Thesis application

Participating student information

Student 1

Name : Alexander Rajula

Personal number : 8810242472

Email : alexander@rajula.org

Thesis Proposal Information

Thesis Title: Surface cross-section image generation using UWB SAR processing

Application Date (yy/mm/dd): 12/01/14

Number of Credits: 30ECTS

Company/Department
> Name: Cinside AB
>
> URL: www.cinside.se

Thesis Contact person
> Name: Dan Axelsson
>
> Email: danaxe@cinside.se
>
> Phone number: 013-212170

Thesis Starting date (yy/mm/dd): 12/01/23

Thesis Ending date (yy/mm/dd):   12/06/03

Theses languish (Eng/Swe): English

BTH supervisor requests: Mats Pettersson

Thesis Description

Background

The area of synthetic aperture radar (SAR) processing has recently gained renewed interest within the scientific and engineering community. SAR systems typically use one antenna with broad radiation characteristics, which is physically scanned over vast area. This is the process of forming a synthetic aperture. Data is recorded over the synthetic aperture using a number of pinging signals. The total amount of reflected radar signal over the aperture is collected and processed using a number of signal processing approaches. It has been shown recently that human-readable images can be generated using SAR data.

The ability of using SAR to generate images of an area is interesting, since it makes it possible to image an area without the need for optical wavelength light. In addition, SAR systems, and radar systems in general, can be designed to work in a variety of atmospheric conditions, including fog and heavy rain.

There are a number of important applications for SAR imaging, for instance weather forecasting, imaging of objects in space, detection of particles in the atmosphere and military surveillance.

Challenge and problem focus

Most SAR systems today are fastened on land-based vehicles or airplanes, since it becomes easy to quickly capture vast areas. The problem we are trying to solve in this thesis is different. It involves the objective of imaging the contents within solid objects, for instance the spacing inside a wall, or the contents of a crate which contents we would like to probe. The ideal outcome is a human-recognizable false-colored image. We propose to use a hand-held radar device, and by physically moving the radar over the container in question perform SAR imaging.

The SAR data then needs processing, and it is this processing which is the main issue in this thesis. In addition, we will need to investigate which kind of radar "ping" should be used, what antennas are most suitable in this hand-held scenario, and how the problem of synthesizing the data in the case of "fuzzy" scanning.

Two possible real life scenarios, given that the design works, is in the police force and in the medical profession. The radar device could for instance be used to look for hidden drugs and/or weapons within craters or walls. In the medical case, the radar might be used instead of ultrasound for scanning the human body.

Method/approach

- Describe your approach and what methods you are going to use!
- Motivate your approach and your methods!
- Provide a time plan!

Goal/Results

If the problem is solved, the algorithms can be implemented on a computer chip to perform image generation in real time. This will make it possible to design a device with a screen integrated with the hand-held scanning device which displays the contents of an object.

In addition, if we succeed in this endeavor, we will have shown that certain signal processing algorithms can be used for short-distance SAR processing, and also have set constraints on system parameters required for image generation to work.

Thesis Project Plan

Thesis Decision

(Departments notes only)

Decision date (yy/mm/dd): _____

Decision:_____

Appointed BTH thesis supervisor:

_____

Course code: _____

_____

Director of Studies ASB/ATS

_____

Thesis Supervisor