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UAS Techniques for Environmental Monitoring

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Remote-sensing assessment of urban forest parks in Karlovo

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Introduction

- The knowledge about urban green infrastructure (UGI) is important for maintaining the quality of life in urban regions.
- The perspective of rapid urban sprawl generates a need of establishment and use of adequate system for monitoring the condition of the urban ecosystems and green spaces.

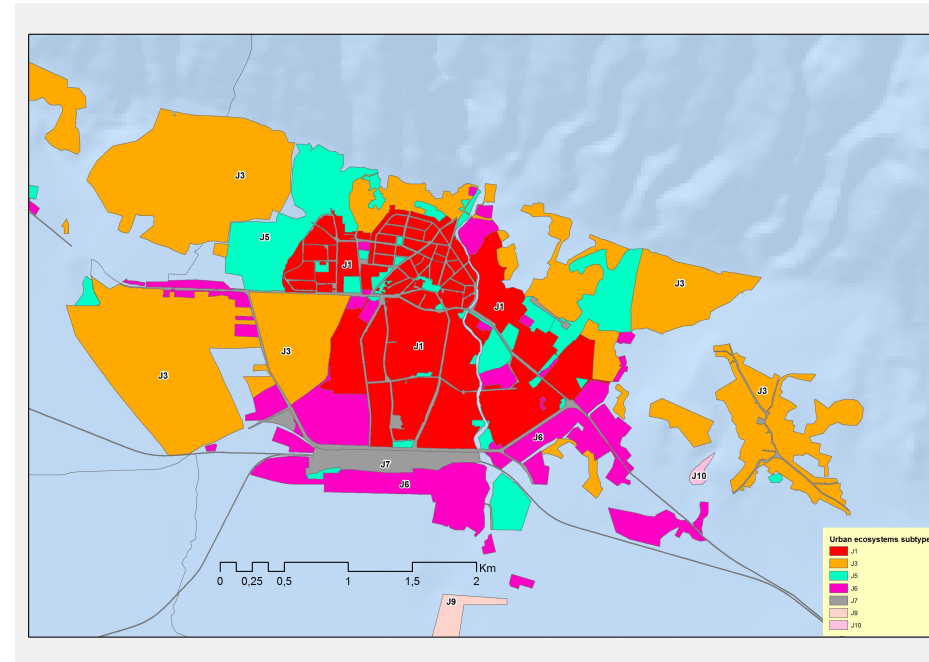


Aim

- In this study are presented the results of the assessment of UGI of Karlovo city (BG) through application of remote sensing Unmanned aerial vehicle (UAV) technology

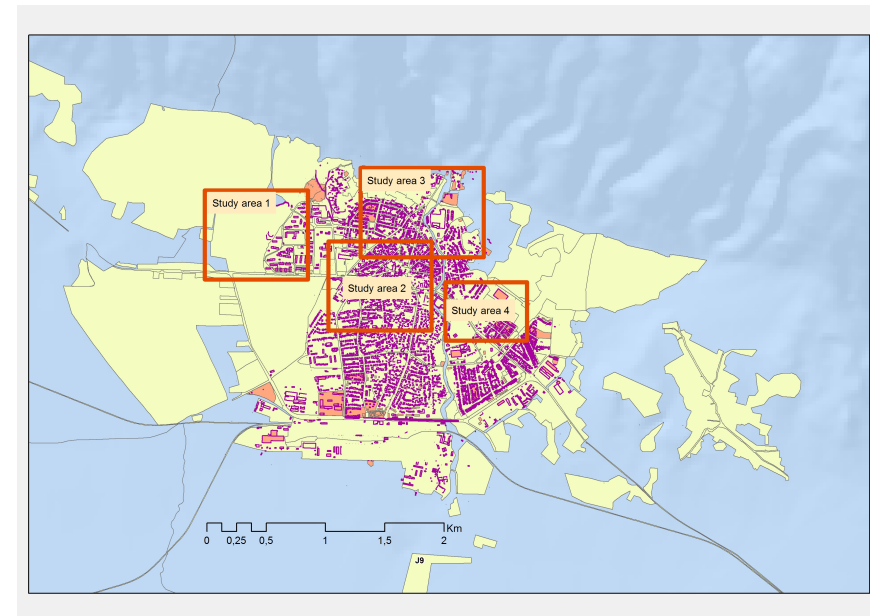
Material and methods

- Karlovo city: a total number of 7 subtypes of urban ecosystems are defined
- J5 – subtype is “Urban Forest park”: object of present study



