Design of FMCW Radar Based on Software Defined Radio with GNURadio for Detection, Range Estimation, and Velocity of an Object

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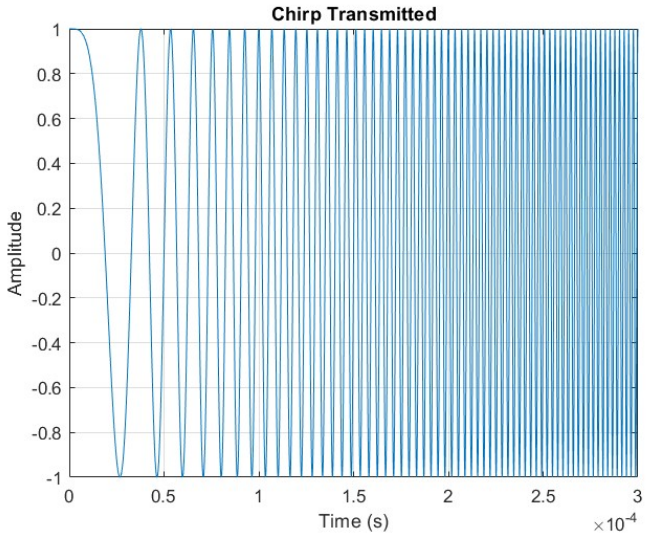
OUTLINE

- Basic Overview
- Objectives
- Research Flowchart
- Data Acquisition
- Data
- Analysis
- Conclusion
- Contribution

