



GDAŃSK UNIVERSITY
OF TECHNOLOGY

2025 IEEE RADAR CHALLENGE
SAR IMAGING USING PHASER 10 GHZ
PHASED ARRAY RADAR PLATFORM

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What is Synthetic Aperture Radar?

Uses radar movement to simulate large aperture

Enables high-resolution radar imaging

Advantages over optical cameras:

- All-weather capability
- Day/night operation



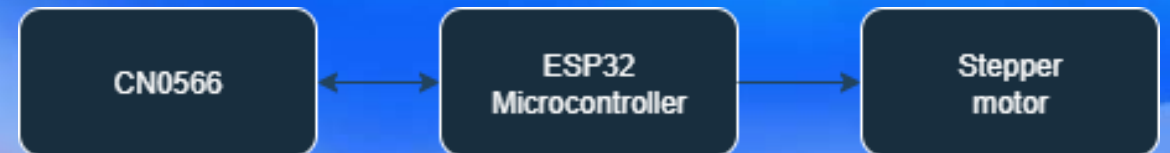


SAR with CN0566 Platform



Demonstration with CN0566 phased array

- Mounted on linear axis rail
- Movement controlled by Raspberry Pi
- Precise movement control with a stepper motor



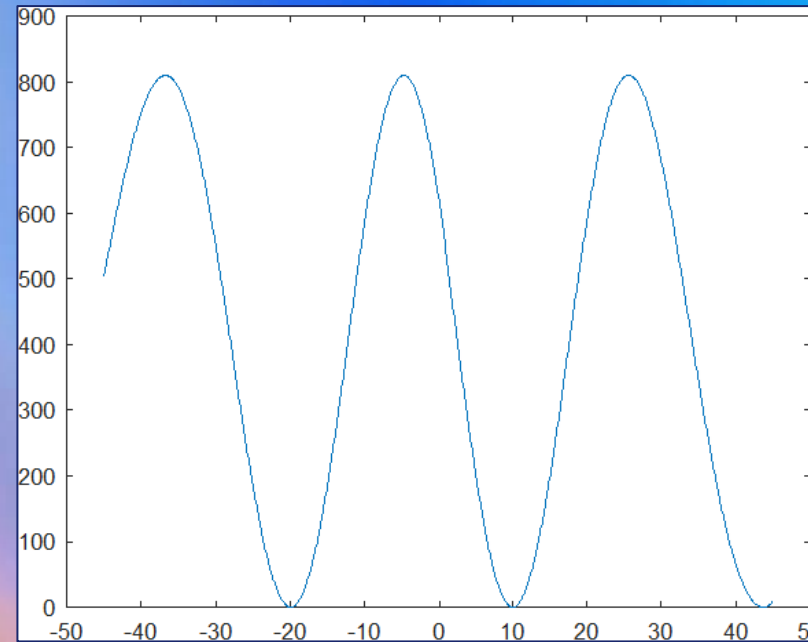


Improved Angle Estimation

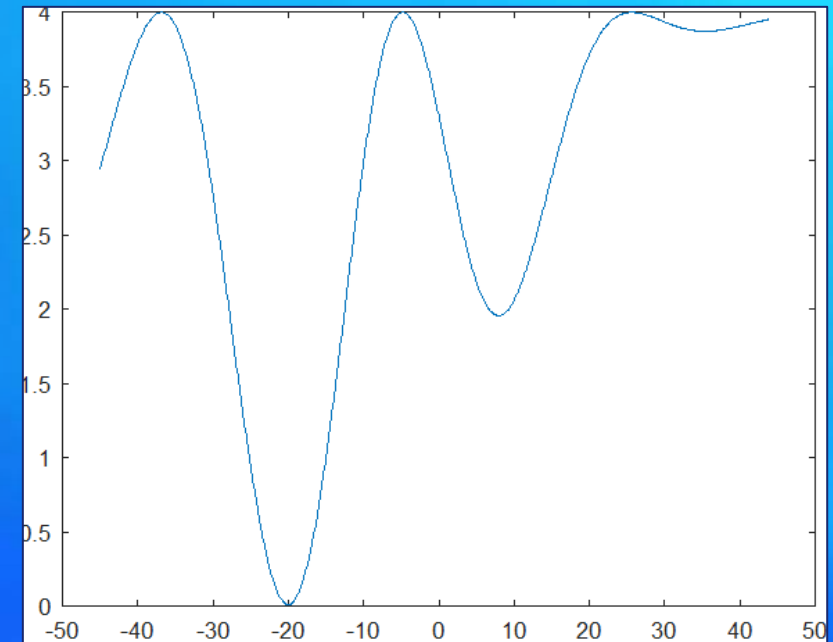
Applied Maximum Likelihood Estimation (MLE) with a goal of estimation Angle of Arrival (AoA).

