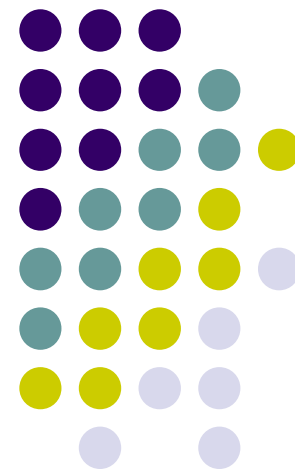
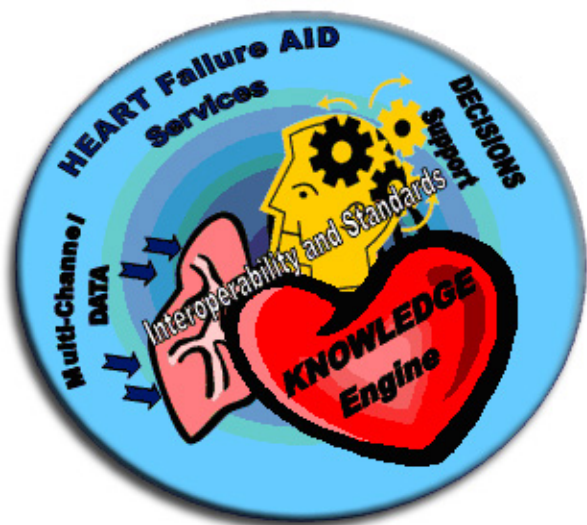


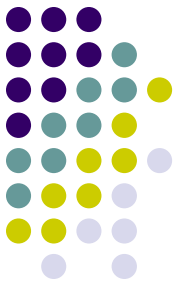


Medicinska ontologija na projektu HEARTFAID

FP6 projekt
Institut Ruđer Bošković
Laboratorij za informacijske sustave

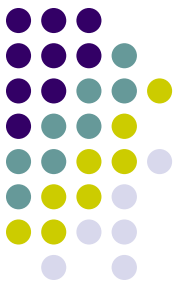


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Sveučilište u Zagrebu



Sadržaj

- Ontologija – što je to?
- Razlozi uporabe
- Jezična osnova
- Proces izrade ontologije
- Medicinski sadržaj
- Daljnji razvoj



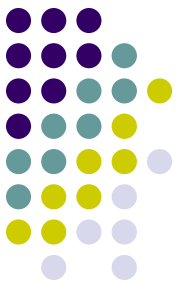
Ontologija

- Način prikaza znanja koji se koristi za terminološki opis određene domene, najčešće detaljni
- Logički jezik s definiranom sintaksom i semantikom
- Omogućuje računalno rasuđivanje i stvaranje novog znanja
- Hijerarhijski pristup opisu domene
- Široka primjena



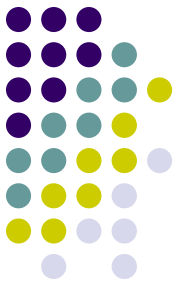
Razlozi uporabe

- Precizan, obiman i učinkovit način sistematizacije znanja
- Omogućuje računalno rasuđivanje nad pojmovima iz neke domene
- Laka prenosivost, nadogradnja i modularnost
- Može se koristiti na Internetu



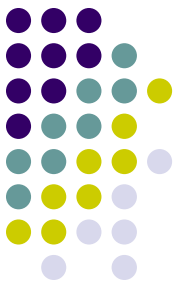
Jezična osnova

- Heartfaid ontologija izrađena je u OWL-DL (engl. Ontology Web Language-Description Logic)
- OWL-DL - maksimalno izražajan i odlučljiv ontološki jezik
- Hijerarhija razreda, veza među razredima, svojstva razreda i pojedinaca
- OWL-DL podrazumijeva otvoren svijet
- Podržava napredno rasuđivanje uključujući: tranzitivna i inverzna svojstva, pobrojane razrede s ograničenjima na vrijednosti objekata, ograničenja na kardinalnost...



