

EHITUSTEADUSKOND
TEEDEINSTITUUT
TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2012

1. Instituudi struktuur

Teedeinstituut, Department of Road Engineering
Instituudi direktor Andrus Aavik

- Geodeesia õppetool, Chair of Geodesy, Artu Ellmann
- Sillaehituse õppetool, Chair of Bridge Engineering, Siim Idnurm
- Teetehnika õppetool, Chair of Road Engineering, Andrus Aavik
- Teede ja liikluse teadus- ja katselaboratoorium, Laboratory of Roads and Traffic, Ott Talvik

2. Instituudi teadus- ja arendustegevuse (edaspidi T&A) iseloomustus

2.1 struktuuriüksuse koosseisu kuuluvate uurimisgruppide

2.1.1 teadustöö kirjeldus:

Structural condition evaluation of pavements and bridges

Aims of the research are: development of back calculation models for determination of E-modulus of pavement layers based on the Falling Weight Deflectometer (FWD) deflection measurement data using deflection bowl characteristics; development of the pavement back calculation software for Estonian conditions; development of models for determination of the remaining service life of the pavement.

Another aim is to study possibility and effectiveness of use of geosynthetics in pavement structures based on the example of reconstruction of national road 15111 and to give recommendations for construction and reconstruction of road sections crossing swamp areas.

Third aim is to determine the correct test method for the filtration modulus of pavement drainage layers and embankment soils and to prepare the draft version of corresponding Estonian standard.

On the area of bridge research the analyses of condition of bridge joints at all Estonian state road network has started. Also most preferable joint structures have to be determined for Estonian condition.

Transport planning and transport impacts

The main research topics in the field of transport planning and transport impacts have been related to travel habits and analysis of transport growth and its impact. An important traditional research area is traffic safety, where TUT has strong position at research and training areas (road safety auditing and inspection, road network impact analysis, safety analysis, etc).

Application of space technologies to improve geoid and gravity field models over the Baltic Sea region

The main aim of this continuously ongoing research is to determine a precise (1-cm) and high-resolution geoid model over Estonia. More specifically, the regional gravity data and the long-wavelength component of the geoid are combined in modified Stokes formula. The gridding of

the terrestrial gravity data benefits from the usage of the space-borne SRTM global model of topographic heights. High-precision GPS-levelling points are used to constrain the resulting geoid model to the national vertical datum. The final model provides an alternative (to the geodetic levelling) and cost-effective method to convert the GPS-derived heights into conventional (sea level related) height values. The resulting model is thus useful at the renovation and maintenance of the objects of the national infrastructure (such as highways, railways, pipelines, power cables etc) and for most of the surveying tasks. This is a part of the gravity and geoid modeling activities of the international Nordic Geodetic Commission (NKG), whereas the Geodesy Chair is acting as a NKG computing centre.

Implementation of the airborne LIDAR and terrestrial laser scanner technology

The Geodesy chair is involved in the research on applicability airborne LIDAR data-series for monitoring coastal processes, detecting of ground surface in areas of complicated relief, etc.

The terrestrial laser scanning (TLS) technology is primarily investigated for enhancing acquirement spatial data of man-made and natural targets. Of particular interest are monitoring of 3D deformations of different construction types. Methods of incorporating the TLS-data into Building information modeling (BIM) are studied as well.

Both the airborne LIDAR and TLS technologies are applied for geoinformatic development of biodiversity, soil and Earth data systems.

2.1.2 aruandeaastal saadud tähtsamad teadustulemused:

Pavement structural condition evaluation

Main results in 2012 involve the analysis of values of deformation, bearing capacity and roughness dependency from the presence of geosynthetics at pavement structure, started at 2009. The correct test method for the determination of filtration modulus of pavement drainage layers and embankment soils was defined.

Transport planning and transport impacts

As in previous years we have been active on regular analysis of transport development trends focusing on travel behaviour, developing transport models, and in fundamental transport planning.

Estimation of across-water height differences by precise hydrodynamic levelling

In cooperation with the Estonian University of Life Sciences and TUT Marine Systems Institute estimation of across-water height differences by precise hydrodynamic levelling using pressure gauges in West-Estonian Archipelago. The results to be applied for improvement of the Estonian National Levelling Network.

