

6. Existing digital models of relief in the Republic of Croatia
7. Island of Mljet
8. Program packages for computer relief shading
9. Analysis of results
10. Conclusion

The thesis compares five program packages for automatic relief shading. The introductory part begins with a review of the past development of computer shading, noting that a comprehensive analysis of all program packages in one place hasn't existed until now.

A prerequisite for good shaded relief presentation is the familiarity with types and way of presenting relief on the maps, therefore the third chapter contains a review of relief presentations on maps with isolines, cotes, symbols, rock drawings, hipsometric tint scale, hatching and shading. However, a prerequisite for quality relief presentation with automatic shading is a good digital relief model. The fourth chapter discusses the production, processing, interpretation, visualization and the applications of DMR.

Theory basics and principles of shading are discussed in the fifth chapter. Classic and computer relief shading are compared. The rules of cartographic shading are also discussed, as well as the rules of dependence of resolution of digital relief model and the presentation scale.

Existing DMRs in the Republic of Croatia (HRT, State Geodetic Administration, Gisdata, Geofoto, Institute of Photogrammetry) are mentioned in the sixth chapter.

The island of Mljet was chosen for the practical part of the work, and the shading of the chosen model was carried out with program packages Surfer, Scop, Idrisi, Arc View and Terrain Analyst. Surfer was processed the most thoroughly (the

working principles, the data files production, the net file production, interpolation and approximation, the methods of net drawing and the production of maps from isoline maps, perspective relief presentations and shade maps are explained). A presentation of the program package Scop is given briefly by its modules, and practical shading was carried out at the Institute of Geodesy in Rijeka. The principle of the ArcView program package was given by modules needed to produce a triangle net, and ArcView Spatial Analyst – a module for modelling raster data, and the practical shading with ArcView program package was carried out at Gisdata in Zagreb. Shading with the Idrisi program package was carried out with version 32, which was available on the Internet as a demo version, and the shading was carried out on the basis of triangle net created with the TIN/CIP module with the Terrain Analyst program package.

At the end of the eighth chapter, you can find a short presentation of some other program packages for automatic relief shading. The following are mentioned: Rivertools, MapRender3D, MicroDEM, 3DEM, Terrain Modelling, GRASS – GIS, TruFlite's 3D, LandSerf and Vulkan. Their capabilities and prices are also listed.

In the end, there is an analysis of the results of shaded relief presentations carried out on the test model of the island of Mljet and a comparison with hand shading. One could say that the shaded relief produced with the Surfer program package doesn't satisfy the cartographic needs; the shaded relief produced with the Scop program package is much better, and the one produced with the ArcView program package, in the author's opinion, is the best and that it best fits classically made shadows. It is essential to say what is the reason for shading and for what needs the program package in question is for; but only Scop, ArcView and Terrain Analyst are professional program packages that can be applied in cartography.

*Stanislav Frangeš*

## *Vlado Cetl, MSc in Technical Sciences*

**V**lado Cetl defended his Master's thesis titled *The Role of Cadastre in the National Infrastructure of Spatial Data* at the Faculty of Geodesy, University of Zagreb on the 8th of May 2003. Prof. Dr. M. Roić was his advisor, and Assist. Prof. Dr. S. Mastelić Ivić, Prof. Dr. Z. Kapović and Prof. Dr. M. Roić were the members of the Commission for the evaluation and defence of the thesis.

Vlado Cetl was born in Pakrac on 14th June 1975. He attended and finished the primary school in Vrbovec. He graduated from the Secondary Technical School "Ruđer Bošković" in Zagreb in 1993 with excellent marks. In the same year he enrolled at the graduate studies of the Faculty of Geodesy, University of Zagreb. In the academic year 1995/96 he received the Rector's reward, and in the year

6. Postojeći digitalni modeli reljefa u Republici Hrvatskoj
7. Otok Mljet
8. Programski paketi za računalno sjenčanje reljefa
9. Analiza rezultata
10. Zaključak

U radu je provedena usporedba pet programskih paketa za automatsko sjenčanje reljefa. Uvodni dio započinje pregledom dosadašnjeg razvoja računalnog sjenčanja, s napomenom da u tu svrhu do sada nije dana sveobuhvatna analiza programskih paketa na jednome mjestu.

