ASTEK
Assistive Technologies and Communication

# ZBORNIK REZIMEA

ČETVRTA MEĐUNARODNA KONFERENCIJA O ASISTIVNIM TEHNOLOGIJAMA I KOMUNIKACIJI - ASTEK 2022

,

# PROCEEDINGS

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Četvrta međunarodna konferencija ASistivne TEhnologije i Komunikacija (ASTEK) održana je u Beogradu 04. i 05. novembra 2022. u Kongresnom centru hotela „Mona – Plaza u Beogradu. Zbog i dalje aktuelne epidemiološke situacije i ovoga puta Konferencija je realizovana kombinovano - tradicionalno uživo ali i on-line formatu. Realizovano je 7 plenarnih predavanja i poster sesija sa 9 radova.

Iskustva i ovogodišnje Konferencije pokazuju da je njena primarna ideja objedinjavanja svih domaćih resursa na polju asistivnih tetehnologija, potsticaj njene intenzivnije primene i doprinos unapređenju brige o deci sa smetnjama u razvoju i osobama sa invaliditetom i sada opravdala očekivanja. Više od 440 učesnika bilo je u prilici da čuje predavanja najeminentnijih stručnjaka iz ove oblasti, kako domaćih tako i predavača iz okruženja ali i Evrope i SAD-a. Od ove godine Konferencija ima i svoj drugi dan, koji je rezervisan za radioničarski rad specijalizovanih komisija (po pozivu). One su na osnovu predočenih dosadašnjih praktičnih rešenja a na osnovu novih teorijskih saznanja izloženih na Konferenciji, predložile konkretne ideje za njihovo inoviranje ali i formulisale potpuno nova. Prateći sadržaji Konferencije bili su izložba slika KEEP IN TOUCH autora Milana Ignjatovića, kao i 3 motivaciona predavanja na realizovanim radionicama drugog dana Konferencije

Ostvaren je u potpunosti cilj konferencije, promocija novih tehnoloških dostignuća u oblasti asistivnih sistema namenjenih deci sa smetnjama u razvoju i osobama sa invaliditetom u sinergiji relevantnih naučno-istraživačkih ustanova, strukovnog udruženja, privrede i krajnjih korisnika. Međunarodni karakter Konferencije označio je njeno pozicioniranje na mapu tradicionalnih godišnjih manifestacija u ovoj oblasti.

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# SADRŽAJ

ČETVRTA MEĐUNARODNA KONFERENCIJA
ASTEK, 2022.

# PLENARNA IZLAGANJA

# ADHD RAZLOŽEN NA NAJSITNIJE SEGMENTE

*Dejan Stevanović*

Klinika za neurologiju i psihijatriju za decu i omladinu, Srbija; Gillberg Neuropsychiatry Centre, Institute of Neuroscience and Physiology, University of Gothenburg, Sahlgrenska Academy, Gothenburg, Švedska

Ova prezentacija daje pregled trenutnog razumevanja nozologije, neuropsihologije i neurobiologije poremećaja sa deficitom pažnje i hiperaktivnošću (eng. ADHD). ADHD je neurorazvojno stanje koje čine glavni domeni simptoma nepažnje, hiperaktivnosti i impulsivnosti, ali sa ogromnom heterogenošću u izražavanju ovih simptoma, preklapajući se sa drugim poremećajima, povezanim komorbiditetima, odgovorom na lečenje, neurokognitivnim sposobnostima i ishodima adaptivnog funkcionisanja. Trenutno, ne postoji konsenzus o tome koje dimenzija najbolje obuhvataju ADHD i nivo na kojem bi trebalo da se mere, tj. prijavljeni simptomi, kognitivni testovi, snimanje mozga ili drugi neurobiološki markeri. Klasični kognitivni profil ADHD-a karakterišu deficiti u svim modalitetima pažnje, brzini obrade informacija, egzekutivnim funkcijama (uglavnom radnoj memoriji i inhibiciji sa naglaskom na kašnjenju nagrađivanja i kontroli interferencije), verbalnoj memoriji, veštinama čitanja, socijalnoj kogniciji i aritmetičkim sposobnostima. Neurofiziološke studije sugerišu da smanjena amplituda i duža latencija P3 komponente povezane sa inhibicijom moždanog potencijala (ERP) mogu biti markeri ADHD-a. Utvrđeno je da su konektivne i mrežne disfunkcije šireg obima centralne u patofiziologiji ADHD-a, pri čemu je farmakoterapija najefikasnija u normalizaciji funkcionalne povezanosti. Pacijenti sa ADHD-om imaju konzistentne funkcionalne abnormalnosti u različitim mrežama fronto-bazalnih ganglija desne hemisfere, uključujući inferiorni frontalni korteks, suplementarnu motoričku zonu i prednji cingularni korteks za inhibiciju i dorsolateralni prefrontalni korteks, parijetalne i cerebelarne oblasti za pažnju.

Ključne reči: ADHD, neurfiziološke studije, neurobiološki markeri

# ADHD BROKEN DOWN INTO THE SMALLEST SEGMENTS

*Dejan Stevanović*

Clinic for neurology and psychiatry for children and youth, Serbia; Gillberg Neuropsychiatry Centre, Institute of Neuroscience and Physiology, University of Gothenburg, Sahlgrenska Academy, Gothenburg, Švedska

This presentation gives an overview of the current understanding of the nosology, neuropsychology, and neurobiology of attention deficit hyperactivity disorder (ADHD). ADHD is a neurodevelopmental condition presenting with the main core symptom domains of inattention, hyperactivity, and impulsivity, but with vast heterogeneity in the expression of these symptoms, overlapping with other disorders, associated comorbidities, treatment response, neurocognitive abilities, and outcomes of adaptive functioning. Currently, there is no consensus reached regarding what kinds of dimensions capture ADHD best and the level they should be measured at, i.e. reported symptoms, cognitive tests, brain imaging, or other neurobiological markers. A classical cognitive profile of ADHD is characterized by deficits across all attention modalities, processing speed, executive function (mainly working memory and inhibition with emphasis on reward delay and interference control), verbal memory, reading skills, social cognition, and arithmetic abilities. Neurophysiological studies suggest that a reduced amplitude and longer latency of the inhibition-related P3 component of the event-related brain potential (ERP) could be a marker of ADHD. Broader-scale connective and network dysfunctions have been found to be central in ADHD pathophysiology, with pharmacotherapy as the most efficacious in normalizing functional connectivity. Patients with ADHD have consistent functional abnormalities in distinct domain-dissociated right hemispheric fronto-basal ganglia networks, including the inferior frontal cortex, supplementary motor area, and anterior cingulate cortex for inhibition and dorsolateral prefrontal cortex, parietal, and cerebellar areas for attention.

Key words: ADHD, neurophysiological studies, neurobiological markers

# PAVLIDIS TEST: PROGNOZA– DIJAGNOZA DISLEKSIJE I ADHD-A OD PREDŠKOLSKOG UZRASTA SA BIOLOŠKOM TAČNOŠĆU I OBJEKTIVNOŠĆU

*George Th. Pavlidis*

Naučni direktor 39 "Centara za disleksiju – Pavlidis metod", profesor psihologije i teškoća u učenju u nastavi psihologije, obrazovanja i medicine na univerzitetima u Engleskoj, Grčkoj i SAD

Tehnologija je unapredila medicinu, ali je njena ograničena upotreba u obrazovanju omela napredak u tom polju.

Disleksija i poremećaj pažnje i hiperaktivnost (eng. Attention Deficit Hyperactivity Disorder, ADHD) su doživotne razvojne neurobiološke i obično nasledne smetnje, koje se često preklapaju. Disleksija je specifiča smetnja u učenju pisanog jezika, uključujući disortografiju. Njen fundamentalni dijagnostički kriterijum je doživotna veoma mala brzina čitanja, bez obzira na jezik, rasu ili kulturu.

Na međunarodnom nivou, dijagnoza ADHD-a je veoma subjektivna i netačna jer je zasnivana upitnicima koje popunjavaju nastavnici i uglavnom roditelji, dok se dijagnoza disleksije zasniva na subjektivnom=netačnom psihoedukativnom čitanju specifičnom za jezik i pisanim testovima, a najranije se to sa ograničenom sigurnošću može uraditi posle sredine drugog razreda. S druge strane, PAVLIDIS TEST se ne zasniva na pisanju ili čitanju, već na objektivnoj biološkoj oftalmokinezi i postiže tačnu biološku prognozu i dijagnozu disleksija i ADHD u predškolskom uzrastu, putem sofisticirane foto-elektronske tehnologije. Stoga se može koristiti na međunarodnom nivou, bez obzira na jezik, kulturu ili rasu u predškolskom uzrastu.

Nikada nije kasno za dijagnozu i lečenje disleksije i ADHD-a, ali što ranije se to uradi bolji će biti i rezultati.

Ključne reči: Pavlidis test, disleksija, ADHD, foto-elektronska tehnologija

# PAVLIDIS TEST: PROGNOSIS – DIAGNOSIS OF DYSLEXIA AND ADHD FROM PRESCHOOL AGE WITH BIOLOGICAL ACCURACY AND OBJECTIVITY

*George Th. Pavlidis*

Scientific director of the 39 "Dyslexia Center - Pavlidis Method", professor of psychology and learning disabilities in the teaching of psychology, education and medicine at universities in England, Greece and the USA

Technology has revolutionized medicine, but its limited use in education has impeded its progress.

Dyslexia and Attention Deficit Hyperactivity Disorder (ADHD) are lifelong developmental neurobiological and usually hereditary disabilities, which frequently overlap. Dyslexia is a specific learning disability of the written language, including dysorthography. Its fundamental diagnostic criterion is the lifelong very slow reading speed, irrespective of language, race or culture.

Internationally, he diagnosis of ADHD is very subjective and inaccurate as it is based on questionnaires that are filled out by teachers and mainly by parents, while the diagnosis of dyslexia is based on subjective=inaccurate, language specific psycho-educational reading and writing tests and the earliest it can be done with limited certainty is after the middle of the 2nd grade. On the contrary, PAVLIDIS TEST is not based on writing or reading, but on the objective- biological ophthalmokinesis and achieves an Accurate Biological Prognosis and Diagnosis of dyslexia and ADHD from Preschool age, via sophisticated photo-electronic technology. Therefore, it can be used internationally irrespective of language, culture or race from Preschool age.

It is never too late for the diagnosis and treatment of dyslexia and ADHD, but the earlier the better and biological technology is the answer.

