Leaders of digital

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Task

Create soft, which would be able to track changes in the nearly homogeneous satellite data, represented as a frame. More specifically, some polygons of nearly homogenous data are given and we need to provide information whether they have changed with the time flow.

Idea

We may consider this task as kind of anomaly detection task. In this case we have some "normal" texture, which the data has. So, parts where the texture changes a lot may be considered as an anomaly.
IN THEORY EVERYTHING WORKED THIS WAY
However, in fact we have received data, where a lot of heterogeneous data was considered as a homogeneous one, so there is no common texture. We may try to find several textures via some kind of color segmentation, however another task-specific way was chosen.
Whole picture is a number of polygons. In theory, one polygon should be assigned to one object. De facto there are several different objects per one polygon. So, each polygon should be divided into sub-polygons.
There are several different possible anomaly cases:

1. value change of pixel differs a lot from the mean of the sub-polygon
2. value change of pixel differs a lot from the mean of the polygon
3. value change of pixel differs a lot from the mean of all the polygons
4. mean value change of the mean of the sub-polygon changes a lot from the polygon
5. mean value change of the polygon changes a lot from overall mean change

Definitions

- $\overline{dK}$ - mean value change in K;
- dk_i - value change for ith element of the K;

- $S(K)$ - square of the K
- $corr(a, b)$ - correlation between a and b, returns value $[-1; 1]$
- $1_{condition}$ - equals 1 if *condition* holds and is equal to 0 otherwise
- $pol(K)$ - returns polygon for the sub-polygon
- $dPols$ - all the polygons' change mean
- $score(dk_i)$ - value in range $[0; 1]$ which indicates certainty of the anomaly

Formula

There are several terms, which do affect the score, and we may create a $6D$ $certaintyvector$ (CV), which produces the certainty about the exact pixel. After that we may apply different losses to it — create a coefficients etc.

$$\begin{aligned}
-corr(dk_i, \overline{dK}) \\
-corr(dk_i, \overline{dpol(K)}) \\
-corr(dk_i, \overline{dPols}) \\
-corr(\overline{dK}, \overline{dpol(K)} \\
-corr(\overline{dK}, \overline{dPols} \\
-corr(\overline{dPols}, \overline{dpol(K)}
\end{aligned}$$