Preduvjet za dobar sjenčani prikaz reljefa je dobro poznavanje vrsta i načina prikaza reljefa na kartama, stoga je u trećem poglavlju dan pregled prikaza reljefa na kartama izohipsama, kotama, signaturama, crtežom stijena, hipsometrijskom skalom boja, šrafama i sjenčanjem. Međutim, preduvjet za kvalitetan prikaz reljefa automatskim sjenčanjem je dobar digitalni model reljefa. U četvrtom poglavlju govori se o izradi, obradi, interpretaciji, vizualizaciji i primjenama DMR-a.

U petom poglavlju obrađene su teorijske osnove i principi sjenčanja. Uspoređuje se klasično i računalno sjenčanje reljefa, govori o pravilima kartografskog sjenčanja te o ovisnosti rezolucije digitalnog modela reljefa i mjerila prikaza.

U šestom poglavlju spomenuti su postojeći DMR-ovi u Republici Hrvatskoj (HRT, Državna geodetska uprava – DGU, GISDATA d.o.o., Geofoto d.o.o., Zavod za fotogrametriju d.d. Zagreb).

Za praktični dio rada izabran je otok Mljet, a sjenčanje izabranog modela provedeno je programskim paketima Surfer, Scop, Idrisi, Arc View i Terrain Analyst. Surfer je najdetaljnije obrađen (objašnjeni su princip rada, stvaranje datoteke podataka, stvaranje datoteke mreže, interpolacija i

aproksimacija, metode crtanja mreže te izrada karata od karata izolinija, perspektivnih prikaza reljefa i karti sjena). Prikaz rada programskog paketa Scop ukratko je dan preko njegovih modula, a praktično sjenčanje obavljeno je u Geodetskom zavodu u Rijeci. Princip rada programskog paketa ArcView prikazan je s pomoću modula potrebnih za automatsko sjenčanje reljefa, i to: ArcView 3D Analyst – modula za izradu mreže trokuta, i ArcView Spatial Analyst – modula za modeliranje rasterskih podataka, a praktično sjenčanje programskim paketom ArcView obavljeno je u tvrtki GISDATA d.o.o. u Zagrebu. Sjenčanje programskim paketom Idrisi provedeno je verzijom 32, koja je kao "demo" verzija dostupna na internetu, a sjenčanje programskim paketom Terrain Analyst provedeno je na temelju mreže trokuta izrađene modulom TIN/CIP.

Na kraju osmog poglavlja može se naći kratak prikaz još nekih programskih paketa za automatsko sjenčanje reljefa. Spomenuti su Rivertools, MapRender3D, MicroDEM, 3DEM, Terrain Modelling, GRASS – GIS, TruFlite's 3D, LandSerf i Vulkan te navedene njihove cijene i mogućnosti.

Na kraju rada nalazi se analiza dobivenih izlaznih rezultata sjenčanih prikaza reljefa provedenih na test-modelu otoka Mljeta i usporedba s ručnim sjenčanjem. Može se reći da sjenčani reljef dobiven programskim paketom Surfer ne zadovoljava kartografske potrebe, sjenčani prikaz dobiven programskim paketom Scop je mnogo bolji, a onaj dobiven programskim paketom Arc View je prema autoričinoj ocjeni najbolji i najviše odgovara klasično izrađenim sjenama. Presudno je i u koju se svrhu izvodi sjenčanje i za koje je potrebe dotični programski paket, ali tek se za Scop, ArcView i Terrain Analyst može reći da su profesionalni programski paketi primjenjivi u kartografiji.

Stanislav Frangeš

## *Vlado Cetl, magistar tehničkih znanosti*

Vlado Cetl obranio je 8. svibnja 2003. godine na Geodetskom fakultetu Sveučilišta u Zagrebu magistarski rad pod naslovom *Uloga katastra u nacionalnoj infrastrukturi prostornih podataka*. Mentor je bio prof. dr. sc. M. Roić, a u povjerenstvu za ocjenu i obranu magistarskog rada bili su uz njega doc. dr. sc. S. Mastelić Ivčić i prof. dr. sc. Z. Kapović.