Key words: Pavlidis test, dyslexia, ADHD, photo-electronic technology

# MULTIDISCIPLINARNA ISTRAŽIVANJA U OBLASTI PSIHOLINGVISTIKE

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ASTEK konferencija je svoj fokus usmerila na potrebe osoba sa specifičnostima u razvoju i načinima ostvarivanja komunikacije, što upućuje na nužnost povezivanja različitih naučnih disciplina. Od posebne važnosti je sinergija dostignuća u oblastima lingvistike, psihologije, logopedije, defektologije i elektrotehnike, kako u domenu istraživanja tako i primeni novih saznanja. Grupa autora u ovom izlaganju razmatra vizuru pogodnu za kompleksnije sagledavanje kauzalnosti u procesu psiholingvističkog razvoja dece sa teškoćama u razvoju. Tradicionalno, kompleksnije sagledavanje zakonitosti komunikativnog i kognitivnog razvoja, svoj oslonac je pronalazilo i u ispitivanjima različitih odstupanja prouzrokovanih fiziološkim ili sredinskim faktorima. Preko dve decenije se u oblasti razvoja i obrazovanja dece sa teškoćama aktualizuju teme koje su više vrednosnog nego naučnog karaktera. Iz tih razloga, kao i činjenice da svedočimo vremenu vrtoglavog razvoja elektronske tehnologije i digitalnih sistema, nova rešenja upućuju na neophodnost modernizacije dijagnostike i tretmana u oblasti psiholingvistike na srpskom govornom području. Izdvaja se srpski jezik pre svega zbog potrebe pripreme baterije testova i lingvističkih markera za ispitivanje i podsticaja razvoja oralne komunikacije, prirodnog gesta i znakovnog jezika. U vezi sa tim važno je napraviti osvrt prema neurorazvojnim aspektima jezičko-kognitivnog razvoja, te razvijanju protokola i standarda za praćenje neurotipičnog razvoja, a na bazi toga i registrovanje odstupanja od neurotipičnog razvoja.

Ključne reči: osobe sa specifičnostima u razvoju, komunikativni i kognitivni razvoj, psiholingvistika,elektronski sistemi, dijagnostika

# MULTIDISCIPLINARY RESEARCH IN PSYCHOLINGUISTICS

*Gordana Nikolić*[1], *Vanja Ković*[2]; *Milica Janković*[3], *Natalija Panić Cerovski*[4]

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The ASTEK conference directed its focus on the needs of people with specificities in development and ways of achieving communication, which points to the necessity of connecting different scientific disciplines. Of particular importance is the synergy of achievements in the fields of linguistics, psychology, speech therapy, special education and electrical engineering, both in the field of research and the application of new knowledge. In this presentation, the group of authors considers a viewpoint suitable for a more complex understanding of causality in the process of psycholinguistic development of children with developmental disabilities. The traditional, more complex perception of the legality of communicative and cognitive development found its support in the examination of various deviations caused by physiological or environmental factors. For over two decades, in the field of development and education of children with difficulties, topics that are more value-judgment than scientific in nature have been brought up to date. For these reasons, as well as the fact that we are witnessing the time of rapid development of electronic technology and digital systems, new solutions point to the necessity of modernizing diagnostics and treatment in the field of psycholinguistics in the Serbian-speaking area. The Serbian tongue is singled out primarily because of the need to prepare a battery of tests and linguistic markers for testing and encouraging the development of oral communication, natural gestures and sign language. In relation to this, it is important to review the neurodevelopmental aspects of language and cognitive development, as well as the development of protocols and standards for monitoring neurotypical development, and on the basis of that, registering deviations from neurotypical development.

Key words: persons with developmental disabilities, communicative and cognitive development, psycholinguistics, electronic systems, diagnostics

# PERSONALIZOVANI VIRTUELNI TRENING I MOTIVACIJA STARIJE POPULACIJE SA POREMEĆAJIMA RAVNOTEŽE*

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Trenutno ne postoje razvijena rešenja poput personalizovane virtuelne obuke koja mogu pomoći osobama koje pate od poremećaja ravnoteže da obavljaju vežbe ravnoteže i hoda i povećaju fizičku aktivnost. Virtuelni fizioterapeut zasnovan na hologramu sastoji se od softvera i uređaja i pruža pacijentima mogućnost da dobiju personalizovana uputstva za vežbanje, kao i povratne informacije. Postoje dve verzije ovog sistema: pametni telefon gde je adapter postavljen na određenoj tački na glavi korisnika i 3D HoloBox koji uključuje hologramsku foliju visoke efikasnosti i projektor visokog lumena za stvaranje najboljeg mogućeg 3D iskustva bez potrebe da pacijent koristi bilo koji uređaj u svrhu prezentacije. U oba slučaja, senzori su postavljeni na telu pacijenta. Interfejs virtuelnog fizioterapeuta predstavlja glavnu vezu sa Holobalance platformom tako što pruža povratne informacije na način prilagođen korisniku, koji se pokreće na osnovu podataka koji se dobijaju sa edge računara ili cloud platforme. Na taj način se pruža poboljšano korisničko iskustvo, kroz realističniji avatar, i omogućava pripremanje prostorije posebno adaptirane za ovu postavku. Nadamo se da ovaj 3D hologram proširene stvarnosti može biti od pomoći kod fizikalnih terapija za ravnotežu koje se obavljaju svakodnevno kako u bolničkim tako i u kućnim uslovima, posebno kod starije populacije koji pate od poremećaja ravnoteže.

Ključne reči: osobe sa poremećajem ravnoteže, vizuelni trening, virtuelni fizioterapeut, 3D HoloBox



* Ovaj rad je rezultat projekta EC HORIZON2020 769574 HOLOBALANCE. Apstrakt odražava samo stav autora. Komisija nije odgovorna za bilo kakvu upotrebu informacija koje sadrži. Ključne reči: rana intervencija, porodica, procena potreba, podrška

# PERSONALIZED VIRTUAL TRAINING AND MOTIVATION OF THE ELDERLY POPULATION WITH BALANCE DISORDERS*

*Nenad Filipović*

University of Kragujevac, Faculty of Engineering

Currently there is a total lack of personalized coaching solutions for people with balance disorders to engage in balance and gait physiotherapy and increase physical activity. The hologram-based balance physiotherapist (BPH) is a system of software and devices which provides patients opportunity to receive personalized exercise instructions as well as feedback. There are two versions: the smartphone where user wears a head mounted adapter to have a smartphone at a set location on the head of the user and 3D HoloBox where highly efficient holographic foil and high lumen projector are used to create the best possible 3D experience without using any type of device on the patient side for presentations purposes. The sensors are attached to the patient body in both cases. The Virtual Coach interface represents the main link with the whole Holobalance platform by providing feedback in a user-friendly manner, which is initiated by the information from the edge computer or cloud platform. This allows improved user experience, through more realistic avatar, making possible to organize a specially adapted room for the setting. We hope that this 3D augmented reality hologram can contribute for everyday balance physiotherapist program at hospital and home, especially for ageing population with balance disorders.

Key words: people with balance disorders, visual training, virtual physiotherapist, 3D HoloBox



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# GRANICA IZMEĐU JAVE I SNA, PRODOR U KREATIVNOST

*Célia Lacaux*

Paris Brain Institute, Francuska

Kreativnost je u srcu svakodnevnih životnih aktivnosti i jedna je od najvažnijih karakteristika čovečanstva. Sve inovacije koje su drastično promenile naš način života, od telefona, interneta, svemirskih brodova, do umetničkih dela, ne bi postojale bez kreativnosti. Osim toga, kreativnost više nije isključivo vezana za umetnike i pronalazače; izrasla je u jednu od najtraženijih sofisticiranih veština za kompanije u dvadeset prvom veku. Bez obzira na to, imamo ograničeno razumevanje kako kreativnost funkcioniše: nove ideje se često pojavljuju niotkuda. Šta ako bismo mogli da prizovemo svoju kreativnu muzu po volji? U ovom predavanju ćemo ispitati kako bi prelazak iz budnosti u san, kada se spremamo da zaspimo, mogao da predstavlja takav ulaz u kreativnost. Naše istraživanje je pokazalo, na primer, da spavanje samo jedan minut povećava verovatnoću rešavanja problema za tri puta. U budućnosti će se možda razviti alati koji će precizno ciljati ovu kreativnu tačku i probuditi nas na vreme da uhvatimo pronicljive utiske pre nego što nestanu u limbu sna.

Ključne reči: kreativnost, san, java, istraživanje sna

# THE BORDERLAND BETWEEN WAKEFULNESS AND SLEEP, A DOORWAY INTOCREATIVITY

*Célia Lacaux*

Paris Brain Institute, France

Creativity is at the heart of daily life activities and is one of humanity's most defining characteristics. All the innovations that have drastically changed our way of life, from the telephone, the internet, spaceships, to works of art, would not exist without creativity. Besides, creativity is no longer exclusively associated with artists and inventors; it has risen to become one of the most sought-after soft skills for companies in the twenty-first century. Nonetheless, we have a limited understanding of how creativity operates: new ideas often seem to emerge out of nowhere. What if we were able to summon our creative muse at will? In this lecture, we will examine how the transition from wakefulness to sleep, as we are about to fall asleep, could constitute such a doorway into creativity. Our research found, for instance, that sleeping for only one minute increased the likelihood of solving a problem by threefold. In the future, tools may be developed to precisely target this creative sweet spot and wake us up in time to capture insightful impressions before they disappear into the limbo of sleep.

Key words: creativity, dream, java, dream research

# NEURALNI MEHANIZMI KOJI SU U OSNOVI SEMANTIČKE OBRADE KOD POREMEĆAJA SPEKTRA AUTIZMA: MAGNETOENCEFALOGRAFSKA STUDIJA

*Banu Ahtam*

Doktor filozofije, instruktor pedijatrije na Harvard Medical School, istraživač u Bostonskoj dečjoj bolnici, direktor kliničkog MEG programa za fetalno-natalni neuroimidžing naučno-istraživačkog centra Bostonske dečje bolnice

Pojedinci sa poremećajima iz autističnog spektra (eng. Autism Spectrum Disorders, ASD) pokazuju poteškoće u korišćenju rečeničnog konteksta da identifikuju tačno značenje dvosmislenih reči, kao što su homonimi. Ovaj rad će opisati studiju koja istražuje neuralnu osnovu efekata rečeničnog konteksta na razumevanje pojedinačnih reči i razrešavanje semantičke dvosmislenosti tokom čitanja kod osoba sa ASD i kod osoba u tipičnom razvoju, koristeći magnetoencefalografiju (eng. *Magnetoencephalography*, MEG). Mogući efekti odlaganja početka jezika na semantičku obradu kod osoba sa ASD-om su takođe ispitani i diskutovani. Rezultati o događajima izazvanim odgovorima u ranoj fazi (150 ms nakon početka završne reči) i N400 latencama biće predstavljeni za tri različite vrste završnih reči rečenice: dominantne homonimi, podređeni homonimi i nedvosmislene reči, za 44 učesnika (N =22 i srednja starost = 20 godina za svaku grupu učesnika). Nalazi ove studije pružaju nove dokaze i podršku za diferencijalne neuronske mehanizme koji su u osnovi semantičke obrade kod ASD-a i ukazuju na to da je odloženo usvajanje jezika kod ASD-a povezano sa različitom lateralizacijom i obradom jezika.