Proces izrade ontologije

- Akvizicija - izvori znanja:
 - Znanje eksperata
 - Smjernice (engl. *guidelines*)
 - Ostali izvori (medicinska literatura, projektna dokumentacija, medicinska web sjedišta)
- Osvješčivanje i definiranje koncepata, najprije razreda, zatim svojstava, pa veza među razredima



Proces izrade ontologije

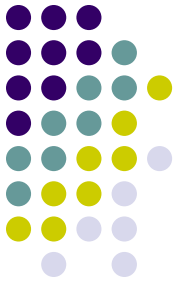
- Slaganje hijerarhije (formalno: TBox) postupcima od vrha prema dnu, od dna prema vrhu i kombinirano
- Dodavanja pojedinaca (ABox) razredima
- Dodavanje poveznica i dokumentiranje
- Integracija u sustav za podršku odlučivanju (eventualno)
- Naknadno dodavanje pojmova i održavanje

Medicinski sadržaj ontologije



- Uključena većina pojmova koji su na bilo koji poznati način povezani s kongestivnim zatajanjem srca
- Oko 200 razreda, 100 svojstava i veza te 2000 pojedinaca
- 5 korjenskih razreda: "HF_concept", "Patient_characteristic", "Patients", "Testing" i "Treatment"
- Dostupna putem:
<http://www.heartfaid.org/links.php>

Medicinski sadržaj ontologije



- Razred “HF_concept” sadrži hijerarhiju podrazreda koja opisuje terminologiju zatajenja srca uključujući:
 - Rizike za kongestivno zatajenje srca,
 - Medicinske sinonime
 - Tipove klasifikacija pacijenata
 - Vremenske okvire

The screenshot displays two panels from a software application:

- CLASS BROWSER:** Shows a class hierarchy for the project "ontologijaGVumlsD5OwL2". The hierarchy is as follows:
 - swrl:Variable (1)
 - HF_concept
 - CHF_risks
 - Blood (8)
 - Central_hemodynamic (7)
 - Clinical (5)
 - Demographical_and_historical (5)
 - Electrophysiologic (4)
 - Functional_and_exertional (3)
 - Classification
 - Clinical_symptomatic_classification (3)
 - New_York_heart_association_of_heart_failure_symptoms (5)
 - Terms
 - Epidemiology_terms (4)
 - Synonym (76)
 - UMLS_syn (626)
 - Timestamp
 - Long_period (3)
 - Months (11)
 - Weeks (10)
 - Years (18)
 - Short_period (2)
 - Days (32)
 - Hours (35)
 - Minutes (18)
 - Patient_characteristics

- INSTANCE BROWSER:** Shows asserted instances for the class "UMLS_syn". The list includes:
- Abdominalgia
- Abnormal_weight_loss
- Acetaminophen
- Acetylsalicylic_acid
- Acoustic_neurilemoma
- Acquired_respiratory_distress_syndrome
- Acute_edema_of_lung
- Acute_MI
- Acute_pulmonary_edema_syndrome
- Acute_rheumatism
- Adiposity
- Adrenal_cortex_hormones
- Adrenaline
- AF
- Age_categories
- Airophony
- Alanine_transaminase
- Alcohol_dependance
- Alcohol_intake_regulation
- Alcohol_use_regulation

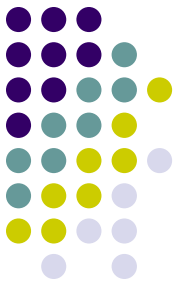
Medicinski sadržaj ontologije



- Razred “Patient characteristics” sadrži:
 - Demografska obilježja pacijenta
 - Moguće dijagnoze
 - Moguće znakove bolesti i simptome
 - Prognozu liječenja
 - Druga obilježja pacijenta

The screenshot displays two panels from an ontology browser. The left panel, titled "CLASS BROWSER", shows a class hierarchy for the project "ontologijaGVumisD5OWL2". The hierarchy starts with "HF_concept" and branches into "Patient_characteristics", "Diagnosis", "Cardiovascular_system_related", and "Other_patient_characteristics". Under "Patient_characteristics", the "Demographic_characteristics" class is expanded, showing subclasses like "Age_group" (7 instances), "Employment_status" (3), "Gender" (2), "Marital_status" (4), and "Racial_group" (4). The right panel, titled "INSTANCE BROWSER", shows the "Age_group" class selected. It displays a list of "Asserted Instances" including Adolescent, Child, Middle_aged, Middle_elderly, Oldest_old, Young_adult, and Young_elderly. Below this, the "Asserted Types" section shows "Age_group" as a type.