Vlado Cetl rođen je 14. lipnja 1975. godine u Pakracu. Osnovnu je školu pohađao i završio u Vrbovcu. Srednju tehničku školu Ruđera Boškovića pohađao je u Zagrebu i maturirao 1993. godine s izvrsnim uspjehom. Iste se godine upisuje na dodiplomski studij na Geodetskom fakultetu Sveučilišta u Zagrebu. U akad. god. 1995/96. primio

1996/97 the Dean's reward for the best student's work. He was granted a University scholarship by the University of Zagreb in the academic year 1995/96. He graduated from the Faculty in 1998 with excellent marks under the tutorship of Prof. Dr. T. Bašić with the thesis titled *The Analysis of a Part of 10-km GPS Network in the Republic of Croatia*. After finishing the studies he started to work at the "Geo-Koretić" geodetic firm in Vrbovec where he worked on various works within the frame of engineering geodesy and maintenance of cadastral documentation. In November 1998, he went to complete the military service, and during this period he finished the officer's school at the Academy of Croatian Air Forces in Zadar and gained the rank of the first in the anti-aircraft defence.

In September 1999 he was appointed a teaching assistant at the Faculty of Geodesy in the Institute for Engineering Geodesy and Spatial Information Management. In the same year, he enrolled at the postgraduate studies in the field of Engineering Geodesy and Spatial Information Management. In his teaching activity he runs exercises in the courses: Geoinformatics II, Real Estate Cadastre, Digital Cadastre, Space Management Support and Traffic Routes Designing. He has actively participated in student practice in the field of Engineering Geodesy and Spatial Information Management in the year 2000 in Opuzen and in 2001 in Stari Grad on the island of Hvar. So far he has published a few scientific and professional articles as a co-author, and was a technical editor of two Proceedings from homeland scientific and professional gatherings. He collaborated on scientific and professional projects: *Improvement of Cadastral Plan – Guidelines and Vectorizing of Cadastral Plans Made in Gauss-Krüger Projection* for the needs of the State Geodetic Administration. He is a collaborator on the scientific project *Cadastral – the Basis of Spatial Data Infrastructure* run by Prof. Dr. M. Roić being performed for the Ministry of Science and Technology of the Republic of Croatia. Within the scope of his professional activity, he works various jobs connected with engineering geodesy: survey and planning for various designing works, setting out, testing of bridges submitted to test loading etc. In 2001, he participated in GPS campaign Geodynamic Network of the City of Zagreb. He is a member of the Commission for Monitoring the Production and Passing of Development Plans of the Town Vrbovec. He is a member of the Technical Committee 211 Geoinformation/Geomatics at the State Institute for Standardization and Measurements. He is also a member of Croatian Geodetic Society and Croatian Mathematical Society.

His master's thesis contains 116 pages of A4 format, an appendix of 34 pages, reference list, abstract in Croatian and English, list of illustrations and tables, and a short curriculum vitae of the author. A CD-R medium is supplemented to the work with the whole master's thesis on it. The work is divided into eight chapters:

1. Introduction
2. Cadastre and Land Registry
3. Infrastructure of spatial data
4. Databases
5. Computer-communication infrastructure and services
6. Meta cadastral portal
7. Conclusion
8. References

The introduction gives a short overview of the works made so far in the area of spatial data infrastructure and of the need for its production. The problems that the work is dealing with and what is intended to be done is also mentioned.

In the second chapter, the momentary system of cadastre and land registry in Croatia is described. The reference systems of cadastre are presented, as well as the connections between them. Apart from that, the guidelines in the modernization of spatial data register are also presented, as well as the current laws and regulations dealing with these problems.

The third chapter gives a detailed description of the infrastructure of spatial data and its basic components that contain: spatial data, metadata, norms and standards, catalogue and the collaboration and associations. Special attention has been paid to metadata and standardization. At the beginning of the chapter, basic terms and their definitions are stated, as well as a short historical review referring to the origins of the spatial data infrastructure.

Because of its exceptional significance, a complete translation of the Executive Order 12906 submitted by the American president Clinton from 1994 is given, and it initiated the production and the improvement of the spatial data infrastructure not only in the USA, but in the whole world. The chapter also gives the overview of the establishment of spatial data infrastructure in some countries in the world, and the situation and possibilities in Croatia has been specially presented. At the end of the chapter, there is a description of how important the cadastral data is in the infrastructure of spatial data.

The fourth chapter gives a detailed description of data models and databases. The existing data models are presented, with a special consideration



je Rektorovu, a u akad. god. 1996/97. Dekanovu nagradu za najbolji studentski rad. U akad. god. 1996/97. dobitnik je Sveučilišne stipendije Sveučilišta u Zagrebu. Diplomirao je 1998. s izvrsnim uspjehom pod mentorstvom prof. dr. sc. T. Bašića na temu *Analiza dijela 10-km mreže GPS točaka u Republici Hrvatskoj*. Nakon završetka studija zaposlio se u geodetskom poduzeću "Geo-Koretić" u Vrbovcu, gdje je radio na različitim poslovima inženjerske geodezije i održavanja katastarskog operata. U studenome 1998. odlazi na odsluženje vojnog roka. Tijekom služenja završio je časničku školu na Učilištu hrvatskoga ratnog zrakoplovstva u Zadru i stekao čin natporučnika protuzračne obrane.