2.2 Uurimisgrupi kuni 5 olulisemat publikatsiooni läinud aastal:

- Kiisa, M.; Idnurm, J.; Idnurm, S. (2012). Discrete Analysis of Elastic Cables. The Baltic Journal of Road and Bridge Engineering, 7(2), 98 - 103.
- Ellmann, A. (2012). Using high-resolution spectral models of gravity anomaly for computing stochastic modifications of Stokes's formula. Computers & Geosciences, 39(2), 188 - 190.
- Liibus, Aive; Kõuts, Tarmo; Ellmann, Artu (2012). Transfer of heights to islands in West-Estonian Archipelago using hydrodynamic levelling. IEEE/OES Baltic 2012 International Symposium (1 - 8).IEEE

2.3 Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustest.

2.4 Loetelu struktuuriüksuse töötajatest, kes on välisakadeemiate või muude oluliste T&A-ga seotud välisorganisatsioonide liikmed:

Andrus Aavik: World Road Association (PIARC), tehniline komitee Road Pavements, liige; Transportation Research Board of the National Academies (USA) representative for Tallinn University of Technology.

Artu Ellmann: International Association of Geodesy, Eesti korrespondentliige.

2.5 Aruandeaasta tähtsamad T&A finantseerimise allikad:

- Siseriiklikud lepingud;
- Välisriiklikud lepingud;
- Konsultatsioonilepingud.

2.6 Soovi korral lisada aruandeaastal saadud T&A-ga seotud tunnustusi (va punktis 2.3 toodud tunnustused), ülevaate teaduskorralduslikust tegevusest, teadlasmobiilsusest ning anda hinnang oma teadustulemustele.

2.7 Instituudi teadus- ja arendustegevuse teemade ja projektide nimetused (*Eesti Teadusinfosüsteemi, edaspidi ETIS, andmetel*)

- Haridus- ja Teadusministeerium
 - sihtfinantseeritavad teemad:
T272, Vedeliku ja konstruktsiooni koostoime mehaanika , Idnurm Juhan (2008-2013)
 - baasfinantseerimise toetusfondist rahastatud projektid (sh TTÜ tippkeskused):
 - riiklikud programmid:
 - Teiste ministeeriumide poolt rahastatavad riiklikud programmid:
 - Uuriija-professori rahastamine:
 - SA Eesti Teadusfond/Eesti Teadusagentuur
 - grandid:
 - ühisgrandid välisriigiga:
 - järel doktorite grandid (SA ETF ja Mobilitas):
 - tippteadlase grandid (Mobilitas):
 - Ettevõtluse Arendamise SA
 - eeluuringud:
 - arendustoetused:
 - SA Archimedesega sõlmitud lepingud
 - infrastruktuur (nn „mini-infra“, „asutuse infra“):
 - Eesti tippkeskused:
 - riiklikud programmid:
AR12052, KESTA, Elurikkuse, mulla ja maapõue andmesüsteemide geoinformaatiline arendus (ERMAS), Artu Ellmann (1.09.2011 - 31.12.2014)

– muud T&A lepingud:

- SA Keskkonnainvesteeringute Keskusega sõlmitud lepingud:

- Siseriiklikud lepingud:

Lep8132, Geosünteesitika kasutamine teekatendis maantee 15111 km 0,0-8,7 remondi näitel, Aavik Andrus (15.12.2008 - 1.12.2013)

Lep9035, Civitas-Mimosa projekti hindamise teostamine, Antov Dago (15.03.2009 - 15.11.2012)

Lep12067, Autopargi läbisõit Eestis sõidukiliide järgi 2011. aastal, Aavik Andrus (17.04.2012 - 23.11.2012)

Lep12071, TEE-EHITUSES KASUTATAVATE FILTRATSIOONIMOODULI ERINEVATE MÄÄRAMISMEETODITE TEADUSLIK VÕRDLUSUURING JA OTSTARBEKA KATSEMEETODI STANDARDISEERIMINE ning TEEDEALA STANDARDIMISTEGEVUSE KOORDINEERIMINE JA OSALEMINE EUROSTANDARDITE VÄLJATÖÖTAMISEL, Aavik Andrus (20.04.2012 - 30.03.2013)

- EL Raamprogrammi projektid:

- Välisriiklikud lepingud:

VA477, Sotsiaalsed hoiakud liiklusohutusse Euroopas SARTRE4, Antov, Dago (1.09.2009 - 30.06.2012)

VIR496, Balti mere piirkonna liiklusohutuse parandamine BALTRIS Antov Dago (1.06.2010 - 10.06.2012)

2.8 Struktuuriüksuse töötajate poolt avaldatud eelretsenseeritavad teaduspublikatsioonid (*ETIS klassifikaatori alusel 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1 ja 5.1*).

