Analysis of informativeness

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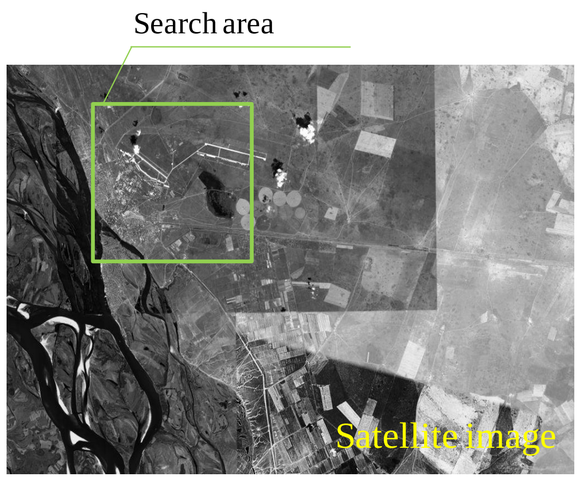
Abstract

Informativeness – (in this work) probability to find some fragment on given image.
This probability are found by repetitively simulated work of searching algorithm on imagery.
The aim is a saliency map, which shows an area of the image suitable for UAV(Unmanned Air Vehicle) navigation.

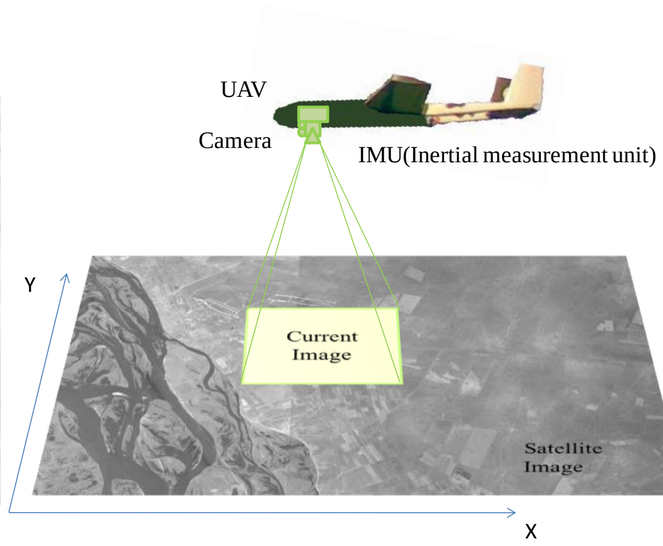
Motivation

This work allows to check up algorithms robustness and images quality (suitability for correlation algorithms work).
Saliency map may be used for determination of airplane flight trajectory.

Theoretical approach



Getting an satellite image from database



Imitation of shooting a picture from airplane

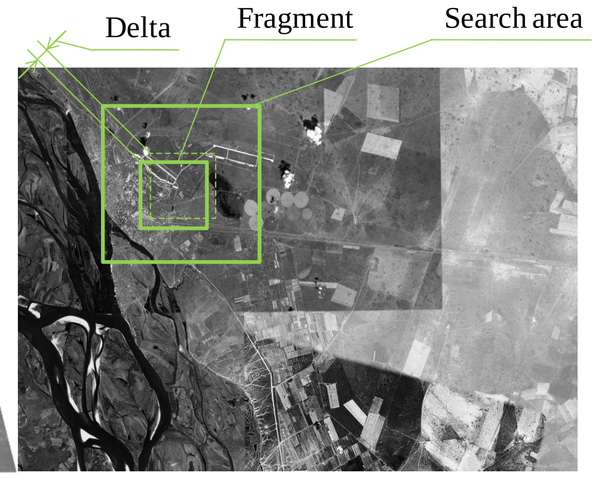
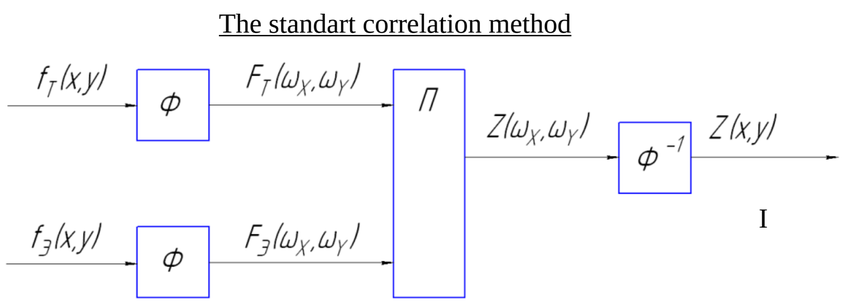


