SPOTLIGHT SAR PROCESSOR BY USING EXTENDED FREQUENCY SCALING

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1. INTRODUCTION

In this paper, I am not writing for drawing out a development of a new SAR processing algorithm. But I write this paper to show the structure of our spotlight SAR processor which is composed of SAR processing techniques of [3]extended frequency scaling algorithm, [1]extended chirp scaling algorithm. Detailed implementation of the process will be mentioned. And I will show the simulation results, the problems that we are facing and future work.

2. CHIRP SCALING ALGORITHM

We have chosen the chirp scaling algorithm as a role model for our spotlight SAR processor. Chirp scaling algorithm is very attracting one because its procedure is very simple for using only multiplications and fast Fourier transformations. Also, it provides us high accuracy. But just chirp scaling algorithm has some limitations in application. First one is that it requires range chirped signal as an input for chirp scaling. Secondly, it can not exploit azimuth spectrum of which bandwidth is larger than the pulse repetition frequency. So, if we want to use chirp scaling algorithm as a spotlight SAR processor, then we need to combine some techniques which help us to handle range dechirped raw data and to utilize the whole azimuth spectrum.

3. RANGE, AZIMUTH SEPERATE PROCESS

With the procedure of range cell migration compensation, range and azimuth processing can be independently done. So, it is possible to use different algorithms' different part of processing of range and azimuth in combination if the azimuth phase history after range processing is the same to what the other algorithm's azimuth processing is expected to compensate for.

4. AZIMUTH RESAMPLING

We intend to build a spotlight processor which can work for sliding spotlight raw data. Two extreme cases of sliding spotlight are spotlight and stripmap acquisition. We could find detailed analysis of the relation between sliding spotlight geometry and acquired azimuth signal bandwidth from [8]one of our reference papers. In that paper, sliding spotlight factor is explained.

We also calculate the sliding spotlight factor and use it to efficiently resample azimuth data because azimuth signal bandwidth can be changed depending on different sliding spotlight fashion and is easy to over pulse repetition frequency.

5. RANGE PROCESS BY EXTENDED FREQUENCY SCALING ALGORITHM

Our spotlight raw simulation data is generated through dechirp on receive process. With this procedure, it is possible to keep range sampling frequency lower than the chirp bandwidth in some conditions.

By the way, our choice for range cell migration compensation method is range scaling rather than interpolation. It is well known that the scaling is better than interpolation in terms of performance and phase preservation.

So, extended frequency scaling algorithm is used for range processing which directly exploits dechirped raw data for range scaling.

6. AZIMUTH PROCESS BY CHIRP SCALING ALGORITHM

We use the chirp scaling algorithm for azimuth processing. It uses effective velocity for precise azimuth phase compensation on doppler frequency domain. And final processed image is attained on azimuth time domain.

7. REFERENCES

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