Ključne reči: poremećaj iz spektra autizma, semantička obrada, magnetoencefalografija

# NEURAL MECHANISMS UNDERLYING SEMANTIC PROCESSING IN AUTISM SPECTRUM DISORDERS: A MAGNETOENCEPHALOGRAPHIC STUDY

*Banu Ahtam*

Harvard Medical School, Boston's Childrens Hospital – Fetal Neonatal Neuroimagining & Developmental Science Center (FNNDSC)

Individuals with autism spectrum disorders (ASD) show difficulties in using sentence context to identify the correct meaning of ambiguous words, such as homonyms. This talk will cover a study that investigates the neural basis of sentence context effects on the understanding of individual words and semantic ambiguity resolution during reading in individuals with ASD and in typically developing (TD) individuals, using magnetoencephalography (MEG). Possible effects of the delay of language onset on semantic processing in individuals with ASD is also examined and discussed. Results on the event related field responses at early (150 ms after the onset of a final word) and N400 latencies will be presented for three different types of sentence final words: dominant homonyms, subordinate homonyms, and unambiguous words, from 44 participants (N=22 and mean age = 20 years for each participant group). Findings of this study provide new evidence and support for differential neural mechanisms underlying semantic processing in ASD, and indicate that delayed language acquisition in ASD is associated with different lateralization and processing of language.

Key words: autism spectrum disorder, magnetoencephalography, semantic processing

# INTEGRISANJE NOVIH ASISTIVNIH TEHNOLOGIJA I IZGRADNJA MODERNE LABORATORIJE ZA ASISTIVNU PODRŠKU U OKVIRU OGRANIČENOG BUDŽETA; POTENCIJALNI MODEL ZA DRUGE OBRAZOVNE INSTITUCIJE*

*Suzanne Delahanty*

Master psihologije, specijalista za alternativne medije i asistivne tehnologije,
Crafton Hills College, Kalifornija

Postoji nekonzistentan nivo kvaliteta i podrške studentima u mnogim obaveznim centrima za asistivnu tehnologiju koji se nalaze širom velike zajednice u kalifornijskom sistemu koledža (KSK). Dok američki zakoni nalažu smeštaj i finansiranje za pružanje usluga studentima sa invaliditetom, zastarela tehnologija i opšti nedostatak sredstava za novu asistivnu tehnologiju su uobičajeni. KSK laboratorije uglavnom nude zastarelu asistivnu tehnologiju i nemaju dovoljno osoblja.

Nedostatak kvalifikovanog osoblja za asistivnu tehnologiju je uobičajen. Postoji nekoliko programa profesionalne obuke u oblasti asistivnih tehnologija i alternativnih medija. Dok je američki tehnološki sektor eksplodirao sa dostupnim pomoćnim tehnološkim rešenjima, KSK laboratorijama nedostaju resursi da ažuriraju svoju tehnologiju onim što studenti sada preferiraju: asistivnim mobilnim aplikacijama i uređajima i bežičnim rešenjima. Neizvesnost budućeg državnog finansiranja i dalje je čest problem u KSK-u, što rezultira kontinuiranom praksom trošenja minimalnog minimuma na centre za asistivnu podršku, umesto ulaganja u njih.

Technology Success Center (TSC) Crafton Hills koledža ponovo je otvoren 2019. Autorka je postavila trogodišnji plan za modernizaciju i proširenje ponude TSC-a, uprkos ograničenom budžetu i broju osoblja. Pandemija i prelazak na nastavu na daljinu predstavljali su nove barijere, ali i mogućnosti da se iznova osmisle trenutni procesi i primene netradicionalna rešenja. Ključna poboljšanja su primenjena na rad TSC laboratorije. Ovo istraživanje objašnjava početne izazove, primenjena rešenja, ključne promene i razloge za nove inicijative i implementacije. Prvobitni cilj je bio da poboljšamo iskustvo naših učenika sa invaliditetom, ali je evoluirao tako da uključuje razvoj modela „nacrta" laboratorije za asistivnu tehnologiju za pomoć sličnim obrazovnim institucijama.

Ključne reči: asistivne tehnologije, asistivna podrška, osoblje za podršku, učenici sa invaliditetom

* Autorovo istraživanje i preporuke omogućila je stalna podrška administratora koledža za nove tehnološke integracije, strategije i investicije autorove laboratorije i programa asistivne tehnologije, namenjene podršci i poboljšanju učenja za svu našu populaciju studenata sa invaliditetom. Ovaj sažetak odražava samo stavove i iskustvo autora. San Bernardino Community College District nije odgovoran za bilo kakvu upotrebu informacija koje sadrži

# INTEGRATING EMERGENT ASSISTIVE TECHNOLOGIES AND BUILDING A MODERN ASSISTIVE SUPPORT LAB ON A BUDGET; A POTENTIAL MODEL FOR OTHER EDUCATIONAL INSTITUTIONS*

*Suzanne Delahanty*

Crafton Hills College (CHC) Yucaipa California (CA), USA

There is an inconsistent level of quality and student support at the many mandatory assistive technology centers located throughout California's large community college system (CCC). While US laws mandate accommodations and funding for servicing disabled students, outdated technology and a general lack of funding for new assistive technology is common. CCC Labs generally offer dated assistive technology and are short-staffed.

A lack of qualified assistive technology staff is common. Few professional training programs in assistive technology and alternative media field exist. While the US technology sector has exploded with affordable assistive technology solutions, CCC labs lack the resources to update their technology with what college students now prefer: assistive mobile apps and devices, and wireless solutions. Uncertainty of future government funding continues to be a frequent issue at CCC', resulting in the continued practice of spending a bare minimum on assistive support centers, instead of investing in them.

Crafton Hills College's Technology Success Center (TSC) re-opened in 2019. The author set a three-year plan to modernize and expand the TSC's offerings, despite limited budget and staffing. The pandemic and moving to remote instruction presented new barriers, but also opportunities to reinvent current processes and implement non-traditional solutions. Key improvements were applied to the TSC lab operations. This action research explains initial challenges, applied solutions, key changes, and rationale behind new initiatives and implementations. The initial goal was to improve our disabled students' experience, but evolved to include developing a model assistive technology lab "blueprint" to assist similar educational institutions.

Key words: assistive technologies, assistive support, support staff, students with disabilities

* Acknowledgements: The author's research and recommendations were made possible by the college administrators continued support for new technological integrations, strategies and investments of the author's assistive technology lab and programs, intended to support and improve learning for all our disabled student population. This abstract reflects only the author's views and experience. The San Bernardino Community College District is not responsible for any use that may be made of the information it contains.

ČETVRTA MEĐUNARODNA KONFERENCIJA
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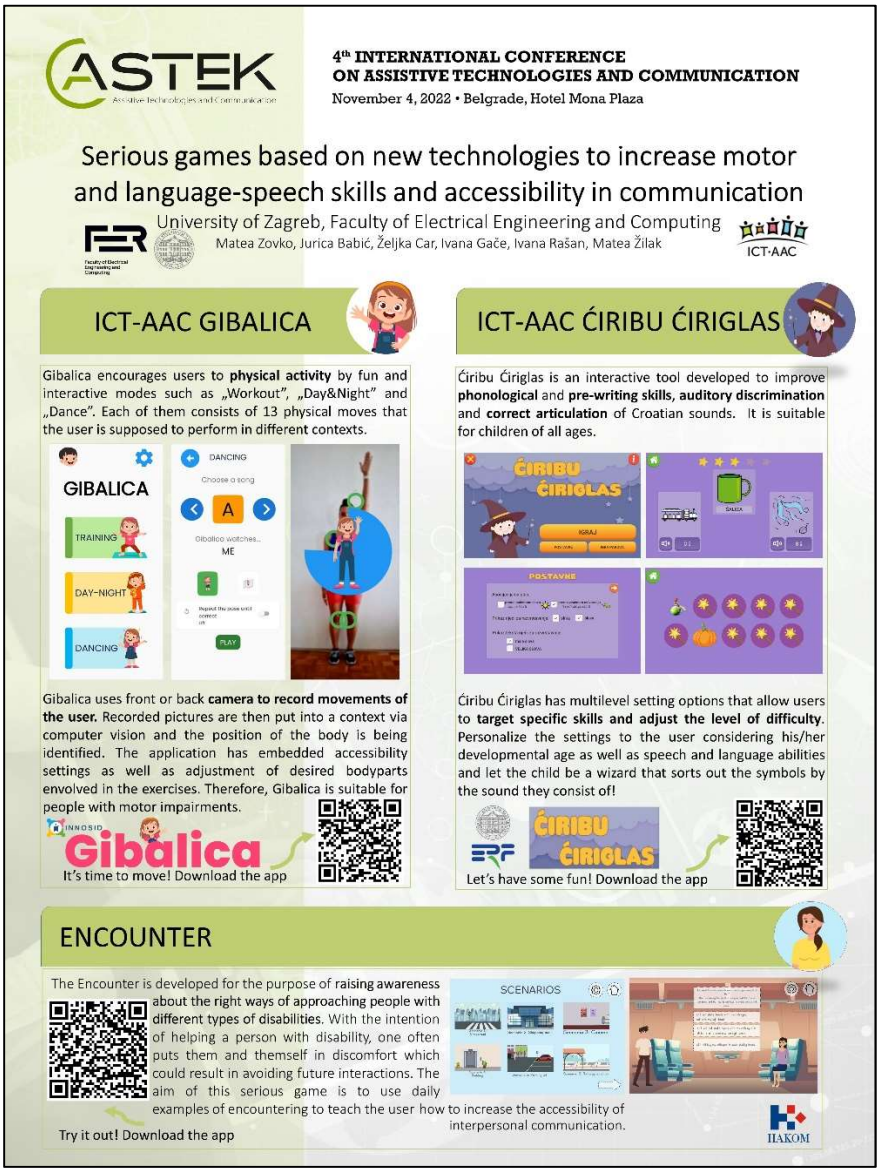
POSTER

# SERIOUS GAMES BASED ON NEW TECHNOLOGIES TO INCREASE MOTOR AND LANGUAGE-SPEECH SKILLS AND ACCESSIBILITY IN COMMUNICATION*

