коллоквиума, защиты реферата или индивидуального задания; итоговый - контроль за аттестационный период по результатам тематического и модульного контролей; заключительный - определение и оценка успеваемости за весь период изучения дисциплины. Данный вид контроля проводится в форме тестового экзамена [1].

Таким образом, преподавание химии в системе модульного рейтингового обучения отличается от традиционного не только структурой, композицией содержания, но и объяснением нового материала. Прежде всего, решаются различные проблемные вопросы. На первый план выдвигаются научность, исследовательская работа. Студенты получают материал не в готовом виде, они вводятся в круг проблем и самостоятельно ищут пути их решения, осваивая не только содержание знаний, но и способы их получения.

Модульное обучение значительно обогащает профессионально-методическую подготовку будущих специалистов, способствует развитию их творческого потенциала, инновационного мышления , усиливает подготовку к реализации технологического подхода в образовании, что способствует формированию компетентности у выпускников высших учебных заведений, в том числе и Национального университета биоресурсов и природопользования Украины.

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INNOVATIONS IN THE GEOSCIENCE RESEARCH: CLASSIFICATION OF THE LANDSAT TM IMAGE USING ILWIS GIS FOR GEOGRAPHIC STUDIES

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Environmental mapping is a necessary tool for the geoscience research in the university classes of geography, GIS cartography and mapping. However, GIS methods of processing remote sensing data are often being discussed, and the optimal approaches are disputed. This work reports innovative approach of the processing Landsat TM satellite image in ILWIS GIS software using unsupervised and supervised classification methods. The methods of ILWIS GIS are compared and the results described below.

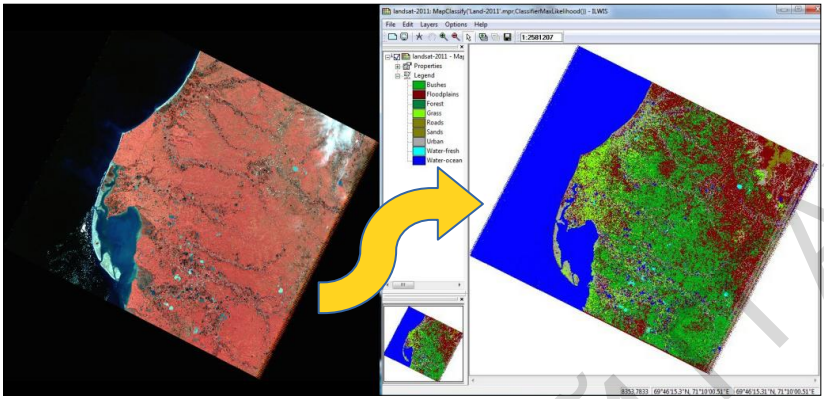

Figure 1. - Supervised classification of the Landsat TM satellite image

The unsupervised classification made using function “Cluster” from the “Operation”, “Image processing” ILWIS menu, does not provide reliable results for the image classification, as it shows separate vegetation classes merged into one. Furthermore, during unsupervised classification various shadows of the same object class are sub-divided into additional classes, e.g. there are various “water” and “grass” classes. The unsupervised classification may be applied when the region is unknown or there is uncertainness in recognizing the area. Therefore, spatial analysis is best to do using supervised classification with training pixels, representing land object classes, homogeneously spread over study area. The main principle for object recognition is similarity of spectral signatures.

Supervised classification is innovative method in geographic research. Supervised classification of the raster imagery aimes at the recognizing of the class membership for each pixel during image analysis. Several approaches of supervised classification have been described previously (Julien et al., 2011) reporting various methods of image classification, from which the most well-known are Maximum Likelihood Classifier and Nearest Distance Classifier. The Maximum Likelihood Classifier is one of the most used, due to its easy and intuitive logical methodology, ease of application and simplicity (Du et al., 2010). Besides, the Maximum Likelihood Classifier enables to receive the most homogenous classes in the classification results, comparing to other methods (Virtanen et al., 2002). The “a priori” knowledge of the location and identity of various landscape features and land cover types are indispensable for the correct classification.