Studied UGI sites

- Study area 1 - 'Apostolova gora' park;
- Study area 2 - Central part of the city;
- Study area 3 - 'Hunting park' and the city stadium area;
- Study area 4 - area of 'Suchurum' waterfall (Northern park)

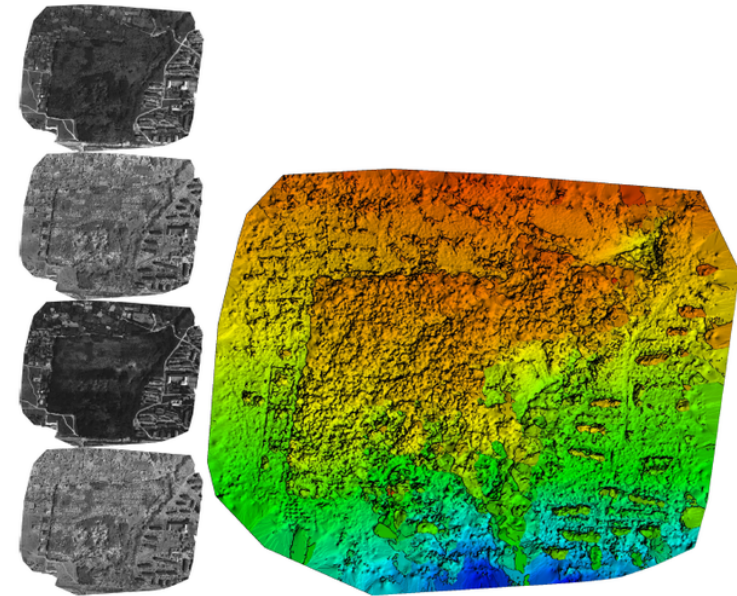
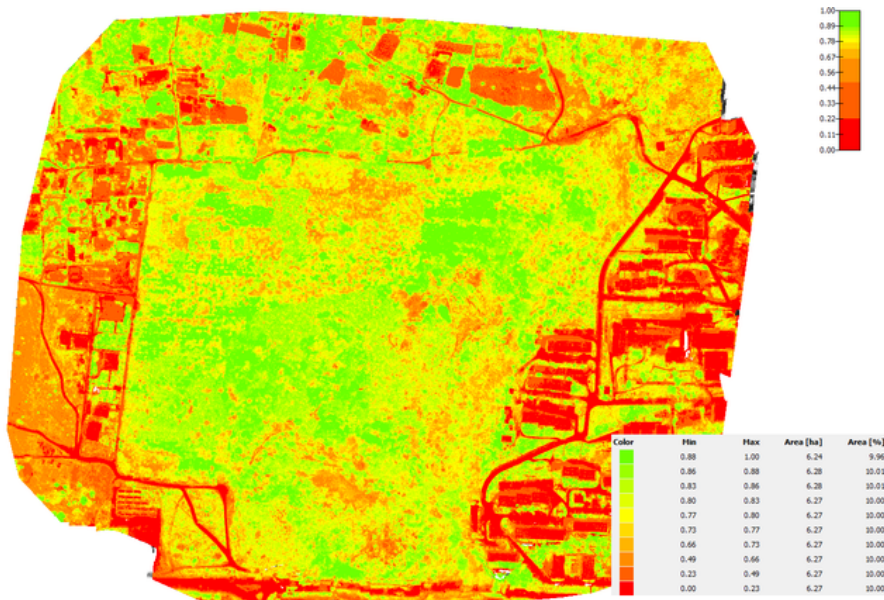