*Matea Zovko, Jurica Babić, Željka Car, Ivana Gače, Ivana Rašan, Matea Žilak*

University of Zagreb, Faculty of Electrical Engineering and Computing

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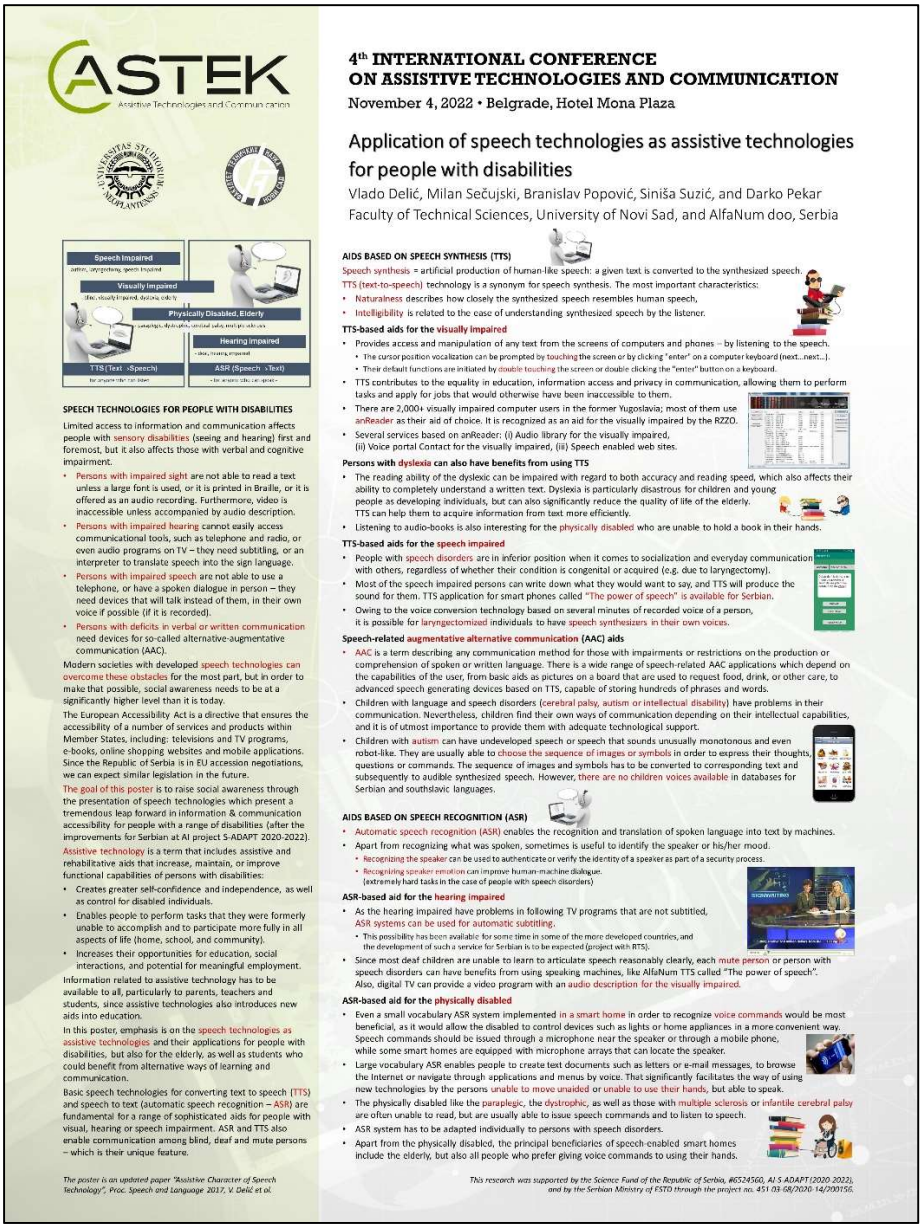
# APPLICATION OF SPEECH TECHNOLOGIES AS ASSISTIVE TECHNOLOGIES FOR PEOPLE WITH DISABILITIES*

*Vlado Delić, Milan Sečujski, Branislav Popović, Sinša Suzić, Darko Pekar*

Faculty of Technical Sciences, University of Novi Sad, and AlfaNum doo, Serbia

POSTER



4th INTERNATIONAL CONFERENCE
ON ASSISTIVE TECHNOLOGIES AND COMMUNICATION
November 4, 2022 • Belgrade, Hotel Mona Plaza

Application of speech technologies as assistive technologies for people with disabilities

Vlado Delić, Milan Sečujski, Branislav Popović, Siniša Suzić, and Darko Pekar
Faculty of Technical Sciences, University of Novi Sad, and AlfaNum doo, Serbia

Speech Impaired
Visually Impaired
Physically Disabled, Elderly
Hearing Impaired
TTS (Text ->Speech)
ASR (Speech ->Text)

SPEECH TECHNOLOGIES FOR PEOPLE WITH DISABILITIES

Limited access to information and communication affects people with sensory disabilities (seeing and hearing) first and foremost, but it also affects those with verbal and cognitive impairment.

- Persons with impaired sight are not able to read a text unless a large font is used, or it is printed in Braille, or it is offered as an audio recording. Furthermore, video is inaccessible unless accompanied by audio description.
- Persons with impaired hearing cannot easily access communicational tools, such as telephone and radio, or even audio programs on TV – they need subtitling, or an interpreter to translate speech into the sign language.
- Persons with impaired speech are not able to use a telephone, or have a spoken dialogue in person – they need devices that will talk instead of them, in their own voice if possible (if it is recorded).
- Persons with deficits in verbal or written communication need devices for so-called alternative-augmentative communication (AAC).

Modern societies with developed speech technologies can overcome these obstacles for the most part, but in order to make that possible, social awareness needs to be at a significantly higher level than it is today.

The European Accessibility Act is a directive that ensures the accessibility of a number of services and products within Member States, including: televisions and TV programs, e-books, online shopping websites and mobile applications. Since the Republic of Serbia is in EU accession negotiations, we can expect similar legislation in the future.

The goal of this poster is to raise social awareness through the presentation of speech technologies which present a tremendous leap forward in information & communication accessibility for people with a range of disabilities (after the improvements for Serbian at AI project S-ADAPT 2020-2022).

Assistive technology is a term that includes assistive and rehabilitative aids that increase, maintain, or improve functional capabilities of persons with disabilities:

- Creates greater self-confidence and independence, as well as control for disabled individuals.
- Enables people to perform tasks that they were formerly unable to accomplish and to participate more fully in all aspects of life (home, school, and community).
- Increases their opportunities for education, social interactions, and potential for meaningful employment.

Information related to assistive technology has to be available to all, particularly to parents, teachers and students, since assistive technologies also introduces new aids into education.

In this poster, emphasis is on the speech technologies as assistive technologies and their applications for people with disabilities, but also for the elderly, as well as students who could benefit from alternative ways of learning and communication.

Basic speech technologies for converting text to speech (TTS) and speech to text (automatic speech recognition – ASR) are fundamental for a range of sophisticated aids for people with visual, hearing or speech impairment. ASR and TTS also enable communication among blind, deaf and mute persons – which is their unique feature.

*The poster is an updated paper "Assistive Character of Speech Technology", Proc. Speech and Language 2017, V. Delić et al.*

AIDS BASED ON SPEECH SYNTHESIS (TTS)

Speech synthesis = artificial production of human-like speech: a given text is converted to the synthesized speech.
TTS (text-to-speech) technology is a synonym for speech synthesis. The most important characteristics:

- Naturalness describes how closely the synthesized speech resembles human speech,
- Intelligibility is related to the case of understanding synthesized speech by the listener.

TTS-based aids for the visually impaired

- Provides access and manipulation of any text from the screens of computers and phones – by listening to the speech.
  - The cursor position vocalization can be prompted by touching the screen or by clicking "enter" on a computer keyboard (next...next...).
  - Their default functions are initiated by double touching the screen or double clicking the "enter" button on a keyboard.
- TTS contributes to the equality in education, information access and privacy in communication, allowing them to perform tasks and apply for jobs that would otherwise have been inaccessible to them.
- There are 2,000+ visually impaired computer users in the former Yugoslavia; most of them use anReader as their aid of choice. It is recognized as an aid for the visually impaired by the RZZO.
- Several services based on anReader: (i) Audio library for the visually impaired, (ii) Voice portal Contact for the visually impaired, (iii) Speech enabled web sites.

Persons with dyslexia can also have benefits from using TTS

- The reading ability of the dyslexic can be impaired with regard to both accuracy and reading speed, which also affects their ability to completely understand a written text. Dyslexia is particularly disastrous for children and young people as developing individuals, but can also significantly reduce the quality of life of the elderly. TTS can help them to acquire information from text more efficiently.
- Listening to audio-books is also interesting for the physically disabled who are unable to hold a book in their hands.

TTS-based aids for the speech impaired

- People with speech disorders are in inferior position when it comes to socialization and everyday communication with others, regardless of whether their condition is congenital or acquired (e.g. due to laryngectomy).
- Most of the speech impaired persons can write down what they would want to say, and TTS will produce the sound for them. TTS application for smart phones called "The power of speech" is available for Serbian.
- Owing to the voice conversion technology based on several minutes of recorded voice of a person, it is possible for laryngectomized individuals to have speech synthesizers in their own voices.

Speech-related augmentative alternative communication (AAC) aids

- AAC is a term describing any communication method for those with impairments or restrictions on the production or comprehension of spoken or written language. There is a wide range of speech-related AAC applications which depend on the capabilities of the user, from basic aids as pictures on a board that are used to request food, drink, or other care, to advanced speech generating devices based on TTS, capable of storing hundreds of phrases and words.
- Children with language and speech disorders (cerebral palsy, autism or intellectual disability) have problems in their communication. Nevertheless, children find their own ways of communication depending on their intellectual capabilities, and it is of utmost importance to provide them with adequate technological support.
- Children with autism can have undeveloped speech or speech that sounds unusually monotonous and even robot-like. They are usually able to choose the sequence of images or symbols in order to express their thoughts, questions or commands. The sequence of images and symbols has to be converted to corresponding text and subsequently to audible synthesized speech. However, there are no children voices available in databases for Serbian and southslavic languages.

AIDS BASED ON SPEECH RECOGNITION (ASR)

- Automatic speech recognition (ASR) enables the recognition and translation of spoken language into text by machines.
- Apart from recognizing what was spoken, sometimes is useful to identify the speaker or his/her mood.
  - Recognizing the speaker can be used to authenticate or verify the identity of a speaker as part of a security process.
  - Recognizing speaker emotion can improve human-machine dialogue. (extremely hard tasks in the case of people with speech disorders)

ASR-based aid for the hearing impaired

- As the hearing impaired have problems in following TV programs that are not subtitled, ASR systems can be used for automatic subtitling.
  - This possibility has been available for some time in some of the more developed countries, and the development of such a service for Serbian is to be expected (project with RTS).
- Since most deaf children are unable to learn to articulate speech reasonably clearly, each mute person or person with speech disorders can have benefits from using speaking machines, like AlfaNum TTS called "The power of speech". Also, digital TV can provide a video program with an audio description for the visually impaired.