Image geo-tagging

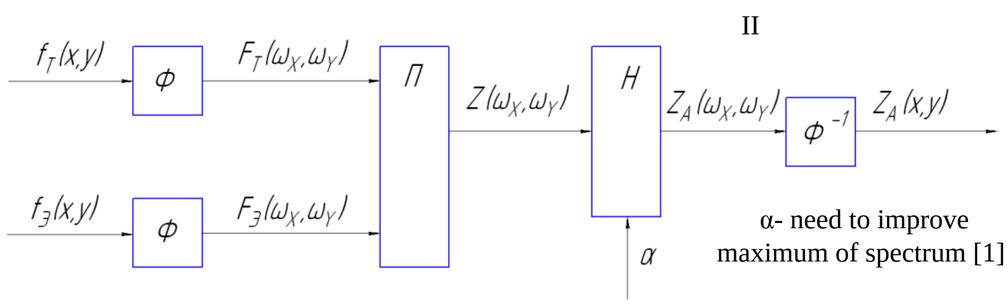
Algorithms

The standart correlation method



I

The method of phase correlation



II

α- need to improve maximum of spectrum [1]

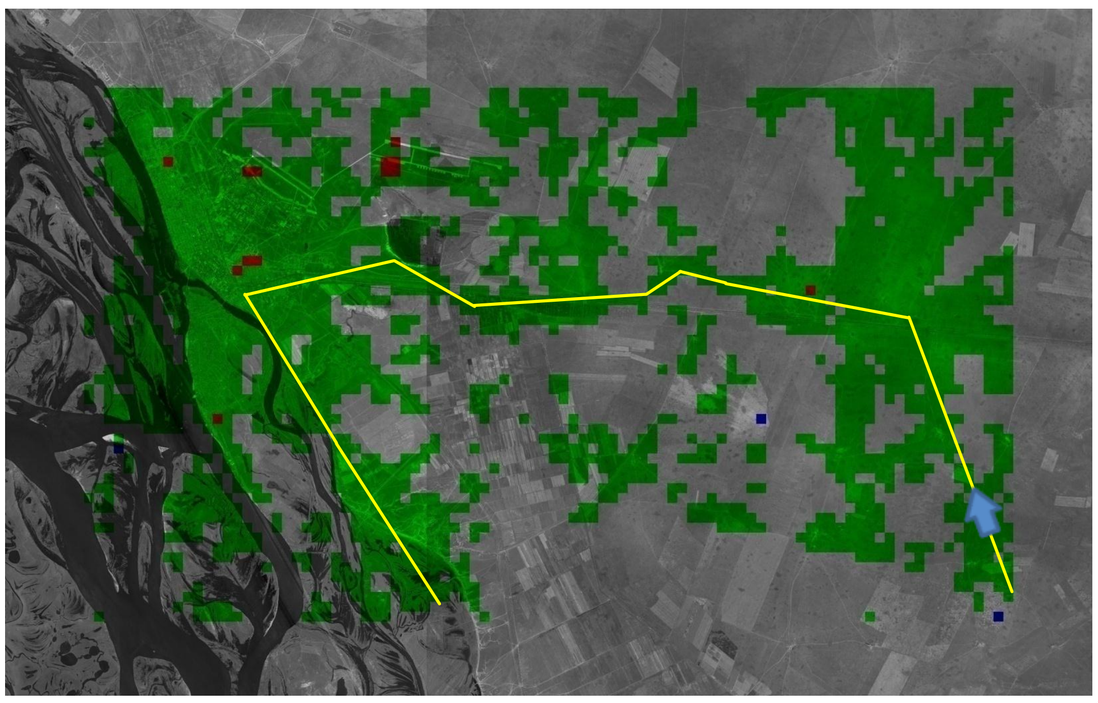
Results: "Saliency map"

Red pixels: Both methods

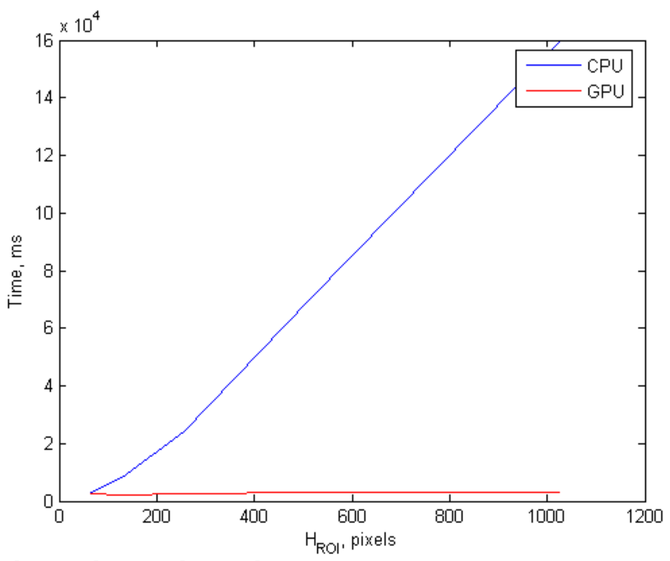
Green pixels: Only II method

Blue pixels: Only I method

Yellow line - a possible trajectory of a plane.