U rujnu 1999. izabran je za mlađeg asistenta na Geodetskom fakultetu u Zavodu za inženjersku geodeziju i upravljanje prostornim informacijama. Iste godine upisuje i poslijediplomski znanstveni studij na usmjerenju Inženjerska geodezija i upravljanje prostornim informacijama. U nastavi drži vježbe iz kolegija: Geoinformatika II, Katastar nekretnina, Digitalni katastar, Podrška upravljanju prostorom i Projektiranje prometnica. Aktivno je sudjelovao u studentskim praksama usmjerenja Inženjerska geodezija i upravljanje prostornim informacijama, 2000. godine u Opuzenu i 2001. godine u Starome Gradu na otoku Hvaru. Do sada je u koautorstvu objavio nekoliko znanstvenih i stručnih članaka te bio tehnički urednik dvaju zbornika radova s domaćih znanstveno-stručnih skupova. Kao suradnik sudjelovao je u znanstveno-stručnim projektima: *Poboljšanje katastarskog plana – smjernice te Vektorizacija katastarskih planova izrađenih u Gauss-Krügerovoj projekciji za potrebe Državne geodetske uprave*. Suradnik je na znanstvenom projektu *Katastar – temelj infrastrukture prostornih podataka* pod voditeljstvom prof. dr. sc. M. Roića, a koji se izvodi za Ministarstvo znanosti i tehnologije Republike Hrvatske. U stručnom radu obavlja različite poslove inženjerske geodezije: izmjera i izrada situacija za različita projektiranja, iskolčenja, ispitivanja mostova na probna opterećenja i dr. God. 2001. sudjelovao je u GPS kampanji Geodinamička mreža Grada Zagreba. Član je Komisije za praćenje izrade i donošenje prostornih planova za Grad Vrbovec. Član je Tehničkog odbora 211 Geoinformacije/Geomatika u Državnom zavodu za normizaciju i mjeriteljstvo. Također, član je Hrvatskoga geodetskog i Hrvatskog matematičkog društva.

Magistarski rad sadrži 116 stranica formata A4, 34 stranice priloga, popis literature, sažetak na hrvatskom i engleskom jeziku, popis slika i tablica, te kratak životopis autora. Radu je priložen i CD-R

medij na kojem se nalazi magistarski rad. Rad je podijeljen u osam poglavlja:

1. Uvod
2. Katastar i zemljišna knjiga
3. Infrastruktura prostornih podataka
4. Baze podataka
5. Računalno-komunikacijska infrastruktura i usluge
6. Metakatastarski portal
7. Zaključak
8. Literatura

U uvodu je kratak pregled dosadašnjih radova u području infrastrukture prostornih podataka i potrebe njezine izgradnje. Također, navedena je problematika kojom se rad bavi i što se njime želi postići.

U drugom je poglavlju opisan trenutačni sustav katastra i zemljišne knjige u Hrvatskoj. Prikazani su referentni sustavi katastra kao i veze između njih. Osim toga prikazane su smjernice u modernizaciji evidencija prostornih podataka kao i aktualni zakoni i propisi koji se bave tom problematikom.

U trećem je poglavlju detaljan opis infrastrukture prostornih podataka i njezinih osnovnih sastavnica, u koje ulaze: prostorni podaci, metapodaci, norme i standardi, katalog te suradnja i savezi. Pritom je posebna pozornost dana metapodacima te normizaciji. Na početku poglavlja dani su osnovni pojmovi i njihove definicije kao i kratak povijesni pregled postanka infrastrukture prostornih podataka. Zbog svoje iznimne važnosti navodi se kompletan prijevod Izvršne naredbe 12906 američkog predsjednika Clintona iz 1994. god., koja je potaknula izgradnju i poboljšanje infrastrukture prostornih podataka ne samo u SAD-u, već i u cijelom svijetu. Daje se, također, pregled uspostave infrastrukture prostornih podataka u nekim zemljama svijeta, a posebno je prikazano stanje i mogućnosti u Hrvatskoj. Na kraju poglavlja opisana je važnost katastarskih podataka u infrastrukturi prostornih podataka.

