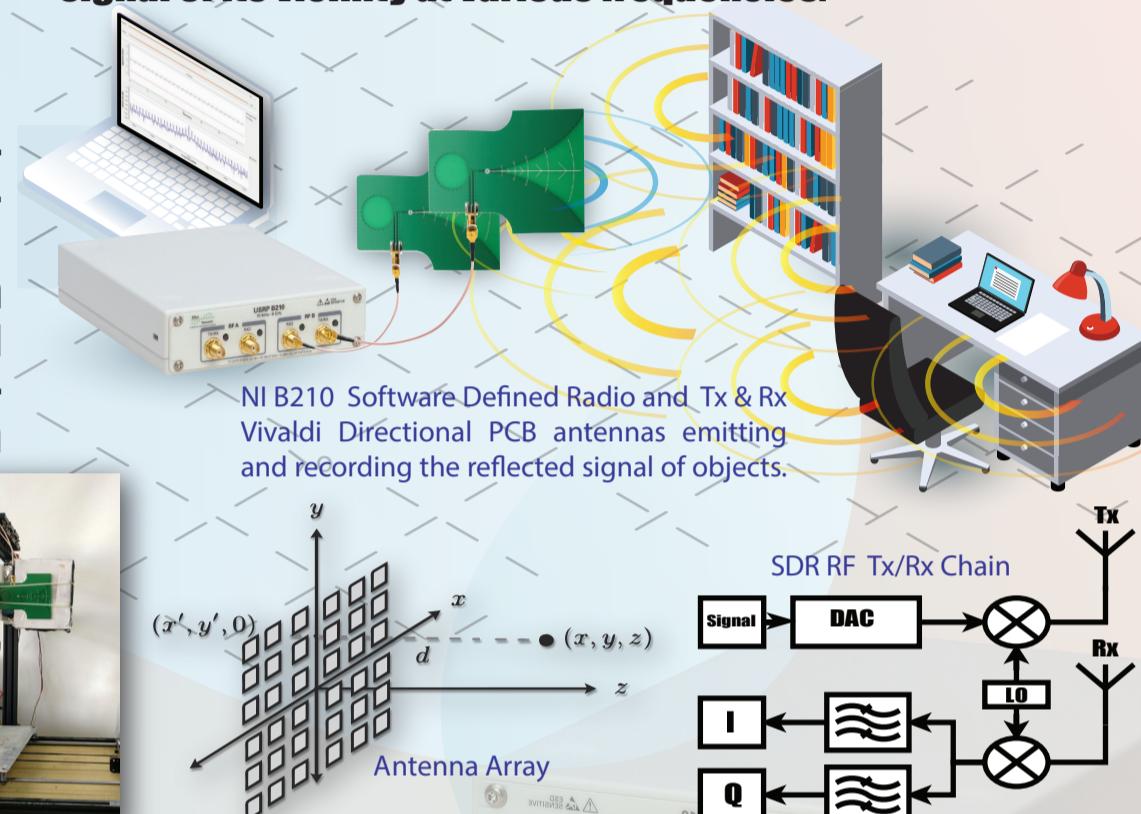
Imaging Simulation

Python implemented code takes a scene matrix file emulating true samples and applies RMA to generate an image.

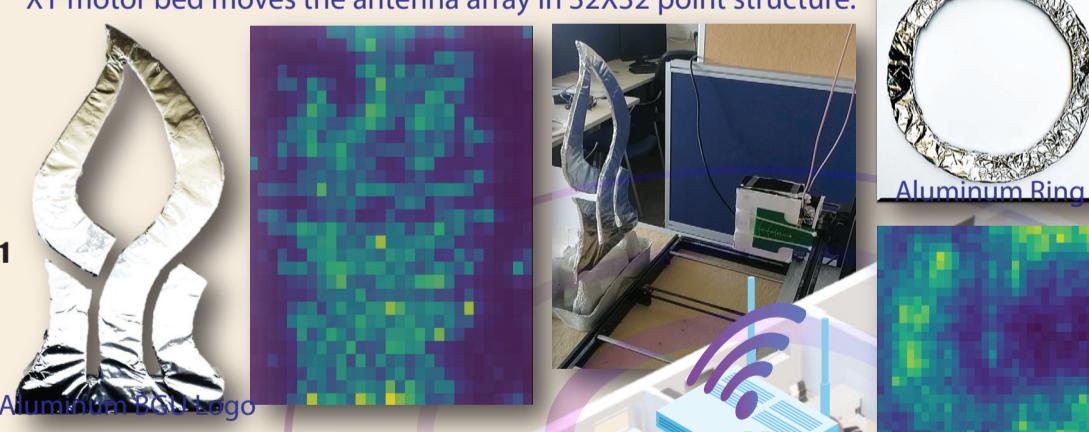
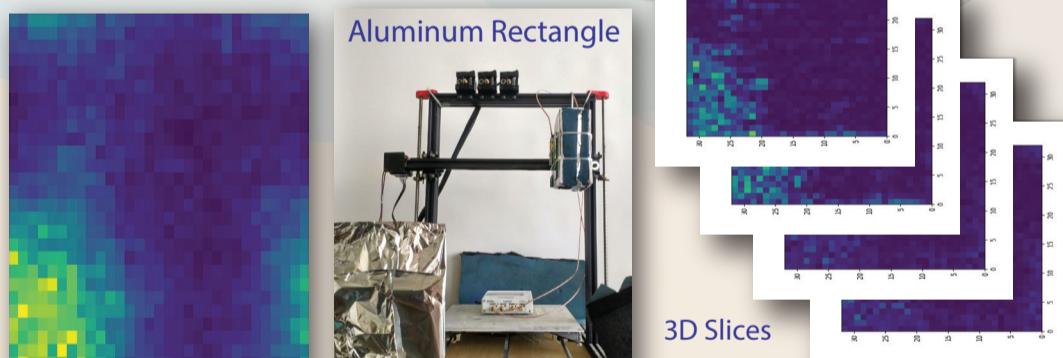


Imaging Implementation

A SDR (Software Defined Radio) which represents the sensor's radio transmits and receives CW (Continues Wave) signals, measuring the amplitude and phase of the reflected signal of its vicinity at various frequencies.



Imaging Results



RSSI Triangulation