Time estimation

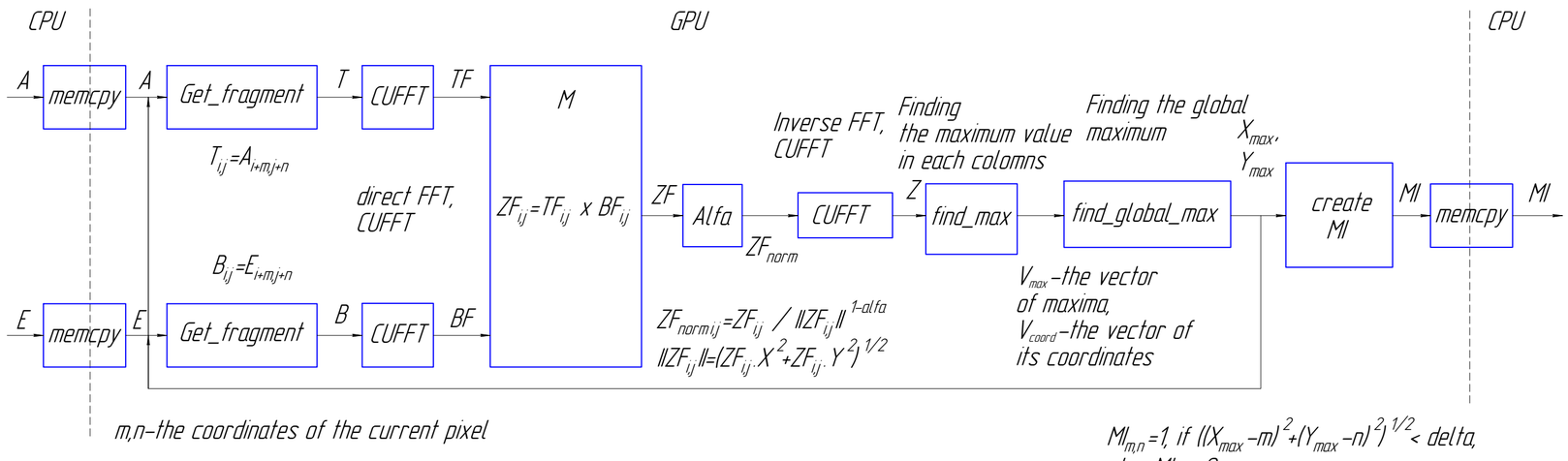


The results are obtained on
CPU – Intel(R) Core(TM) i7 930 2.80GHz
GPU – NVIDIA GTX480