U četvrtom su poglavlju detaljno opisani modeli i baze podataka. Prikazani su postojeći modeli podataka s posebnim osvrtom na relacijski model koji se trenutačno najviše upotrebljava kao i objektni model koji će vjerojatno prevladati u budućem vremenu. Kao sustavi koji se najviše upotrebljavaju u infrastrukturi prostornih podataka prikazane su distribuirane baze podataka.

U petom se poglavlju obrađuju računalno-komunikacijska infrastruktura i usluge. Prikazana su

of the relation mode that is mostly used, as well as the object model that will probably prevail in the future. The distributed databases are presented as the systems that are mostly used in the infrastructure of spatial data.

The fifth chapter deals with computer-communication infrastructure and services. The basic properties of computer networks are presented, as well as the protocols that define the network communication. Global computer network Internet and network services used on it have been given special consideration: work on a remote computer, data transfer, electronic mail and web. A presentation of web technologies is also given and they are used for spatial data transfer with a special emphasis on GML, a language for saving and distributing the spatial data. At the end of the chapter a short reference is given to the security of computer networks, as well as to the security of network communication.

The sixth chapter presents a practical part of the work in which the author makes an important contribution to the improvement of the efficiency of spatial data infrastructure. In order to offer information about spatial data, competent institutions and firms, as well as norms and standards to the users, the author has made a metacadastral portal that is accessible on-line. The contents of the portal are saved in two relation databases, and it is presented on the portal as demanded by the users, applying ASP technology. The first base has the data about competent institutions at home and abroad that deal with spatial data saved. There is also information about the firms in private sector. The base has the information about various norms and other legal regulations connected with spatial data entered, and principally with cadastre. The second base is the implementation of ISO norm 19115 Metadata that defines the metadata as a set of elements describing the spatial data. The chapter also gives a detailed presentation of that norm. Metacadastral portal is installed on the server of the Department for Engineering Geodesy and Spatial Information Management, and its URL address is <http://www.igupi.geof.hr/ipp>. Interested users can find the information about various organizations participating in the infrastructure of spatial data at all social levels by means of the portal. The private sector is specially processed, and the users have the possibility to search authorized firms throughout Croatia. The relevant international and European standards are presented. One can also find information about various laws, ordinances, instructions and similar.

For some documents created before 1990 that cannot be found on web pages of Narodne novine, pdf files have been made with an access to them provided. Along with the above mentioned, the metadata is the most important portal content. The users can search through key metadata for some sets of spatial data that are applied in teaching activities or have been made by the students of the Faculty of Geodesy. Such a description makes it easier for a user to find the existing spatial data and depending on his/her needs enable further contact with the owner, i.e. manufacturer, and then buy the data.

In the seventh chapter a conclusion and recommendations are given. Technological advance in collecting the spatial data, as well as the development in the field of computer and communication technologies have provided the production of national infrastructures of spatial data that aim to provide uninterrupted, simple and unique access to spatial data to all interested users for the purpose of general welfare at local, regional and global levels. It is especially emphasized that the role of cadastral data should be the basis of the spatial data infrastructure for some countries at large-scale data. The author points out that Croatia needs to update its spatial registers and make catalogues of the existing data as soon as possible, and make them accessible to a wider circle of users. The metacadastral portal made in this work gives an exceptional contribution to that issue. Its further completion, as well as the improvement of the structure using quickly developing technologies, are important tasks in the future.

In the eight, final chapter of the Master's thesis a presentation of references with URL addresses are given.

The Commission has made a conclusion that this work has made an exceptional contribution to the profession in the field of cadastre and spatial data infrastructure. Regarding the current situation in Croatia, the existing spatial data infrastructure does not meet the needs of the time we live in. The author has dedicated his efforts in this work to the problems that are relatively new in Croatia, but their implementation and improvement are necessary for the future, especially in the processes of including Croatia into the European and world integrations. The practical part of the work presents the possibilities offered by information and communication technologies in spatial information management, which gives the users the guidelines for their future work.

*Miodrag Roić*

osnovna svojstva računalnih mreža kao i protokoli kojima je definirana komunikacija na mreži.

Posebno je obrađena globalna računalna mreža internet i mrežne usluge koje se na njoj koriste: rad na udaljenom računalu, prijenos datoteka, elektronička pošta i web. Uz to su prikazane tehnologije weba koje se koriste za prijenos prostornih podataka, pri čemu je posebno naglašen GML, jezik za pohranu i distribuciju prostornih podataka. Na kraju poglavlja kratak je osvrt na sigurnost računalnih mreža kao i sigurnost komunikacije na mreži.

