Combining data obtained in different electromagnetic ranges

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I. INTRODUCTION

Images have found application in many areas. Information obtained in different electromagnetic bands can increase the efficiency of the system as a whole. As the used image diapason most often are: x-ray, ultraviolet, near and far infrared, visible, microwave ranges. This images have found application in many areas. They are used in navigation systems, security, access control, medicine, technics and technologies, space, astronomy, geodesy, construction, agriculture and etc.

Image combining technique is to combine two or more images from the same scene to obtain a single image that will have a wider viewing angle. Source images before merging can have overlapping areas, which can cause images to be captured at different times, shooting points, or sensor type.

Mainly the existing approaches have only focused on image combining from optical flow. The general algorithm for combining images can be represented as follows: from the source database, the key points are automatically determined; definition images with a lot of matching the key points; stitching of unnecessary key points; stitching selected images; postprocessing to provide an integrated seamless image [1]. Existing approaches using information from the different range are used for example in clinical medicine for the human diagnosis [2]; in the video surveillance of critical objects if there are poor visibility conditions; for tasks of stitching satellite imagery in the agricultural application areas, remote sensing [3]. The most relevant algorithms for finding camera orientation measurements when receiving adjacent frames are methods based on SIFT and SURF. These measurements are used in subsequent processing for geometric calculations and methods of seamless connection of frames. In [4], the use of a combination of SIFT and SURF creates a panoramic image. The grid registration method is used for different images where the noise level is small and the lens speed is low [5]. Widening field of view and enhancing image resolution simultaneously is a common problem for remote sensing. In addition, if there are not exact overlapping areas, there are the seams (visible lines) in the final image.

The aim of the work is to obtain a combined seamless image from several images in different spectral ranges. This work describes several algorithms are proposed based on the analysis of images, including the stitching of only single diapason images.

II. DATA IMAGES

A. Model images

The input data are pairs of images obtained in the different electromagnetic range. In the work, we have considered of fixation data from different points of view. This data has different the angle of rotation, camera parameters, time shots. In the third case, the camera is mobile. In figure 1 is the presented the model of combining data has in different electromagnetic ranges.

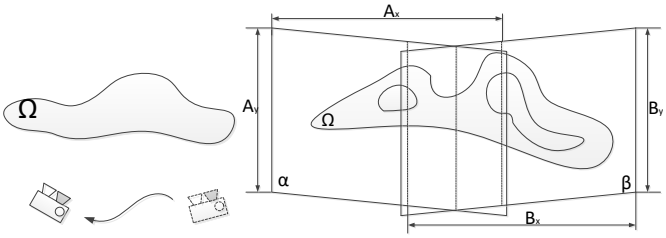

Figure 1. Model image combining.

B. Algorithm of combining data

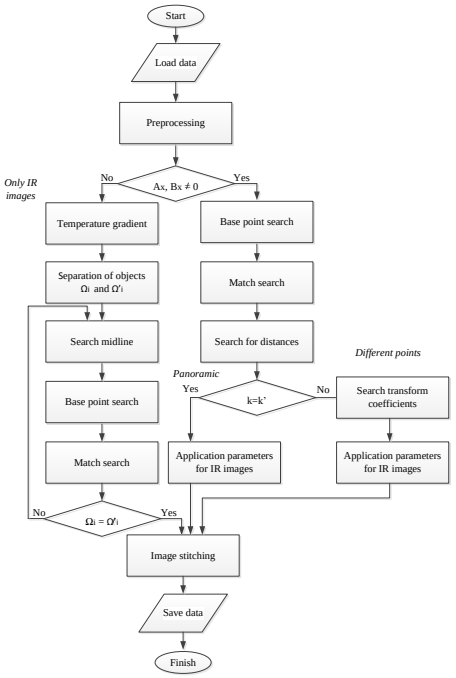

Figure 2. Algorithm combining data

III. EXPERIMENT RESULTS

The algorithm proposed in the work allows you to combine the data received by different devices. As such data, pairs of images obtained from medical or aerospace studies, microscope, X-ray, ultraviolet, infrared, microwave and visible spectors can serve as such data. As test data, we use images in the infrared, visible and X-ray ranges. Images in the visible range are obtained using a mobile phone camera with a low resolution. Images in the infrared range are obtained using a camera FLIR C2. X-ray images are obtained using a standard apparatus of medical fluoroscopy.

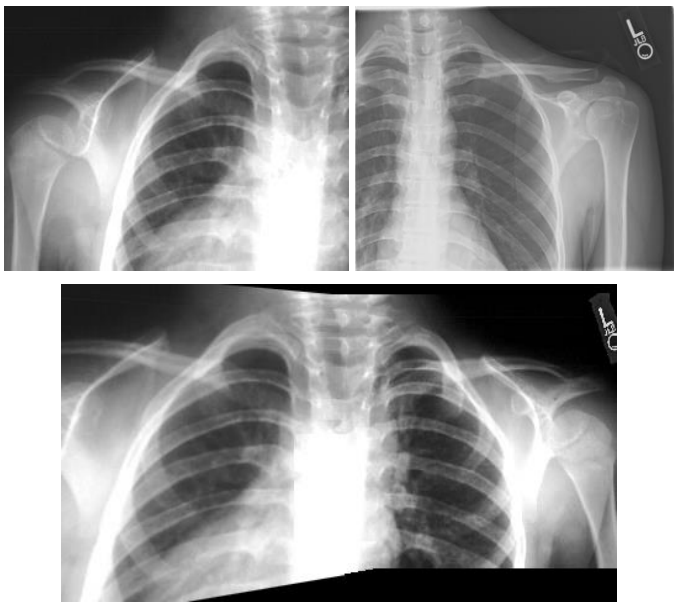

Figure 2. Experimental results.

The proposed algorithm makes it possible to combine the data obtained as by one simple of cameras and as a pair of different cameras. Limitations on the size of the matrix or type of sensor are not entered. In some cases, the correct operation of the algorithm requires manual selection of object boundaries.

The proposed algorithm can be used in many areas, including medicine, security, architecture, technology, management systems, agriculture, livestock, etc.

ACKNOWLEDGMENT *(Heading 5)*

This work was supported by Russian Ministry of Education and Science in frame of the Federal Program "Research and development on priority directions of scientific-technological complex of Russia Federation in 2014-2020" (contract № 14.577.21.0212 (RFMEFI57716X0212)).

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