IOWA STATE UNIVERSITY
College of Engineering

Lightning Talk 2
Millimeter-Wave Imaging Radar

Group 20: Nathan Ayers, Matthew Caron,
Michael Levin, Rodrigo Romero

Problem Statement

Researchers and students at Iowa State University need a method to analyze materials, beyond the surface of those materials. The researchers and students are working in CNDE at Iowa State University, but this is not a problem specific to people at Iowa State University, there are likely people working around the world on similar projects. The problem may occur at any point in an items lifecycle, requiring regular analysis of the material. The importance of this is crucial to ensure safe operation, where a material analysis of the inside of a material is required. Finally, we will design a product that will analyze a material to check for defects and communicate that to the analyzer.

Project Management/ Tracking Procedures

Our project is built on fundamental components that are needed before new components and programs can be integrated. Because of this we decided to use a waterfall workflow. Gitlab helps us to keep our individual parts in order and will be very effective when sharing work that multiple people will need for implementing certain components

Task Decomposition

- Matt is responsible for hardware oriented tasks.
- Rodrigo is in charge of Serial Peripheral Interface which will send and receive the signals through the DAQ and FPGA in a synchronized fashion.
- Michael is responsible for making the ADC which will convert the raw data being received by the FPGA into their real and imaginary components.
- Nathan will create an interface between the SPI and the output of the FPGA.

Project Milestones

Matt: Select ADC and DAC with compatibility to the FPGA, design the PCB, produce the PCB, integrate with pre-existing hardware components.

Rodrigo: Alquistry Lab manipulation at a high level, Verilog code for communication between radar and PC, establish the frequency regulation program.

Michael: Create a rudimentary structure for decomposing inputs into real and imaginary outputs, make the system work on a clock connected to the SPI, make the input and output into binary signals, optimize DSP as a whole

Nathan: Begin communication with FTDI chip, learn to write to pins and test the output at pins, Learn to read the value at specific pins, create a program to save data from pins into a processable format.

Project Timeline/ Schedule

- We plan to have the hardware finished by the end of the semester to give us a good foundation to finish the programming parts in the next semester
- By the end of September we expect to have the SPI done with Matt's help.
- With three members working on the same task, the DSP should take no more than a month so that should be done by the end of October.
- We expect to finish the interface and correct any bugs by the end of November
- We will use our remaining time to polish the device and test it thoroughly

Risks/Risk Mitigation

- The possible risks this team can face are about timeline, and technical knowledge in software development.
- To mitigate technical expertise knowledge this team is planning in reach out to one of the team members of the Center for Non-Destructive Evaluation who's expertise is related to programming skills and software architecture.
- To overcome any possible timeline related risks, the team plans to have more frequent meetings with the subject matter expert to get ahead faster and solve minimal difficulties.

PERSONNEL EFFORT REQ'S

- Matt estimates 75 hours
- Rodrigo estimates approximately 80 hours to complete his mission.
- Michael estimates no more than 60 hours
- Nathan estimates approximately 80 hours to complete his project milestones.