Use of remote sensing technology for non-invasive survey of wall paintings, plasters and pictures

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Abstract:

In conservation and detection of counterfeits the modern method of radiometrical measurements is often used. It means a survey using ultra-violet, visible and infrared part of electromagnetic radiation. Hyperspectral or standard (in countable defined spectral range) approach is used. A new project named "New Modern Methods of Non-invasive Survey of Historical Site Objects" started at CTU in Prague with the New Year. The project is designed for four years and is funded by the Ministry of Culture in the Czech Republic. It is focused on material and chemical composition, damage diagnostics, condition description of paintings, images, construction components and whole structure object analysis in cultural heritage domain. This paper introduces used instruments and shows the first results in the historical painting field. Infrared reflectography and hyperspectral imaging have been used for painting documentation. 17th century painting "On the Road" by Flemish author Thomas van Apshoven was chosen for the first analysis with a kind permission of academic painter Mr. M. Martan. Hyperspectral analysis using VNIR (400-1000nm) and IR reflectoscopy method have been applied on oil on wooden board painting. Different results of details were given. The goal was to detect and visualize the underdrawings made by the author. It was found, that IR reflectoscopy gives sufficient outcomes and searched lines are clearly visible on an IR photoghraphy. Hyperspectral approach to the painting analysis was discovered as more complex. First results show, that the VNIR spectral range is not enough to penetrate under the upper drawing, but it is possible to make a spectral library of searched materials. Bigger wavelengths are superior and the range 1500-1800nm needs to be discovered. For this reason, experimental IR reflectoscopy was done using hired special CCD Hamamtsu camera in 1500 – 1800nm wavelengths. Using the new instrument we will be able to locate the underdrawings as well as enlarge the spectral profile of desired materials and colors. Other funding sources are to be found for extended VNIR or SWIR instruments; we will purchase a special SWIR camera or hyperspectral SWIR camera for other research. In next steps of the project another methods for painting exploration will be studied. Future work in this field is to create a spectral library for mid-european materials used for paintings. By historical plasters, we use other method like thermal imaging and ground penetrating radar. This contribution will refer about first result of our project.