Medicinski sadržaj ontologije



- Razred “Testing” sadrži sve podatke o medicinskim testovima. To uključuje:
 - Popis testova
 - Uobičajena mjerenja
 - Normalne raspone mjerenja
 - Bitne rezultate mjerenja
 - Prvi pregled

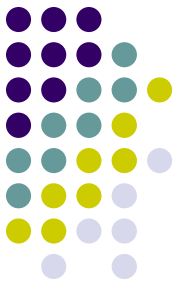
The screenshot displays two panels from a software application. The left panel, titled "CLASS BROWSER", shows a class hierarchy for a project named "ontologijaGVumIsD5OWL2". The hierarchy is as follows:

- Plan (1)
- Testing
 - Normal_ranges (33)
 - Physical_examination (1)
 - Relevant_test_results (57)
 - Test_characteristics (3)
 - Test_list
 - Echocardiography_tests (3)
 - Electrocardiography_tests (2)
 - Hematology_and_biochemistry_tests (25)
 - Other_tests (15)
 - Test_measurements (2)
 - Cardiac_magnetic_resonance_imaging_measurements (9)
 - Cardiac_output_measurements (1)
 - Cardiopulmonary_stress_test_measurements (8)
 - Chest_X-ray_measurements (3)
 - Common_measurements (2)
 - Echocardiography_measurements (14)
 - Electrocardiography_measurements
 - Exercise_test_measurements (14)
 - Hematology_and_biochemistry_measurements (31)
 - Natriuretic_peptides_measurements (2)
 - Physical_examination_measurements
 - Pulmonary_function_tests_measurements (3)
 - Radionuclide_angiography_measurements (3)
 - Six-minute_walk_test_measurements (3)
- Treatment (3)

The right panel, titled "INSTANCE BROWSER", shows the "Asserted Instances" for the class "Other_tests". The instances listed are:

- Cardiac_MRI
- Cardiopulmonary_stress_test
- Cardiovascular_monitoring
- CAT_scan_of_brain
- Chest_CT
- Coronary_angiography
- Endomyocardial_biopsy
- Exercise_stress_test
- MRI_brain_procedure
- Natriuretic_peptides
- Pulmonary_function_tests
- Renal_angiography
- Six-minute_walk_test
- Test_for_allergens
- Thoracic_radiography

At the bottom of the Instance Browser, the "Asserted Types" section shows "Other_tests".



Medicinski sadržaj ontologije

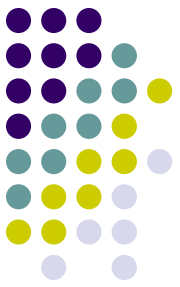
- Razred “Treatment” sadrži medicinske postupke koji se koriste u liječenju zatajenja srca, uključujući:
 - Lijekove (predstavljani skupinom kao i specifičnim generičkim lijekom)
 - Uređaje
 - Operacije i druge postupke
 - Preporuke liječnika

The screenshot displays two panels from a software application. The left panel, titled "CLASS BROWSER", shows a class hierarchy for the project "ontologijaGVumlsD5OWL2". The hierarchy is as follows:

- Treatment (3)
 - Devices_and_surgery
 - Medical_device (8)
 - Artificial_cardiac_pacemaker (3)
 - Surgery (8)
 - Left_ventricular_restoration (4)
 - Medical_procedure (10)
 - Medication
 - Avoid_or_use_with_caution_medications (9)
 - Heart_failure_medication_group (19)
 - ACE_inhibitor (5)
 - Adrenergic_beta_antagonist (8)
 - Aldosterone_receptor_antagonist (2)
 - Angiotensin_II_receptor_blocker (6)
 - Anti_arrhythmia_agents
 - Anti_arrhythmia_agent_class_I
 - Anti_arrhythmia_agent_class_II
 - Anti_arrhythmia_agent_class_III (5)
 - Calcium_antagonist (2)
 - Cardiac_glycoside (1)
 - Diuretics
 - Fibrinolytic_agent (4)
 - Inotropic_agent (9)
 - Oxygen_therapy (1)
 - Vasodilator_agent_and_nitrate (5)
 - Other_medications_groups (11)
 - Recommendations (15)

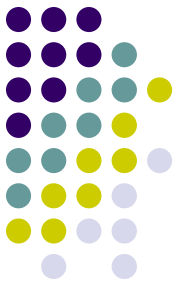
The right panel, titled "INSTANCE BROWSER", shows the "Asserted Instances" for the class "Medical_procedure". The instances listed are:

- Carotid_endarterectomy
- Continuous_positive_airway_pressure
- Electric_countershock
- Endotracheal_intubation
- Infusion
- Inhalation_anesthesia
- Oral_rehydration
- Percutaneous_coronary_intervention
- Spinal_anesthesia
- Thoracentesis



Daljnji razvoj

- Integracija u sustav za potporu odlučivanju
- Proceduralno znanje “oživljava” ontologiju – skup pravila
- Iskorištenje ontologije (u trenutnom ili izmijenjenom obliku) u projektima slične namjene
- Tehnologija primjenljiva za stvarnu pomoć liječnicima pri liječenju pacijenata



Hvala!