ASR-based aid for the physically disabled

- Even a small vocabulary ASR system implemented in a smart home in order to recognize voice commands would be most beneficial, as it would allow the disabled to control devices such as lights or home appliances in a more convenient way. Speech commands should be issued through a microphone near the speaker or through a mobile phone, while some smart homes are equipped with microphone arrays that can locate the speaker.
- Large vocabulary ASR enables people to create text documents such as letters or e-mail messages, to browse the Internet or navigate through applications and menus by voice. That significantly facilitates the way of using new technologies by the persons unable to move unaided or unable to use their hands, but able to speak.
- The physically disabled like the paraplegic, the dystrophic, as well as those with multiple sclerosis or infantile cerebral palsy are often unable to read, but are usually able to issue speech commands and to listen to speech.
- ASR system has to be adapted individually to persons with speech disorders.
- Apart from the physically disabled, the principal beneficiaries of speech-enabled smart homes include the elderly, but also all people who prefer giving voice commands to using their hands.

*This research was supported by the Science Fund of the Republic of Serbia, #6524560, AI-S-ADAPT (2020-2022), and by the Serbian Ministry of ESTD through the project no. 451-03-68/2020-14/200156.*

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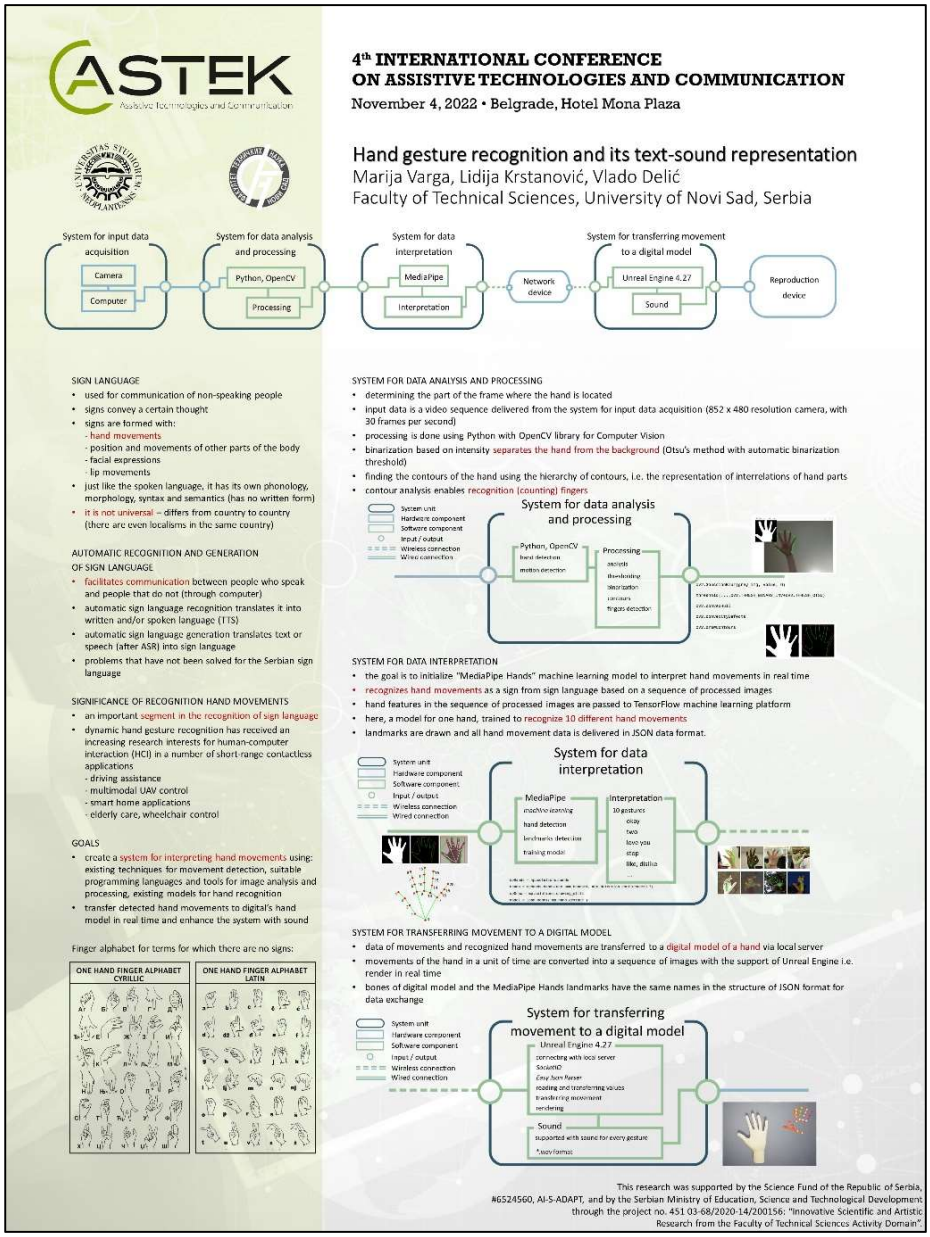
# HAND GESTURE RECOGNITION AND ITS TEXT-SOUND REPRESENTATION*

*Marija Varga, Lidija Krstanović, Vlado Delić*

Faculty of Technical Sciences, University of Novi Sad, Serbia

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# COLOR IMPACT ON THE DETECTION OF DYSLEXIC READING TENDENCIES USING EYE TRACKING*

*Ivan Vajs[1, 2], Gordana Čolić[5], Vanja Ković[3], Tadeja Jere Jakulin[6], Tamara Papić[4], Gregor Papa[7], Andrej Savić[1], Milica M. Janković[1]*

[1]School of Electrical Engineering, University of Belgrade; [2]Innovation Center, School of Electrical Engineering in Belgrade; [3]Faculty of Philosophy, University of Belgrade; [4]Faculty of Technical Sciences, University Singidunum; [5]The College of Social Work; [6]FTŠ Turistica, University of Primorska; [7]Computer Systems Department, Jožef Stefan Institute

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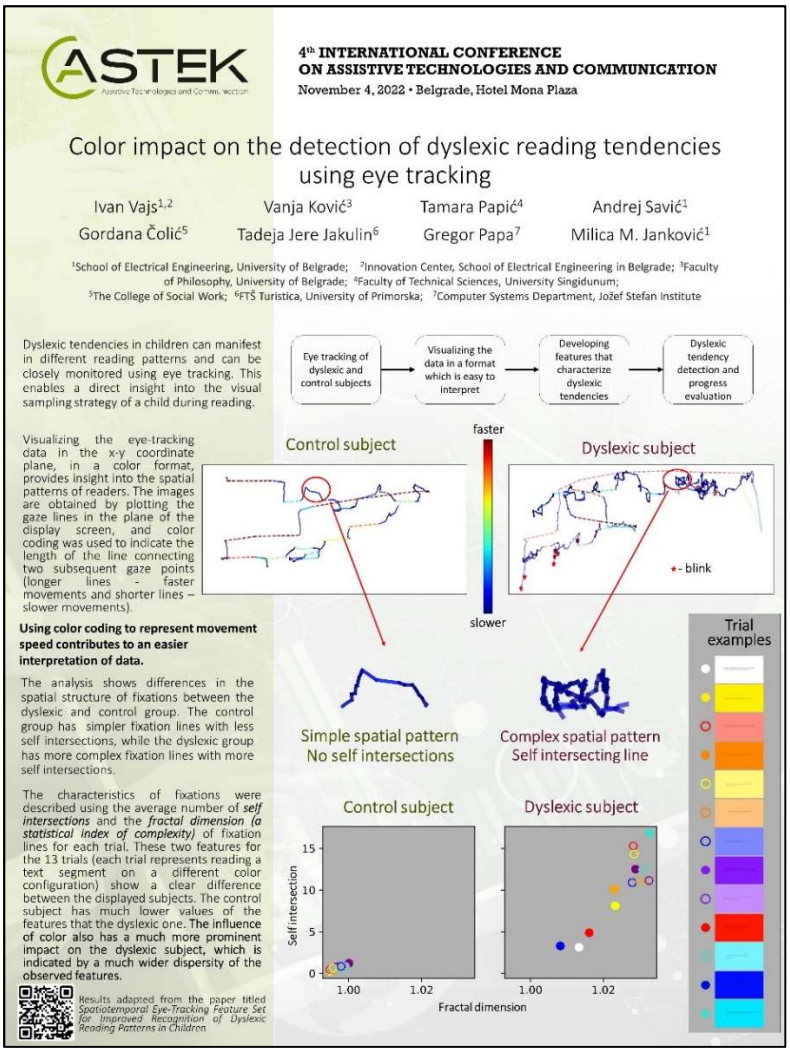


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# CLASSIFICATION OF SERBIAN SIGN LANGUAGE ALPHABET BASED ON ELECTROMYOGRAPHY AND KINEMATIC SIGNALS*

*Tijana Aleksić*

School of Electrical Engineering, University of Belgrade, Serbia

ASTEK
Assistive Technologies and Communication

**4th INTERNATIONAL CONFERENCE ON ASSISTIVE TECHNOLOGIES AND COMMUNICATION**
November 4, 2022 • Belgrade, Hotel Mona Plaza

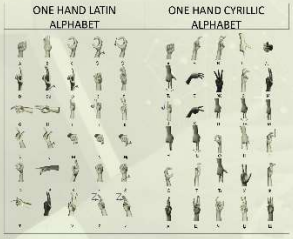
**Classification of serbian sign language alphabet based on electromyography and kinematic signals**
Tijana Aleksić,
Student at School of Electrical Engineering, University of Belgrade, Serbia

**This paper examines the potential of using electromyography and kinematic signals to differentiate the Serbian sign language alphabet letters. The classification is performed using three different classifiers based on six features extracted from the recorded signals. High accuracy results are reported, and the method shows strong potential for this application.**

**What are the main goals in this paper?**

- Creating a classifier for differentiating individual letters of serbian latin sign language alphabet based on the electromyography and kinematic signals acquired by wearable technology.
- Comparing multiple classification methods based on machine learning algorithms.
- Finding optimal parameters for each classification method and choosing the best option

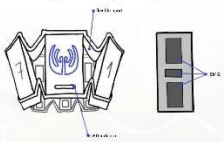
Although the sign language is mainly based on whole words or sentences, in every language there is also a sign alphabet. In the Serbian language there are two alphabets, and the Latin alphabet is considered in this paper.