U šestom je poglavlju prikazan praktični dio rada, u kojem autor daje važan prilog poboljšanju učinkovitosti infrastrukture prostornih podataka. Da bi se korisnicima pružile informacije o prostornim podacima, nadležnim institucijama i tvrtkama te normama i standardima, izrađen je metakatastarski portal, koji je on-line dostupan na webu. Sadržaj portala spremljen je u dvije relacijske baze podataka, a prikazuje se na portalu na zahtjev korisnika, upotrebom ASP-tehnologije. U prvu bazu spremljeni su podaci o nadležnim tuzemnim i inozemnim institucijama koje se bave prostornim podacima. Uz to, tu su i informacije o tvrtkama u privatnom sektoru. U bazu su unesene i informacije o različitim normama i ostalim zakonskim propisima vezanim uz prostorne podatke, a poglavito uz katastar. Druga je baza implementacija norme ISO 19115 Metadata, kojom su definirani metapodaci kao skup elemenata kojima se opisuju prostorni podaci. U tom poglavlju je, također, detaljniji prikaz te norme. Metakatastarski portal postavljen je na poslužitelju Zavoda za inženjersku geodeziju i upravljanje prostornim informacijama, a URL-adresa mu je <http://www.igupi.geof.hr/ipp>. Putem portala zainteresirani korisnici mogu pronaći informacije o različitim organizacijama koje sudjeluju u infrastrukturi prostornih podataka na svim razinama društva. Posebno je obrađen privatni sektor, a korisnicima je omogućeno pretraživanje ovlaštenih tvrtki diljem Hrvatske. Od normi su prikazane relevantne međunarodne i europske norme. Također se mogu pronaći i informacije o različitim zakonima, pravilnicima, uputama i sl. Za neke dokumente starije od 1990. god., koji se ne mogu pronaći na web-stranicama Narodnih novina, izrađene su pdf-

datoteke i omogućen im je pristup. Uz navedeno, metapodaci čine najvažniji dio sadržaja portala. Korisnicima je omogućen pregled ključnih metapodataka za neke skupove prostornih podataka koji se koriste za izvođenje nastave ili su ih izradili studenti Geodetskog fakulteta. Takav opis olakšava korisniku pronalaženje postojećih prostornih podataka te, ovisno o njegovim potrebama, omogućuje daljnji kontakt s vlasnikom, odnosno proizvođačem, i nabavku podataka.

U sedmom poglavlju dani su zaključci i preporuke. Tehnološki napredak u prikupljanju prostornih podataka kao i napredak na području računalnih i komunikacijskih tehnologija omogućio je izgradnju nacionalnih infrastrukture prostornih podataka, kako bi svi zainteresirani korisnici imali nesmetan, brz, jednostavan i jedinstven pristup prostornim podacima, radi opće dobrobiti na lokalnoj, regionalnoj i globalnoj razini. Posebno se ističe uloga katastarskih podataka, koji kao podaci najkrupnijeg mjerila za neku državu trebaju biti upravo temelj infrastrukture prostornih podataka. Autor ističe kako bi u Hrvatskoj trebalo što prije urediti prostorne evidencije i katalogizirati postojeće prostorne podatke te ih staviti na uvid širem krugu korisnika. Metakatastarski portal izrađen u ovom radu daje tomu izniman doprinos. Njegovo daljnje upotpunjavanje kao i poboljšanje strukture uz upotrebu brzo razvijajućih tehnologija važan su zadatak u budućnosti.

U osmom, završnom, poglavlju magistarskog rada dan je prikaz literature i URL-adrese.

Povjerenstvo je zaključilo da je ovaj rad izniman doprinos struci na području katastra i infrastrukture prostornih podataka. S obzirom na trenutačno stanje u Hrvatskoj, postojeća infrastruktura prostornih podataka ne zadovoljava potrebe vremena u kojem živimo. Autor se u svom radu posvetio problematici koja je relativno nova u nas, a čija je implementacija i poboljšanje u budućnosti nužno, posebice u procesima priključenja Hrvatske europskim i svjetskim integracijama. Praktični dio rada prikazuje mogućnosti koje pružaju informatičke i komunikacijske tehnologije u upravljanju prostornim informacijama, a što daje korisne smjernice za budući rad.

*Miodrag Roić*