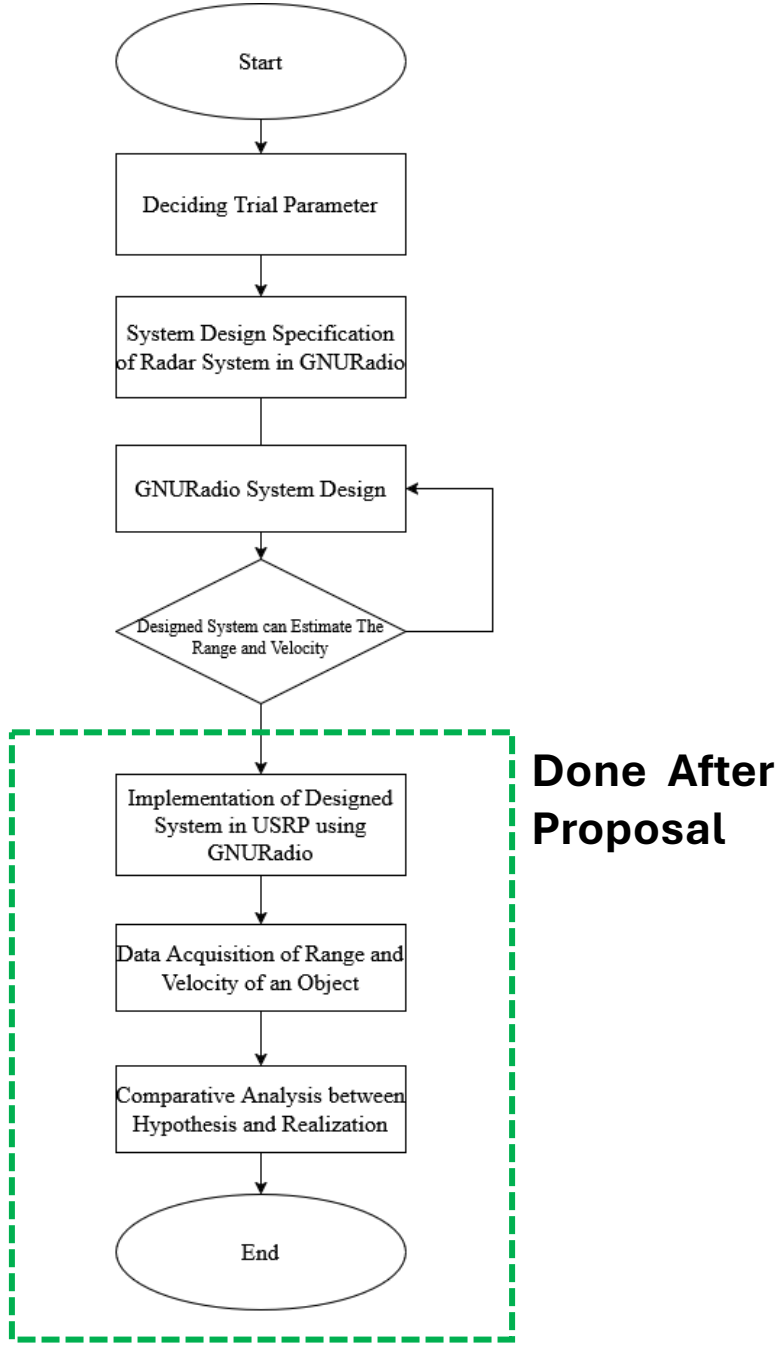


GNU Radio

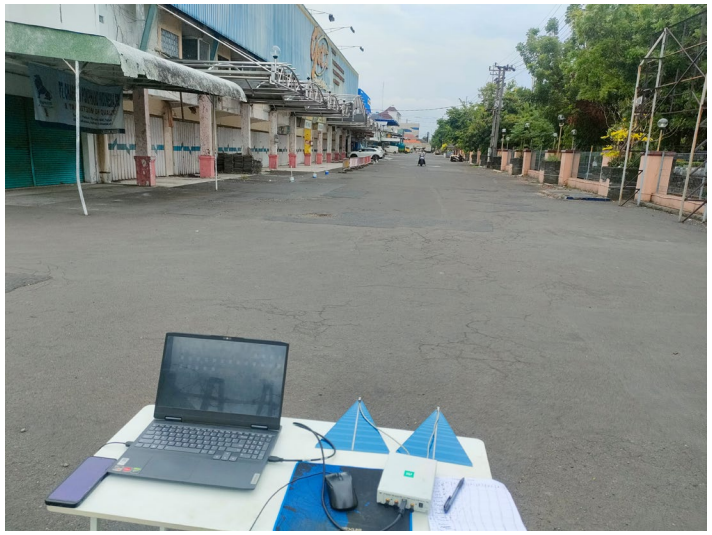
THE FREE & OPEN SOFTWARE RADIO ECOSYSTEM

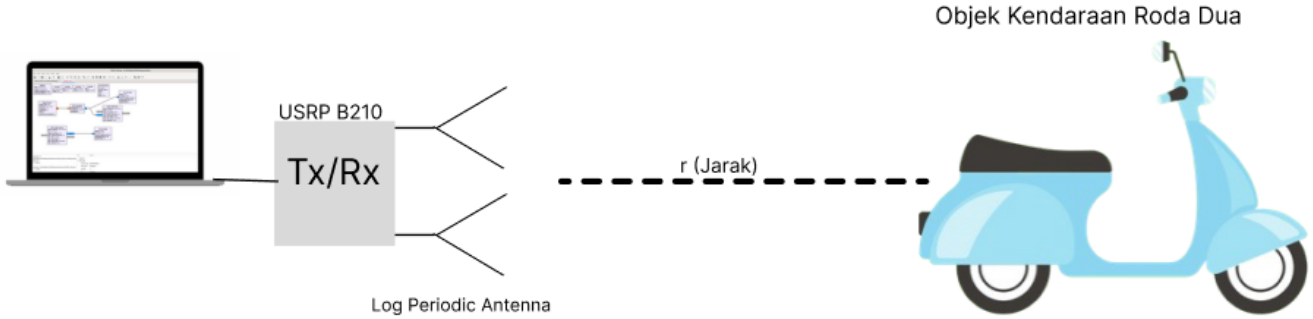
OBJECTIVES

- Designing FMCW Radar system with GNURadio and USRP B210
- Test the system’s ability to detect, estimate range and, the velocity of an object
- Evaluating the designed System



Done After Proposal




Objek Kendaraan Roda Dua
USRP B210
Tx/Rx
r (Jarak)
Log Periodic Antenna

DATA

Actual Range (m)	Predict Range (m)	Trial	Absolute Deviation
3	-55,04	1	58,04
3	-7,3192	2	10,3192
3	-8,4902	3	11,4902
6	7,0264	1	1,0264
6	6,7336	2	0,7336
6	5,5626	3	0,4374
9	9,0757	1	0,0757
9	9,0757	2	0,0757
9	8,7830	3	0,2170

Actual Velocity (km/h)	Predict Velocity (km/h)		Trial
	Approaching Radar	Receding Radar	
5	0	0	1
5	0	0	2
5	0	0	3
10	-9,8	10,3	1
10	0	0	2
10	0	0	3
15	-18,03	0	1
15	0	0	2
15	0	0	3
20	0	0	1
20	0	0	2
20	0	0	3

ANALYSIS

Great result in range estimation at 9 meter

Average result in range estimation at 6 meter

Bad result in range estimation at 3 meter

Bad result in velocity estimation

Can detect the movement of object

Bigger object for larger radar cross section

CONCLUSION

FMCW Radar has successfully been implemented

Assessment of the system has been done, the designed system can detect an object, estimate range, and velocity

The evaluation show a good range detection starting from 6 meter up to 9 meter, while velocity estimation does work, it is not reliable

This research has shown the step by step in designing FMCW radar system with USRP B210 and GNURadio

CONTRIBUTIONS

Giving a step by step approach on how to implement FMCW radar system on USRP B210

Assessing the ability of the designed system

As a reference on the implementation of FMCW radar using B210 USRP