The supervised classification of the multi-spectral imagery has been performed using 'Classify' operator in ILWIS applied to Landsat TM 1988. The classification process included following steps. First, the models of the classes were defined by creating a "sample sat" in ILWIS GIS. Namely, the training pixels with similar spectral values were defined and selected as representations for various classes. These pixels have contrasting colors, visually visible and distinguishable on the image, which serve as training areas for diverse classes (Tab.1). The sample pixels

were defined in the Sample Set Editor in ILWIS, which was initially created in the main menu. A created Sample Set has a reference to the set of Landsat bands (1-7), which are needed to create sample statistics. After assigning pixel sets, a raster polygon map was automatically created with .mpr file extension. It contained sample pixels, location and legend, i.e. the names of the classes allocated to pixels. Easy interpretation of the image strongly depends on the optimal color composite map. Therefore, to choose proper combination of bands I used interactive color composite using "Map List as Color Composite" function in ILWIS GIS, which enabled to interactively configure combination of bands and to change various images in order to achieve the optimal visualization of the color composite. The combinations of the RGB menu, HSI (Hue, Saturation and Intensity bands) and YMC (Yellow, Magenta, and Cyan) were also tested. Finally, the band combination of 5-2-1 was accepted. The next step consisted of actual supervised classification. The ILWIS GIS classification menu enables to choose several possible classifiers, from which the Maximal Likelihood was chosen. Training pixels were extracted in Sample Set Editor indicating the representative land cover classes. The classification has been completed in interactive way, using several attempts of creating training samples, selecting various sample sets and respective pixels selected in Sample Set Editor using domain for classification "Landclasses". The classification was repeated the until the final results were achieved (Fig.1). Shadows of green colors represent grass, shrub vegetation coverage and forest canopy.

Table 1. - Land cover classes: summary of characteristics and features

Land Cover Class	Brief Description	No of Pixels	Landsat TM: natural color composite	Landsat TM: false color composite
Grass	Sparse vegetation with low density	22	Light greenish	Light dull bordeaux to dark pinkish
Bushes	Dense vegetation coverage	16	Green, smooth texture	Dull red
Forest	Forest canopy	73	Camouflage green	Dark bordeaux
Urban areas	Human settlements (towns, villages)	10	Grey and greenish grey	Violet and lilac
Fresh water	Rivers and lakes	332	Navy blue	Soft-to dark blue
Salt water	Ocean	5295	Dark blue	Almost black
Flood plains	River flood areas, alluvial land	4	Dark grey	Brownish red
Roads	Road network	3	Steel grey, slightly purple	Dark brown
Sands	Exposed sands, rocks & soils without vegetation	114	Light aquamarine	Light rose, pink

The results demonstrate successful application of the innovative approach of technical satellite image processing for the studies of the environment. The presented methods can be used by students of geography.

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БЯСПЛАТНАЯ ВЫШЭЙШАЯ АДУКАЦЫЯ ЖАНЧЫН ЗНАХОДЗЯЧЫХСЯ Ў АДПАЧЫНКУ ПА ДОГЛЯДУ ЗА ДЗЯЦЬМІ ЯК КРЫТЭРЫЙ АДПАВЕДНАСЬЦІ ЎЗАЕМААДНОСІН ДЗЯРЖАВЫ ГРАМАДСТВА І СЯМ'І

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У сучасным грамадстве не дастаткова аднаго жадання, каб атрымаць у пэўнай сферы дзейнасці вышэйшую адукацыю. Праблематычнасць бачыцца не толькі ва ўзроўні прафесійнай падрыхтаванасці грамадзян краіны, але і ў платнасці адукацыйнага працэсу, што на сённяшні дзень з'яўляецца перашкодай да самаўдасканальвання як асобы, так і агульнага развіцця грамадства на інтэлектуальнай аснове якога грунтуецца і агульный дабрабыт. Зыходзячы з раздзелу ІІ, артыкула 49 Канстытуцыі Рэспублікі Беларусь беларускім грамадзянам гарантуецца даступнасць і бясплатнасць агульнай сярэдняй і прафесійна-тэхнічнай адукацыі [3]. У сваю чаргу, вышэйшая адукацыя прадугледжана для ўсіх у адпаведнасці са здольнасцямі кожнага. Але атрыманне бясплатнай адукацыі ў дзяржаўных навучальных установах дапушчальна выключна на конкурснай аснове. Паводле Кодэкса Рэспублікі Беларусь “Аб адукацыі” ад 13 студзеня 2011 №243-З [2] вышэйшая адукацыя характарызуецца фарміраваннем ведаў, уменняў, навыкаў і інтэлектуальнага, маральнага, творчага і фізічнага развіцця асобы. Што адлюстроўвае з боку гледжання дзяржавы характар адукацыіі як сыстэмнна прадугледжаный працэсс. А таму дастаткова лагічным і мэтазгодным на думку аўтара выглядае прапанова па наданню увагі у адносінах адукацыі жанчын, знаходзячыхся ў адпачынку па догляду за дзецьмі да трох гадоў. Такі спецыфічны падыход у дачыненні да дадзенай катэгорыі грамадзян абумоўлены неабходнасцю бесперапыннага падтрымання прафесіяналізму жанчын на належным узроўні. Што мае самае непасрэднае дачыненне да захавання іх статусу у сям'і і