Remote-sensing

- Multispectral camera 'Parrot SEQUOIA', integrated with a specialized professional UAV system of type 'Flying Wing'
- Standard RGB channel
- The camera was equipped with a solar radiation sensor which serves for calibration of the obtained reflex images.
- For accomplishment of the assessment NDVI (Normalized Difference Vegetation Index)
- The field mission was preceded by careful planning and drawing up of a precise flight plan. The missions' planning was performed using SenseFly-E-motion specialized platform
- Imaging was performed with sensors for gathering of positioning and quality data (about the condition of the ecosystems) with the assistance of professional UAV system eBee that utilizes photogrammetric and multispectral cameras. The gathered field information was processed by specialized platform for photogrammetric processing Pix4D Professional Mapper.

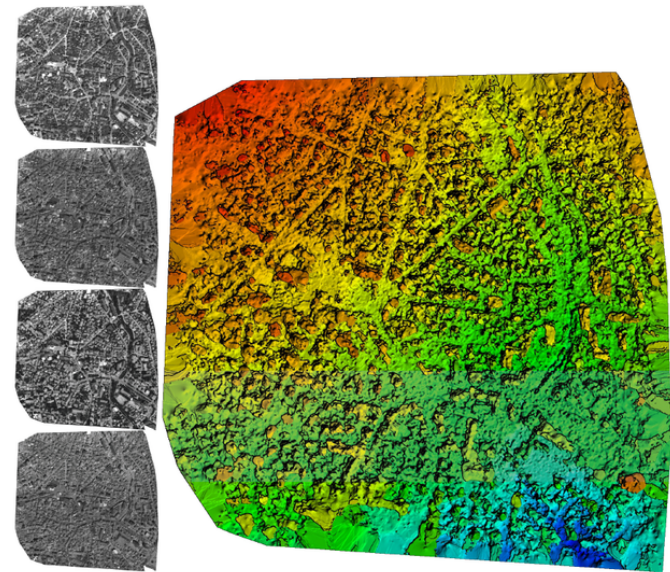
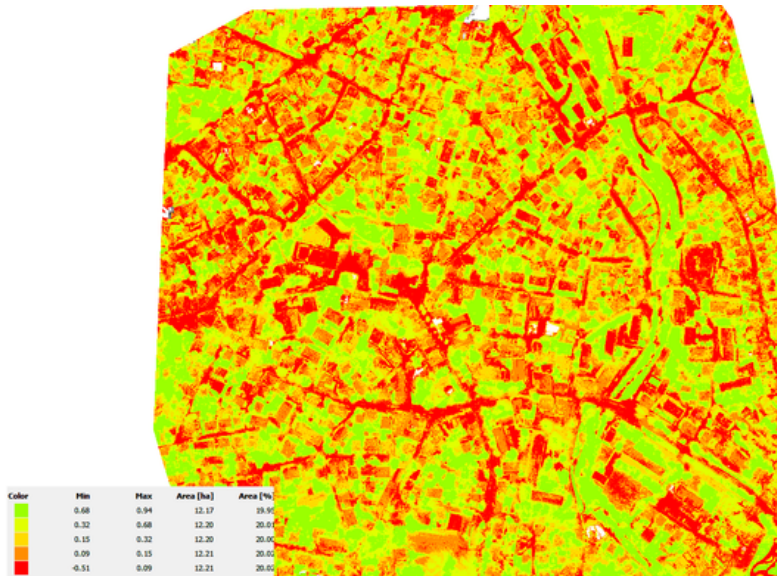
Results: Study area 1

- The map scheme clearly showed the areas with a high value of vitality of the vegetation cover, as well as those with a lack of vegetation cover and vegetation in an unsatisfied condition.
- In almost 50% of the studied area the vegetation index is more than 0.75, but in the park territory can be seen relatively large areas with poor vegetation and corresponding NDVI index values between 0.6 and 0.7.