**What is the motivation for the paper and where it can be used?**

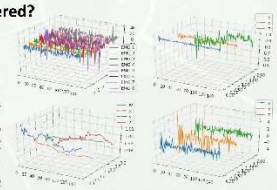
- Lack of published papers for sign language, especially for serbian sign language
- Difficulties that deaf people face in day-to-day living can be reduced by the new technologies for translation.
- Best classifier can be potentially used for real-time system for writing and speaking the sign language

**What signals and features can be used for differentiating the alphabet letters?**
In this research, MYO-armband (ThalmicsLab, Canada) was used. Armband has 8 EMG signal amplifier, IMU unit and orientation sensor unit. The device is connected with the bluetooth module integrated in the main block of the device itself. All of the blocks are connected with flexible strip which should hold the device on the forearm, near the elbow. From this device we can document 8 EMG data signals, 3 gyroscope signals, 3 accelerometer signals and 4 orientation data signals. From the obtained time series we calculate 6 parameters such as mean value, median value, standard deviation of signal, skewness, minimal and maximal value for fragment of signal. These features are inputs for classifiers.



**Which method for classifying are considered?**

- K nearest neighbour - **KNN**
- Logistic Regression - **LR**
- Support Vector Machine - **SVM**



All signals for letter "I" from the base that is prepared during this research.

All data for training and validating the algorithms are acquired on 3 subjects, one male and two females. Every subject was asked to perform all alphabet letters separately for 10 s each and every single letter for 10 times. The data is split into the training and validation sets and for all the classifiers we calculated Leave-one-out (LOO) cross-validation score for evaluating the classifiers. This score was calculated by leaving one data on the side and train model on the rest of the dataset. Process is repeated for each data in dataset and the final result is average accuracy from validation sets.

**What are the results for optimal parameters?**

- **KNN** method LOO cross-validation score was **80.2 %**
- **LR** method LOO cross-validation score was between **62 %** for **multinomial logistic regression** and **70 %** for multiclass logistic regression based on principle **"One-vs-one"** (ONO)
- **SVM** method LOO cross-validation score was **83.6 %.**

With these scores we can say that **SVM** algorithm **is the best** for classifying letters of serbian sign language alphabet, although **both SVM** and **KNN** have the same accuracy of **84 %** when the validation and training set is separated into the 25 % and 75% respectively. The reason for wrong classifications can potentially be because of similarity between some letters like "Z" and "Ž" and those assumptions can be in some way proven to be truth.

This research was part of bachelor thesis in the School of Electrical Engineering, University of Belgrade, Serbia
Mentored by an associate professor Milica Janković

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# DIGITAL EDUCATION PLATFORM "DIGI ACADEMY" INNOVATIVE CONTRIBUTION OF THE DIGI-ID PLUS PROJECT*

*Daniela Bratković*[1], *Rea Fulgosi-Masnjak*[1], *Ana-Maria Bohaček*[1], *Lea Masnjak Šušković*[1], *Alisa Fabris*[2], *Sara Fiori*[2], *Esther Murphy*[2]

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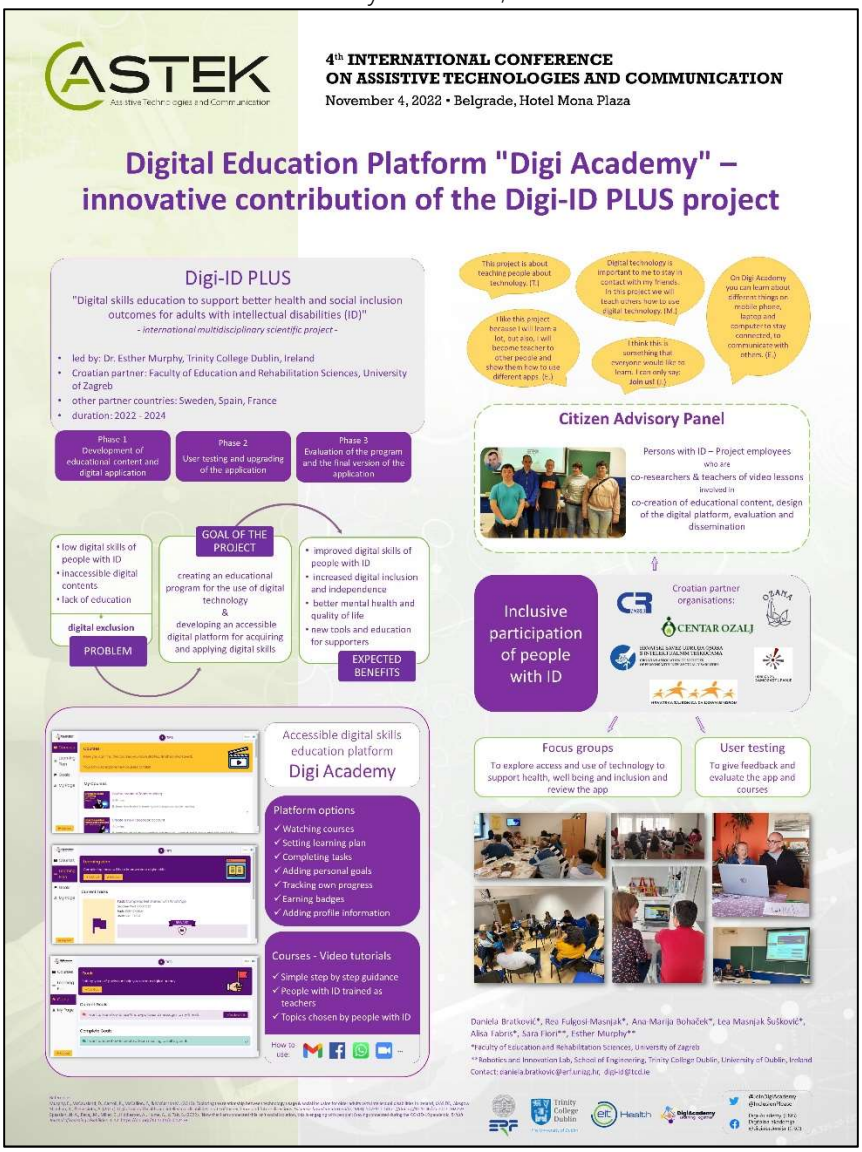


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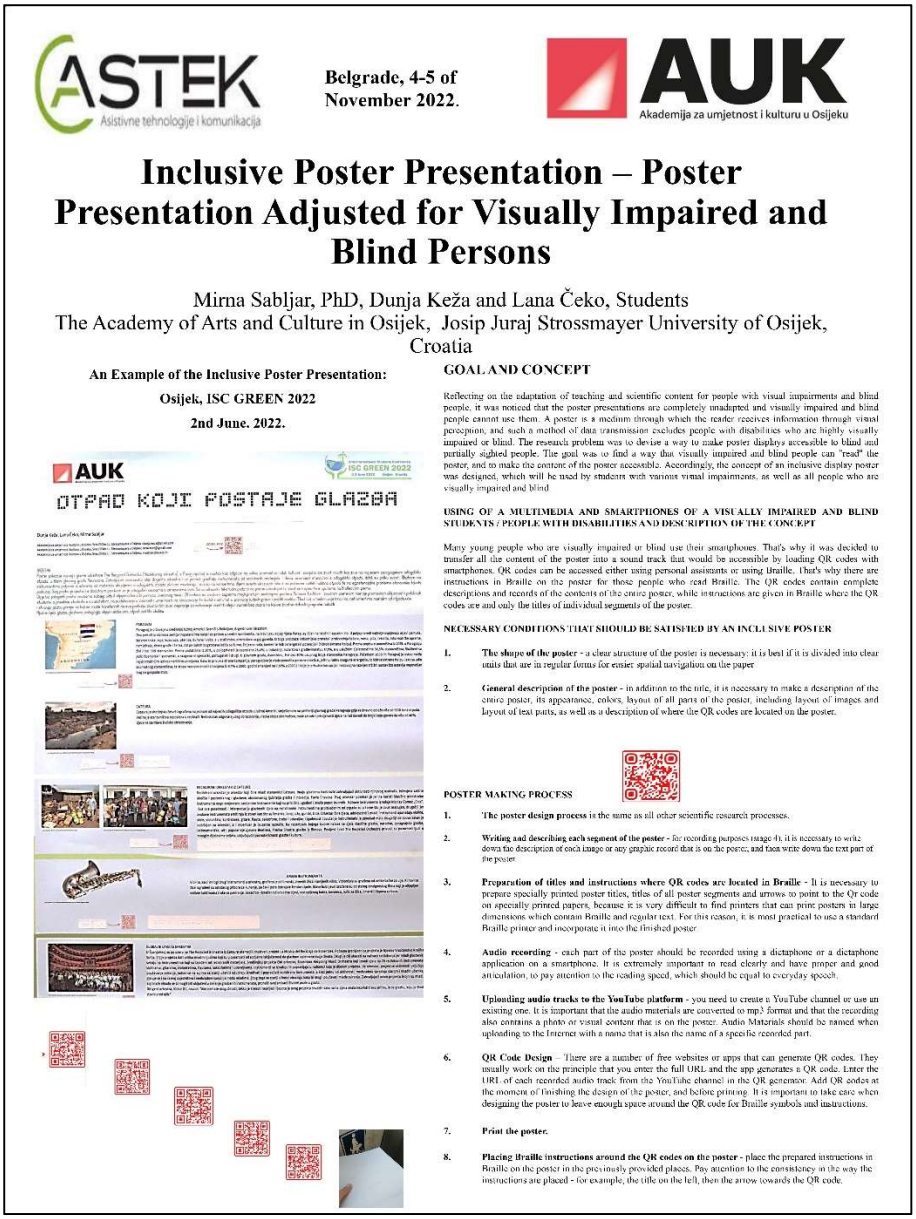
# INCLUSIVE POSTER PRESENTATION PRESENTATION ADJUSTED FOR VISUALLY BLIND PERSONS*

*Mirna Sabljar, Dunja Kea, Lana Čeko*

Academy of Arts and Culture in Osijek, Josip Juraj Strossmayer University of Osijek, Croatia



ASTEK Asistivne tehnologije i komunikacija

Belgrade, 4-5 of November 2022.

AUK Akademija za umjetnost i kulturu u Osijeku

## Inclusive Poster Presentation – Poster Presentation Adjusted for Visually Impaired and Blind Persons

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The Academy of Arts and Culture in Osijek, Josip Juraj Strossmayer University of Osijek, Croatia

**An Example of the Inclusive Poster Presentation:**
**Osijek, ISC GREEN 2022**
**2nd June. 2022.**

AUK

ISC GREEN 2022

OTPAD KOJI POSTAJE GLAZBA

**GOAL AND CONCEPT**

Reflecting on the adaptation of teaching and scientific content for people with visual impairments and blind people, it was noticed that the poster presentations are completely unadapted and visually impaired and blind people cannot use them. A poster is a medium through which the reader receives information through visual perception, and such a method of data transmission excludes people with disabilities who are highly visually impaired or blind. The research problem was to devise a way to make poster displays accessible to blind and partially sighted people. The goal was to find a way that visually impaired and blind people can "read" the poster, and to make the content of the poster accessible. Accordingly, the concept of an inclusive display poster was designed, which will be used by students with various visual impairments, as well as all people who are visually impaired and blind.