1.1

Abbak, R.A.; Sjöberg, L.E.; Ellmann, A.; Ustun, A. (2012). A precise gravimetric geoid model in a mountainous area with scarce gravity data: a case study in central Turkey. *Studia Geophysica et Geodaetica*, 56(4), 909 - 927.

Kiisa, M.; Idnurm, J.; Idnurm, S. (2012). Discrete Analysis of Elastic Cables. *The Baltic Journal of Road and Bridge Engineering*, 7(2), 98 - 103.

Ellmann, A. (2012). Using high-resolution spectral models of gravity anomaly for computing stochastic modifications of Stokes's formula. *Computers & Geosciences*, 39(2), 188 - 190.

1.2

Abbak, R.A.; Ustun, A.; Ellmann, A. (2012). Comparison of Simple and Complete Bouguer Approaches in Interpolation of Mean Gravity Anomalies. *Journal of Geodesy and Geoinformation*, 1(1), 45 - 52.

Ustinova, N., Kala, V., Mill, T., Ellmann, A. (2012). Geodetic Surveying Studies for Civil Engineering Students at Tallinn University of Technology. *Geodesy and Cartography*, 38(2), 86 - 91.

1.3

Pashkevich, M. (2012). Comprehensive approach to road safety in Estonia: the common responsibility and mutual obligations concept. Barents Newsletter on Occupational Health and Safety, 15(3), 88 - 92

2.1

2.2

Hast, E.; Nilsson, A.; Skrodenis, E.; Antov, D.; Ratkeviciute, K.; Bernotaite, I.; Varhelyi, A.; Toth-Szabo, Z.; Ekman, L. et al (2012). Saving life, health and money in road traffic. Improving road infrastructure safety in the Baltic Sea region. Sweden: The Swedish Transport Administration

3.1

Liibusk, Aive; Kõuts, Tarmo; Ellmann, Artu (2012). Transfer of heights to islands in West-Estonian Archipelago using hydrodynamic levelling. IEEE/OES Baltic 2012 International Symposium (1 - 8).IEEE

3.2

Mäe, R.; Antov, D.; Antso, I. (2012). Urban Sprawl - Mobility Potentials in Suburban Areas of Tallinn. M. Pacetti, G. Passerini, C.A. Brebbia, G. Latini (Toim.). The Sustainable City VII (967 - 977).Wessex Institute of Technology Press

3.3

Antov, D.; Banet, A.; Barbier, C.; Bellet, T.; Bimpeh, Y.; Boulanger, A.; Brandstätter, C.; Britschgi, V.; et, al. (2012). European road users' risk perception and mobility. The SARTRE 4 survey.

4.1

5.1

2.9 Struktuuriüksuses kaitstud doktoriväitekirjade loetelu (*NB! struktuuriüksus lisab struktuuriüksuse töötaja juhendamisel mujal kaitstud doktoriväitekirjade loetelu*)

2.10 Struktuuriüksuses järel doktorina T&A-s osalenud isikute loetelu (*ETIS-e kaudu esitatud taotluste alusel*)

2.11 Struktuuriüksuses loodud tööstusomandi loetelu

3. Struktuuriüksuse infrastruktuuri uuendamise loetelu (summa eurodes)

PV007403, Mõõtejaama Percostation kompl., 12.07.2012 (4 000,00)

PV007440, Märgpesu-sõelumisseade, 22.08.2012 (2 580,00)

PV007473, Leica ScanStation C10/3D Laser, 18.10.2012 (64 500,00)

PV007496, Pinnase elastsusmooduli tester, 5.12.2012 (4 590,00)

PV007498, Tahhümeeter Trimble M3 kompl., 5.12.2012 (4 766,67)

PV007499, Tahhümeeter Trimble M3 kompl., 5.12.2012 (4 766,66)

PV007500, Tahhümeeter Trimble M3 kompl., 5.12.2012 (4 766,67)

PV007501, Mõõtesüsteem RTK-GNSS satelliit, 5.12.2012 (25 340,00)

PV007502, Digitaalne tippnivelliiri kompl., 5.12.2012 (2 590,00)