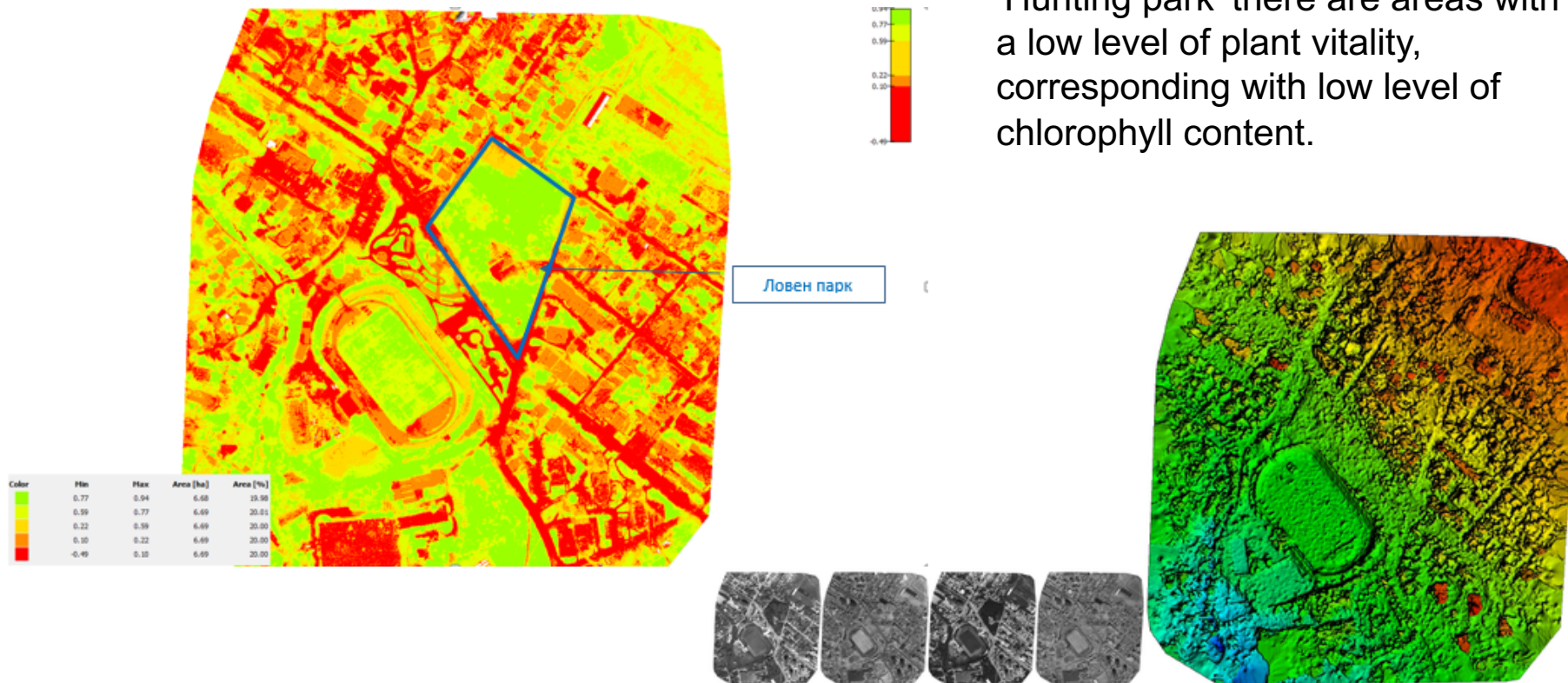
Results: Study area 2

- Generally, in this part of urban area of Karlovo the elements of green infrastructure are the most fragmented and have the smallest coverage.
- More than 50% of the territory represents embedded and built-up areas without vegetation cover.
- Only about 15% of the central part of the city has an NDVI index more than 0.75.