**USING OF A MULTIMEDIA AND SMARTPHONES OF A VISUALLY IMPAIRED AND BLIND STUDENTS / PEOPLE WITH DISABILITIES AND DESCRIPTION OF THE CONCEPT**

Many young people who are visually impaired or blind use their smartphones. That's why it was decided to transfer all the content of the poster into a sound track that would be accessible by loading QR codes with smartphones. QR codes can be accessed either using personal assistants or using Braille. That's why there are instructions in Braille on the poster for those people who read Braille. The QR codes contain complete descriptions and records of the contents of the entire poster, while instructions are given in Braille where the QR codes are and only the titles of individual segments of the poster.

**NECESSARY CONDITIONS THAT SHOULD BE SATISFIED BY AN INCLUSIVE POSTER**

1. **The shape of the poster** - a clear structure of the poster is necessary: it is best if it is divided into clear units that are in regular forms for easier spatial navigation on the paper
2. **General description of the poster** – in addition to the title, it is necessary to make a description of the entire poster, its appearance, colors, layout of all parts of the poster, including layout of images and layout of text parts, as well as a description of where the QR codes are located on the poster.

**POSTER MAKING PROCESS**

1. **The poster design process** is the same as all other scientific research processes.
2. **Writing and describing each segment of the poster** - for recording purposes (stage 4), it is necessary to write down the description of each image or any graphic record that is on the poster, and then write down the text part of the poster.
3. **Preparation of titles and instructions where QR codes are located in Braille** - It is necessary to prepare specially printed poster titles, titles of all poster segments and arrows to point to the Qr code on specially printed papers, because it is very difficult to find printers that can print posters in large dimensions which contain Braille and regular text. For this reason, it is most practical to use a standard Braille printer and incorporate it into the finished poster.
4. **Audio recording** - each part of the poster should be recorded using a dictaphone or a dictaphone application on a smartphone. It is extremely important to read clearly and have proper and good articulation, to pay attention to the reading speed, which should be equal to everyday speech.
5. **Uploading audio tracks to the YouTube platform** - you need to create a YouTube channel or use an existing one. It is important that the audio materials are converted to mp3 format and that the recording also contains a photo or visual content that is on the poster. Audio Materials should be named when uploading to the Internet with a name that is also the name of a specific recorded part.
6. **QR Code Design** – There are a number of free websites or apps that can generate QR codes. They usually work on the principle that you enter the full URL and the app generates a QR code. Enter the URL of each recorded audio track from the YouTube channel in the QR generator. Add QR codes at the moment of finishing the design of the poster, and before printing. It is important to take care when designing the poster to leave enough space around the QR code for Braille symbols and instructions.
7. **Print the poster.**
8. **Placing Braille instructions around the QR codes on the poster** - place the prepared instructions in Braille on the poster in the previously provided places. Pay attention to the consistency in the way the instructions are placed - for example, the title on the left, then the arrow towards the QR code.

POSTER

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# CENTRI ZA ASISTIVNE TEHNOLOGIJE
# CENTERS FOR ASSISTIVE TECHNOLOGIES*

*Medina Vantić-Tanjić*

Edukacijsko-rehabilitacijski fakultet, Univerzitet u Tuzli, Tuzla, Bosna i Hercegovina

POSTER


* Poster je dostupan u izvornom obliku na linku:
https://drive.google.com/file/d/1B1QhUuyJD7oxRuSS1zTp1mMbrwg7mAac/view?usp=share_link

# E-PLATFORMA ZA DALJINSKU PODRŠKU DECI SA INVALIDITETOM I NJIHOVIM PORODICAMA*

*Goran Petrušev, Mate Sabolić*

Savez specijalnih edukatora i rehabilitatora Republike Severne Makedonije

4th INTERNATIONAL CONFERENCE
ON ASSISTIVE TECHNOLOGIES AND COMMUNICATION
November 4, 2022 • Belgrade, Hotel Mona Plaza

EDUINK.MK

E-PLATFORMA ZA DALJINSKU PODRŠKU DECI SA INVALIDITETOM I NJIHOVIM PORODICAMA

Goran Petrušev, Mate Sabolić

Savez specijalnih edukatora i rehabilitatora Republike Severne Makedonije

Uvođenjem onlajn nastave učenici su značajni izazovi u učenju među učenicima sa smetnjama u razvoju. Nastava koja je realizovana učenjem na daljinu imala je negativan uticaj na njih i njihove porodice. Istovremeno, najviše su pogođeni učenici, posebno oni na selu, učenici iz socijalno ugroženih porodica, kao i učenici sa smetnjama u razvoju, što je istaklo već postojeće probleme u nastavi sa kojima se suočavaju.

Predmet ovog izveštaja je opis E-platforme za daljinsku podršku deci sa smetnjama u razvoju i njihovim porodicama koju je izradio Savez specijalnih edukatora i rehabilitatora RSM u saradnji sa Makedonskim Montesori asocijacijom, koja je finansijski podržana od strane Misije OEBS-a u Skoplju. Cilj je upoznavanje šire stručne javnosti sa platformom vvv.eduink.mk koja je namenjena podršci inkluzivnom obrazovanju.

Platforma omogućava individualizovanu podršku u učenju za učenike sa smetnjama u razvoju uključenim u redovne škole, koji nastavu prate po Individualnom planu obrazovanja (IOP). Postoji odeljak koji je dostupan svim posetiocima i odeljak za pružanje personalizovanih usluga podrške učenju. Postavljeni sadržaji omogućavaju lakše savladavanje nastavnog materijala učenicima sa smetnjama u razvoju, a korisni su i njihovim roditeljima u pružanju adekvatne podrške kod kuće i značajan su resurs za nastavno osoblje i druge stručnjake uključene u nastavu sa ovim učenicima. U budućnosti je planirano da se ova platforma integriše u okvire nacionalne onlajn platforme, kako bi bila dostupna svim učenicima sa smetnjama u razvoju uključenim u redovni sistem obrazovanja.

Učenici sa smetnjama u razvoju, porodice dece sa smetnjama u razvoju, učenje na daljinu (onlajn nastava), podrška na daljinu, E-platforma

Platforma ima glavni deo koji je dostupan svim posetiocima, gde se mogu pronaći informacije za predškolce i osnovce. Sadržaji obrađuju teme o dostignućima u razvojnim oblastima tipične dece uzrasta 6-7 godina, period pre polaska u osnovno obrazovanje, sa ciljem sticanja uvida u kompetencije koje dete tog uzrasta treba da poseduje da bi moglo da prati nastavu po redovnom planu i programu. Nadalje, platforma nudi informacije o inkluzivnom obrazovanju, vrstama podrške koja se pruža učenicima sa smetnjama u razvoju u redovnim školama, šta je IOP, kome je namenjen i kako se priprema, opis različitih strategija za rad sa učenicima različitih vrsta hendikepa, objašnjenja različitih pristupa i metoda rada sa decom sa smetnjama u razvoju, saveti za roditelje, kao i opis studija slučaja. Takođe, platforma nudi personalizovanu uslugu podrške učenju koja zahteva registraciju učenika (od strane roditelja ili nastavnika), a zatim kreira personalizovani profil na koji učenik, roditelj, nastavnik (i druge osobe, kao što su defektolog i/ ili asistenta u nastavi, u slučaju da učenik ima podršku u učenju i od ovih lica). Na ovim personalizovanim profilima postavljeni su individualizovani obrazovni sadržaji i smernice za učenje prema IOP u učenika.

Sa uvođenjem onlajn nastave u Republici Severnoj Makedoniji, učeni su značajni izazovi u učenju među učenicima sa smetnjama u razvoju. Nastava koja se izvodila putem učenja na daljinu, kao jedine bezbedne opcije za zdravlje, imala je negativan uticaj na njih i njihove porodice. Generalno, obrazovne institucije nisu bile u potpunosti pripremljene za onlajn učenje, nisu postojali razvijeni standardi za e-učenje, kao ni nacionalna platforma za učenje na daljinu u osnovnom i srednjem obrazovanju. Istovremeno, najviše su pogođeni učenici, posebno oni na selu, učenici iz socijalno ugroženih porodica, kao i učenici sa smetnjama u razvoju, što je ukazalo na već postojeće probleme u nastavi sa kojima se suočavaju (Poseban izveštaj RSM Ombudsman, 2020).

Predmet ovog izveštaja je opis E-platforme za daljinsku podršku deci sa smetnjama u razvoju i njihovim porodicama, a cilj je da se šira stručna javnost upozna sa platformom vvv.eduink.mk koja je namenjena podršci inkluzivnom obrazovanju . E-platformu je razvio Savez specijalnih edukatora i rehabilitatora Republike Severne Makedonije u saradnji sa Makedonskim Montesori udruženjem, 2020. godine, uz finansijsku podršku Misije OEBS-a u Skoplju. Reč je o digitalnoj platformi koja nudi individualizovanu podršku u učenju za učenike sa smetnjama u razvoju koji su uključeni u redovnu nastavu u osnovnim školama i koji prate nastavu prema Individualnom obrazovnom planu (IOP) (https://sojuzser.org/indek/indek.php /mk / activities/projects/current-projects/item/134-informacija-eduink). Na platformi se mogu naći različiti edukativni sadržaji (tekstovi, fotografije, prezentacije, video zapisi), kroz koje se podstiče savladavanje nastavnog materijala, kako prema uzrastu učenika sa smetnjama u razvoju, tako i prema njihovom IOP-u. Da bi se obezbedila dostupnost široj ciljnoj grupi, platforma je, pored makedonskog, i na albanskom jeziku.

Ovakve obrazovne onlajn platforme su od velikog značaja jer omogućavaju individualizovanu podršku u učenju za učenike sa smetnjama u razvoju uključenim u redovne škole, odnosno omogućavaju lakše savladavanje nastavnog materijala učenicima sa smetnjama u razvoju, a korisne su i njihovim roditeljima u pružanju odgovarajuće podrške u dom i predstavljaju značajan resurs za nastavno osoblje i druge profesionalce uključene u nastavu sa ovim učenicima (https://eduink.mk/opis na usluge/). Ova vrsta platforme pruža mogućnost učenicima sa smetnjama u razvoju da dobiju kontinuiranu personalizovanu podršku kroz prilagođene (diferencirane i specificirane) nastavne sadržaje prema ciljevima IOP-a i korisne su u slučajevima kada se nastava odvija uz učenje na daljinu, kao i tokom nastava uz fizičko prisustvo. U budućnosti je planirano da se ova platforma integriše u okvire nacionalne onlajn platforme, kako bi bila dostupna svim učenicima sa smetnjama u razvoju uključenim u redovni obrazovni sistem, na nivou osnovnog i srednjeg obrazovanja.