Without SAR:
Angular aliasing and ambiguous results

With SAR:
No aliasing and unambiguous results



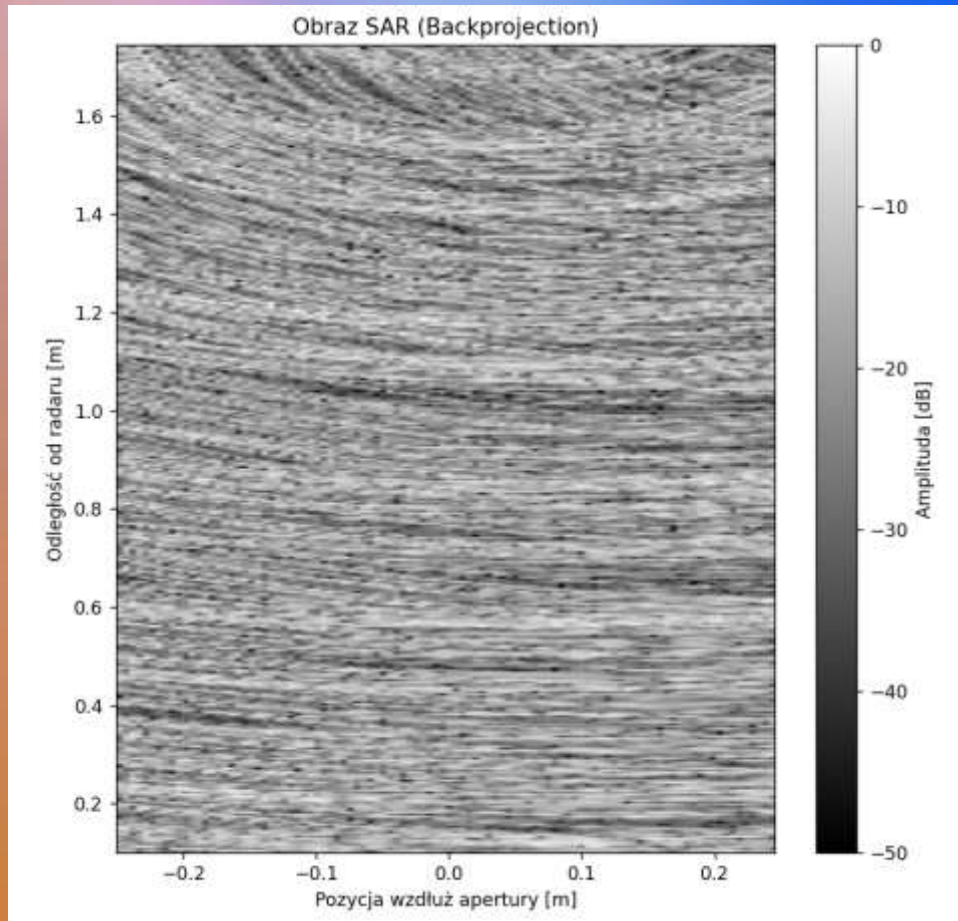
Without SAR



With SAR



SAR Imaging Algorithm



We used backpropagation method

Backpropagation process:

- Calculate distance to all antenna positions for each pixel
- Coherently sum amplitude + phase
- Reverse wave propagation which gives a focused image



Results and Conclusions

SAR improved estimation of Angle of Arrival
SAR imagery is dominated by noise

Likely causes:

- Suboptimal processing (calibration, phase alignment errors)
- Noisy indoor environment (reflections, multipath)

Next steps:

- Improve data processing pipeline
- Perform tests in larger / outdoor area