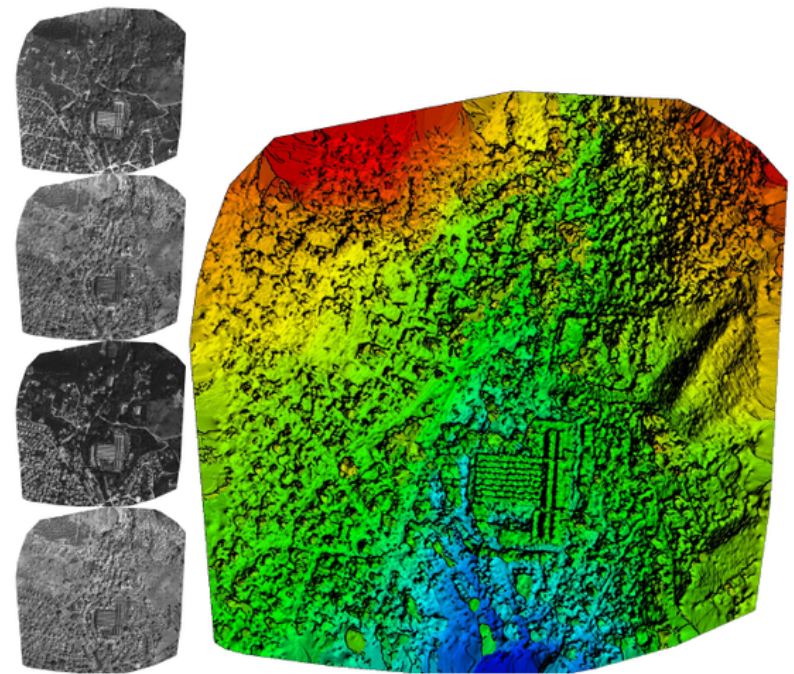
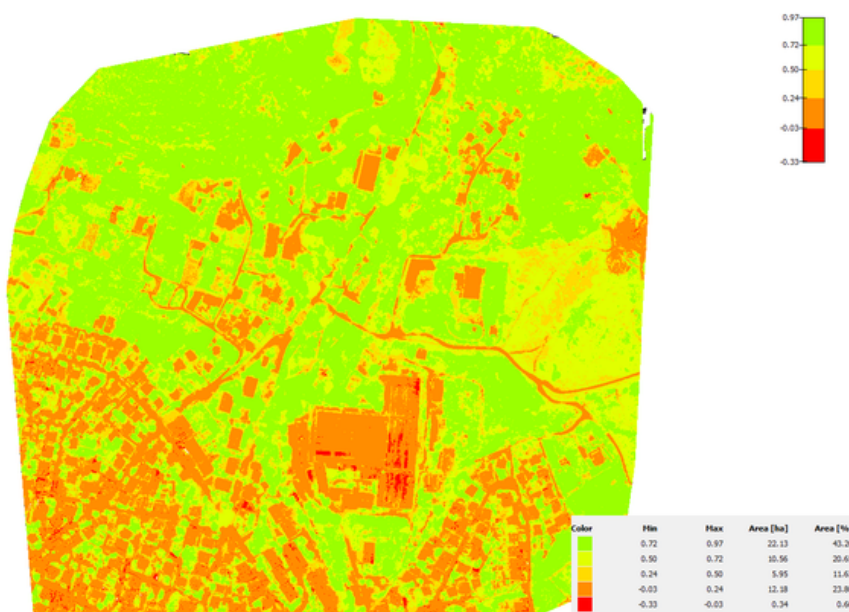
Results: Study area 3

- Around 20% of the examined territory has a NDVI indexes above 75% which is due to the large areas with green infrastructure and good vitality of the vegetation.
- Data analysis shows that in 'Hunting park' there are areas with a low level of plant vitality, corresponding with low level of chlorophyll content.



Results: Study area 4

- The examined area is characterized with relatively good condition of green system.
- For more than 40% of the whole territory the index values above 0.7 were calculated.
- These values show high level of plant vitality and relatively good spatial coverage.



Conclusion

- The results showed that the implementation of this approach could be used extensively for remote monitoring of green systems in settlements with subsequent detailed investigation of solitary trees for assessment of their health status, which could be an effective support tool for decision-makers.
- *Dimitrov et al. 2018. "Integrated assessment of urban green infrastructure condition in Karlovo region by in-situ observations and remote sensing. One ecosystem (under press)*



Thanks for your attention!