POSTER

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https://drive.google.com/file/d/1Lbiwudgoy4N1F1wFLxuRiGA4xXdycNHJ/view?usp=share_link

ČETVRTA MEĐUNARODNA KONFERENCIJA
ASTEK, 2022.

# RADIONICE – MOTIVACIONA PREDAVANJA

# PRAĆENJE RAZVOJA KOMUNIKACIONIH VEŠTINA I MOGUĆNOSTI OBJEKTIVNE PROCENE STANJA ISPITANIKA TOKOM KOMUNIKACIJA

*Dr Jelena Sučević*

Postdoktorant u Oxford University BabyLab centru;

Ova radionica će se fokusirati na razvoj instrumenata za praćenje i procenu komunikacionih veština. Radionica će okupiti stručnjake iz različitih disciplina, uključujući psihologiju, mentalno zdravlje, psihijatriju, inženjerstvo i specijalnu edukaciju. Cilj radionice je da oformi interdisciplinarni pristup kreiranju preciznih instrumenata za procenu ranih komunikacionih veština, pri čemu će ti instrumenti biti prilagođeni uzrastu ispitanika i laki za upotrebu. Istraživanja u oblasti razvoja pokazuju da je postignuće na testovima kognitivnih i jezičkih veština na ranom uzrastu povezano sa uspehom tokom kasnijeg školovanja. Stoga, postoji potreba za razvojem instrumenata za procenu koij će biti optimizovani za primenu u radu sa malom decom. Tokom ove radionice, planiramo da identifikujemo koje su to sposobnosti čija procena bi bila naročito korisna, kao i da razmotrimo mogućnosti i ograničenja u ovom domenu. Drugi cilj ove radionice je da razmotri potencijal daljeg razvoja ovih instrumenata u obliku igara, ne samo za procenu, već i za podršku razvoja kod dece u programima koji fokusiraju na intervencije, sa ciljem da ovi instrumenti ne služe samo za procenu, već i za podršku razvoja, naročito kod dece sa netipičnim razvojnim trajektorijama.

# MONITORING THE DEVELOPMENT OF COMMUNICATION SKILLS AND THE ABILITY TO OBJECTIVELY ASSESS THE CONDITION OF THE INTERVIEWEE DURING COMMUNICATION

*Dr. Jelena Sučević*

Postdoctoral fellow at the Oxford University BabyLab Center

This workshop will focus on the development of tools for monitoring and assessment of communication skills. The workshop will bring together experts from various disciplines, such as psychology, mental health, psychiatry, engineering and special education. The aim of the workshop is to provide an interdisciplinary approach to designing precise, age- appropriate and user-friendly tools for the assessment of early communication skills. Developmental research shows that achievement on tests of cognitive and language skills in early years is related to later academic success at school. Therefore, there is a need to develop screening tools specifically optimised for working with young children. In this workshop, we aim to identify key skills that will benefit from monitoring, discuss opportunities and identify challenges in this domain. Another aim of this workshop is to explore how these monitoring tools can be used and developed beyond assessment, for gamification of these tools designing interventions programmes that could not only assess, but also support early development, especially in atypically developing children.

# O LINGVISTICI ZNAKOVNIH JEZIKA I SRPSKOM ZNAKOVNOM JEZIKU

*Dragana Raičević*

Master kognitivne i funkionalne lingvistike, doktorant na Univerzitetu u Gentu

Na prezentaciji će biti reči o počecima modernih lingvističkih istraživanja znakovnih jezika u svetu i o dosadašnjim lingvističkim istraživanjima srpskog znakovnog jezika. Navešćemo neke od najznačajnijih univerzitetskih i istraživačkih centara koji se bave istraživanjima znakovnih jezika u Evropi i neke od dosadašnjih projekata ovih centara. Govorićemo o razlikama i sličnostima između znakovnih jezika, i znakovnih jezika i govornih jezika. Posebnu pažnju ćemo posvetiti srpskom znakovnom jeziku, korisnicima srpskog znakovnog jezika, varijetetima srpskog znakovnog jezika i načinu na koji gluva deca usvajaju srpski znakovni jezik u odnosu na način na koji deca koja čuju usvajaju svoj maternji jezik. Osvrnućemo se na nedostupnost prirodnog jezičkog inputa od rođenja kod gluve dece, kao i na kvalitet života gluvih osoba u kontekstu lingvističkog i kognitivnog razvoja. U zaključku ćemo istaći neka od osnovnih ljudskih prava koja se često uskraćuju gluvim osobama, kao što su pravo na pristup informacijama, ali i pravo na kvalitet i tačnost pruženih informacija. Pristupačnost informacijama sagledaćemo, između ostalog, u odnosu na ulogu tumača za znakovne jezike i savremene tehnologije poput avatara.

Ključne reči: znakovni jezici, srpski znakovni jezik, lingvistika znakovnih jezika, kvalitet informacija, moderne tehnologije

## ON SIGN LANGUAGE LINGUISTICS AND SERBIAN SIGN LANGUAGE

*Dragana Raičević*

Master of Cognitive and Functional Linguistics, PhD student at the University of Ghent

The presentation will cover the beginnings of modern sign language linguistics and modern sign language research abroad and in Serbia. I will mention some of the most important university and research centres which investigate sign languages in Europe, and some of these centres' major projects. Special attention will be paid to Serbian Sign Language, Serbian Sign Language users, regional variation of Serbian Sign Language, and sign language acquisition by deaf children compared to spoken language acquisition by hearing children. I will look at the lack of the natural language input from birth in deaf children, and at the quality of life of deaf people in the context of language and cognitive development. In conclusion, the access to accurate and complete information as one of the basic human rights will be highlighted. The access to information will be considered with respect to Linguistic Quality Assurance (LQA) and the role of sign language interpreters in meeting the demands of LQA compared to modern technologies such as signing avatars.

Key words: sign languages, Serbian Sign Language, sign language linguistics, Linguistic Quality Assurance, modern technologies

# RADNA MEMORIJA – OD KONCEPTUALNOG REŠENJA PREKO NEUROPSIHOLOŠKE OSNOVE DO MODELA STIMULACIJE I EMPIRISJKOG PRAĆENJA EFEKATA OBUKE

*Ljiljana Ranđić*

Psiholog, Algo centar za rano čitanje

Radna memorija (RM) je operativni sistem privremenog zadržavanja podataka radi obavljanja operacija nad njima. Koncept radne memorije Bedli i Hič su uobličili u nastojanju da se objasne kognitivni procesi zadržavanja podataka – koji nisu mogli da se objasne konceptima kratkoročne i dugoročne memorije. Trokomponentni model isprva se sastojao od izvršne komponente i dva podređena sistema: fonološke petlje i vizuospacijalnog ekrana. Pomoćni sistemi odgovarali su onome što se do tada smatralo kratkoročnim pamćenjem u različitim modalitetima – verbalnom i vizuospacijalnom. Najvažniju komponentu čini centralni izvršilac koji integriše unutar sebe i koncept pažnje, a neuroanatomski vezan je za aktivnost frontalnog režnja. Njegovi osnovni zadaci vezani su za prebacivanje pažnje, nadgledanje i ažuriranje informacija, inhibiciju odgovora i registrovanje znakova koji upozoravaju na rutinsko reagovanje. Bedli je naknadno dodao i epizodni ekran koji podrazumeva uključivanje i procesiranje informacija iz dugoročne memorije. Radna memorija je u razvojnom dobu ključni beočug razvoja složenih funkcija poput: govora, čitanja, ali i svih složenih kognitivnih procesa. U odraslom dobu ključni je faktor kognitivne efikasnosti, a u poznom dobu pad funkcionalnosti RM biva ključni prediktor opšte kognitivne deteriorizacije. Iako koncept RM, paradoksalno, nikada nije neposredno uvezan sa konceptom inteligencije on je empirijski itekako dovođen u vezu sa inteligencijom i za te potrebe kreirani su zadaci koji su njegov reprezent. Koncept RM još uvek nije do kraja operacionalizovan u okviru standardizovanog mernog instrumenta već je unutar različitih baterija našao svoje delimične „objektivne reprezente". Savremene tehničko-tehnološke alatke pružaju nam mogućnost za ostvarivanje ideala modela koji bi inkorporirao obuku, usmerenu ka osnaživanju RM, i proces empirijskog praćenja njenih efekata sa ciljem koji bi rezultirao standardizovanjem instrumenta koji operacionalizuje sam koncept RM.

# WORKING MEMORY – FROM THE CONCEPTUAL SOLUTION THROUGH THE NEUROPSYHOLOGICAL BASIC TO THE MODEL OF STIMULATION AND EMPIRICAL MONITORING TRAINING EFFECTS

*Ljiljana Ranđić*

Psychologist, Algo Center for Early Reading

Working memory is an operating system for temporarily holding data in order to perform operations on them. The concept of working memory was formulated by Baddeley and Hitch in an effort to explain the cognitive processes of data retention - which could not be explained by the concepts of short-term and long-term memory. The three-component model initially consisted of an executive component and two subordinate systems: the phonological loop and the visuospatial screen. The auxiliary systems corresponded to what until then was considered short-term memory in different modalities - verbal and visuospatial. The most important component is the central executor, which integrates the concept of attention within itself, and is neuroanatomically linked to the activity of the frontal lobe. Its basic tasks are related to shifting attention, monitoring and updating information, inhibiting responses and registering signs that warn of routine reactions. Baddeley subsequently added an episodic display that involves the inclusion and processing of information from long-term memory. In the developmental age, working memory is the key to the development of complex functions such as: speech, reading, but also all complex cognitive processes. In adulthood, it is a key factor in cognitive efficiency, and in late age, the decline in RM functionality is a key predictor of general cognitive deterioration. Although the concept of RM, paradoxically, is never directly connected with the concept of intelligence, it is empirically very much connected with intelligence, and for these purposes, tasks that represent it were created. The RM concept has not yet been fully operationalized within the framework of a standardized measuring instrument, but has found its partial "objective representations" within different batteries of tests. Modern technical-technological tools provide us with the opportunity to realize the ideal of a model that would incorporate training, aimed at strengthening RM, and the process of empirical monitoring of its effects with the aim of resulting in the standardization of an instrument that operationalizes the very concept of RM.

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Zbornik rezimea [Elektronski izvor] / Četvrta međunarodna konferencija o asistivnim tehnologijama i komunikaciji
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а) Деца са посебним потребама -- Апстракти б) Образовна технологија -- Апстракти в) Информациона технологија -- Образовање -- Апстракти г) Социјална интеракција -- Апстракти

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