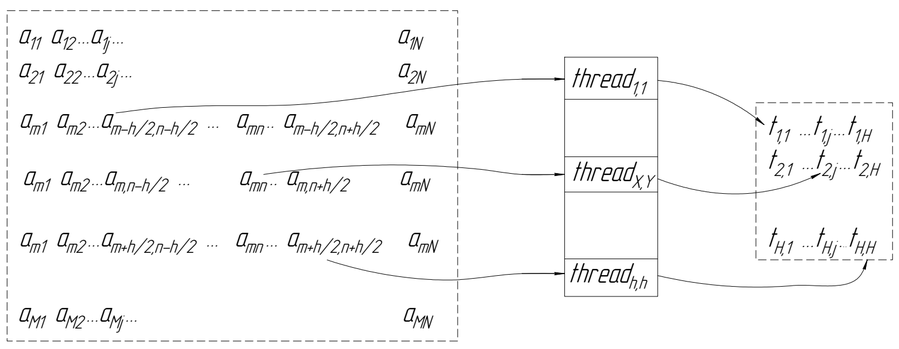
Parallelization

Algorithm parallelization. CUDA technology

The structure of the parallel program



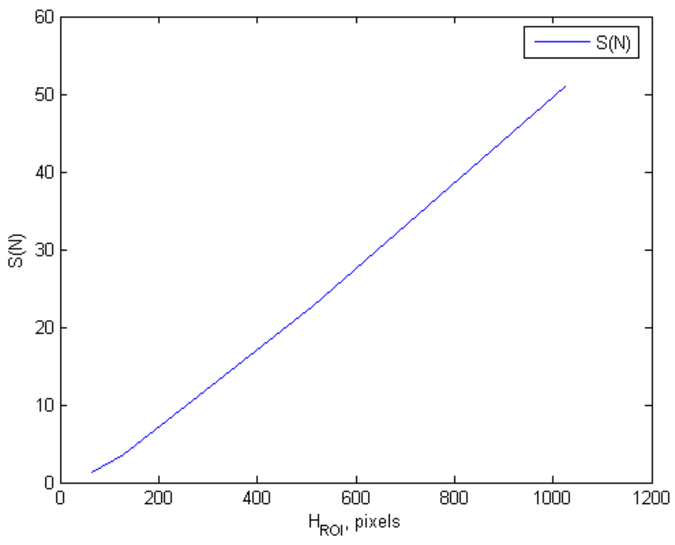
Example of parallelization of the function Get_fragment



$V_{max\,j}=max(Z_j)$,
$V_{coord\,j}=i_{max\,j}$

```
X=bx*DBx + tx ;
Y=by*DBy + ty ;
bx = blockIdx.x ;
by = blockIdx.y ;
tx = threadIdx.x ;
ty = threadIdx.y ;
DBx = blockDim.x ;
DBy = blockDim.y
```

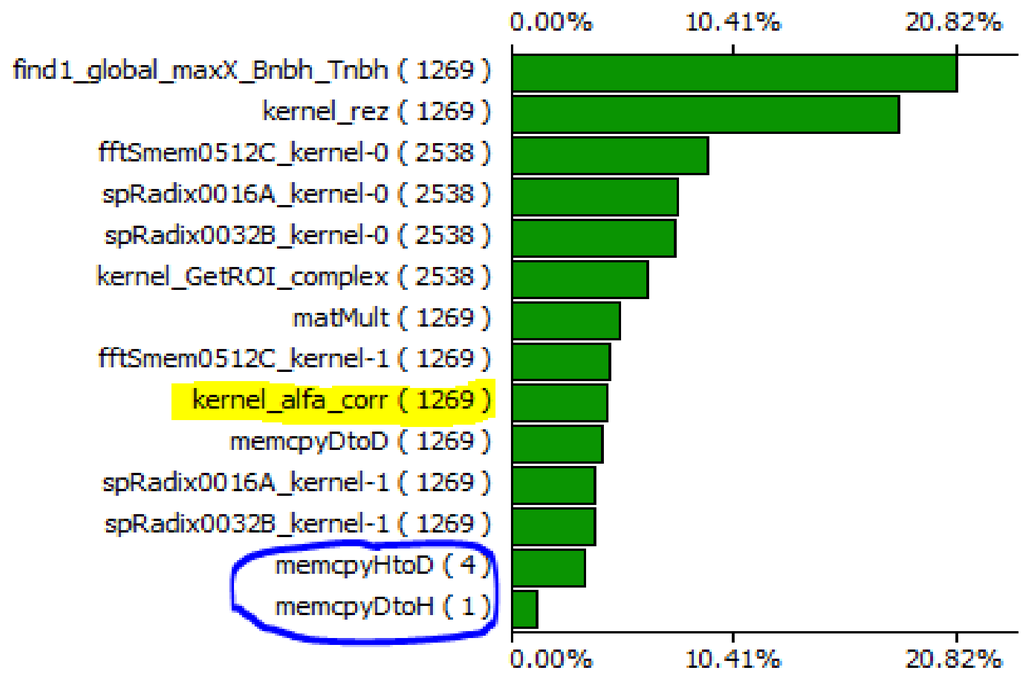
Acceleration



Conclusion

- Obtained a workable software, with the implementation of the algorithm for the graphic card processor.
- An acceleration achieved more than 50 times compared to a sequential version on the real data.
- A comparison of two algorithms of image tagging was carried out.
- Software implementation was optimized with using CUDA profiler.
- Using CUDA is a good and simple way to speed up your application if you work with large images.

Optimization: CUDA profiler



Acknowledgement

This work had been defended as diploma in BMSTU and I dedicate that to Aleksey and Vladimir Torshilov.

References

[1] В.К.Баклицкий, А.М.Бочкарев, М.П.Мусьяков "Методы фильтрации сигналов в корреляционно-экстремальных системах навигации"-М.: "Радио и связь", 1986