THE PROPOSED MULTI STEP TERRASAR-X IMAGES MATCHING METHOD

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ABSTRACT

The availability of new high resolution radar spaceborne sensors offers new interesting potentialities for the geomatics application: spatial and temporal change detection, generation of Digital Surface Model (DEM) using radargrammetry and interferometry. one of the above processes essential steps is image matching. In this Paper some existing methods for matching SAR images are discussed. The aim is multi step image matching gaining, the matching stage consists of several main parts.

1. INTRODUCTION

Today, utilizing radar imagery in different applications has been more attention by many researchers around the world due to introduction of high resolution SAR satellite sensors and data accessibility in 24 hours for all weather conditions. therefore, using high resolution SAR images in large scale mapping and specially DEM generation have been a practical reality. for example, availability of new high resolution SAR spaceborne sensors as COSMO-SkyMed, TerraSAR-X and RADARSAT-2 offers new interesting potentialities for the acquisition of data useful for the generation of DEMs and other applications. image matching is necessary for these applications. ZNCC\textsuperscript{1} is one of the most common methods in area based matching which usually leads to DEM production. ZNCC can be improved by multi size window and expanded window. Among feature based matching method, SIFT\textsuperscript{2} and SURF\textsuperscript{3} are most common methods whereas census and Ranklet are also used for sparse matching.

in this paper the multi step algorithm originated on the combination of feature and area based images matching, range and doppler are physical equations that commonly as geometric constrain for our proposed image matching.

\textsuperscript{1} Zero Normalized Cross Correlation
\textsuperscript{2} Scale Invariant Feature Transform
\textsuperscript{3} Speeded Up Robust Feature
2. METHODOLOGY

The matching step consists of several main parts. In this algorithm, a SAR image is firstly filtered by a speckle suppression algorithm and then a feature detection algorithm is used to extract feature points. Then feature descriptors are extracted and local matching is performed. In continue, using a specific criterion and metric and using geometric and radiometric constraints, the corresponding features are matched. After performing local matching, global matching is done. The aim is to the an optimal multi step image matching algorithm. Our proposed method show in fig(1).

![Diagram](image)

**Figure 1:** proposed multi step SAR image matching method

3. EXPERIMENTAL RESULTS

In this study, we use a pair of TerraSAR-X Single-Look Slant-range Complex (SSC) images with short and long baseline. The images were acquired over the city of Jam, southern Iran, in spotlight mode and descending orbit(fig2).

![Images](image)

**Figure 2:** pair of TerraSAR-X Single-Look Slant-Range Complex (SSC), acquired over the city of Jam, southern Iran
We use a part of these images by 700×700 pixels. the proposed optimization method is able to cope more complications than other methods with a high point correspondence accuracy in short and long base line images. this method match 679 point with subpixel precision for short base line images and 171 point with subpixel precision for long base line images in short time(fig3).

Figure 3: master and slave images(long base line) points extracted and image matched with proposed multi step method

4. CONCLUSION

According to the results of the experiments, finally a multi-step optimization model for matching were determined. the proposed optimization method is able to cope more complications than other methods with a high point correspondence accuracy in short and long base line images. for example, according to short and long base line image paires the proposed the multi-step approach is 11% and 23% better than feature based matching with primary window description.

REFERENCES


