UMLS-SKOS
A Semantic Web Framework for Representing Biomedical Knowledge

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What to expect

- Background
  - What is SKOS
- UMLS - SKOS
- Method
- Discussion
  - SKOS vs Domain Ontology
  - Integrity and Gap Analysis
  - Use Cases
- Remaining Work
Simple Knowledge Organization System
SKOS

A framework for use of thesauri, classification schemes, subject heading systems, controlled vocabularies, and taxonomies within the framework of the Semantic Web

Supports representing terminological knowledge and its linkage with domain knowledge in unambiguous, reusable, encapsulated and traceable fashion

Exploits Semantic Web for information sharing and reuse on distributed environment (web)

Enables construction of mashup meta-thesauri unambiguously using multiple sources of knowledge (e.g. PHIN-VADS, HL7)

Enables extension or adoption of standards based terminology systems in novel ways to meet local demands (e.g. PHIN-VADS, HL7)
Abdominal Pain In SKOS

“A clinical syndrome with acute abdominal pain that is severe, localized, and rapid onset. Acute abdomen may be caused by a variety of disorders, injuries, or diseases.”
UMLS - SKOS

UMLS - Semantic Net

- Entity
- Event

SKOS/SKOS-XL

- Concept
- Label
- ConceptScheme

rdfs:subClassOf
UMLS-SKOS

SKOS

Semantic Net

Metathesaurus

SNOMEDCT  MeSH  MedDRA  NCI  ...

SKOS-XL
Method

- Namespaces
- UMLS-Semantic Network
  - Semantic Types and Semantic Relations
  - Assumptions
- UMLS-MTH
  - CUIs, SUI and Labels
  - Hierarchies
  - Semantic Relations and Mappings
- Source Vocabularies
  - Terms, AUI and Labels
  - Semantic Relations
  - Label Relations
Namespaces

- SKOS: http://www.w3.org/2004/02/skos/core#
- SKOS-XL: http://www.w3.org/2008/05/skos-xl#
The Semantic Network

The Semantic Network

Thursday, December 3, 2009
The Semantic Network Assumptions

- All Semantic Types are modeled as owl:Class and rdfs:subClassOf skos:Concept
- The ‘isa’ relations between the Semantic Types and Relations are modeled as ‘rdfs:subClassOf’ and rdfs:subPropertyOf
- All other semantic relations are modeled as sub-properties of skos:related
- A relation is defined as symmetric if its ‘owl:inverseOf’ was self reflexive
- Inverse of a property is sub-property of the inverse of its super-property: “If B is inverse Of A, and A is subProperty of C, and D is inverse of C, then B is subProperty of D”.

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The Semantic Network Assumptions

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- Inverse of a property is sub-property of the inverse of property: “If B is inverse Of A, and A is subProperty and D is inverse of C, then B is subProperty of D”.
UMLS-Metathesaurus Relations (associations)
“Abdominal Pain” is a clinical syndrome with acute abdominal pain that is severe, localized, and rapid onset. Acute abdomen may be caused by a variety of disorders, injuries, or diseases.
"Achondroplasia" in Turtle!

Achondroplasia is a genetic disorder that is the most frequent form of short-limb dwarfism. It affects individuals and causes a disturbance of epiphyseal chondroblastic growth, resulting in inadequate enchondral bone formation. Affected individuals exhibit short stature caused by rhabdomyolysis, rhizomelic shortening of the limbs, characteristic facies with frontal bossing, mid-face hypoplasia, exaggerated lumbar lordosis, limitation of elbow extension, genu varum, and trident hand. (Online Mendelian Inheritance in Man, http://www.ncbi.nlm.nih.gov/Omim, MIM#100800, April 20, 2001)

Achondroplasia is an autosomal dominant disorder that is the most frequent form of short-limb dwarfism. Affected individuals exhibit short stature caused by rhabdomyolysis, rhizomelic shortening of the limbs, characteristic facies with frontal bossing, mid-face hypoplasia, exaggerated lumbar lordosis, limitation of elbow extension, genu varum, and trident hand. (MeSH)
Abdominal Pain (C0000737)
Graphic representation of UML semantic network structures and relationships, including concepts like UMLS, SKOS, SAB, MTH, SNOMEDCT, MeSH, and MedDRA, with various labels and identifiers like "Abdominal Pain", C0000737, C0172359, C0238551, 9209005, 113345001, 140460009, AUI, S035799, SUI, STR, and others. The diagram also includes semantic relations such as skos:broader, skos:narrower, skos:exactMatch, and skos:semanticRelation.
UMLS-SKOS

SKOS

Semantic Net

Metathesaurus

SNOMEDCT MeSH MedDRA RCD NCI
Disjointness of skos:ConceptScheme and skos:Concept

Source vocabularies are Metathesaurus Concepts and have CUI

Exact Cardinality of 1 for skos:prefLabel per language (UMLS does not provide any axioms for labels)

SKOS supports different languages through language tags. No new notation or IRIs are provided for the same concept in different languages
skos:topConcept is not explicitly supported by UMLS-MTH or its sources of vocabularies (should be manually added)

skos:prefLabel, skos:altLabel and skos:hiddenLabel are pairwise disjoint properties. However umls:rn, umls:rb and umls:ro are not.

skos:mappingRelation and skos-xl:labelRelations are not explicitly modeled in UMLS and
- UMLS uses the same kinds of relations for mapping between labels (lexical forms) or concepts, and to establish hierarchies between concepts and terms

Rigorous and automated analysis and enforcement of UMLS-SKOS integrity requires OWL-2 constructs such as disjoint properties and HasKey
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UMLS uses the same kinds of relations for mapping between labels (lexical forms) or concepts, and to establish hierarchies between concepts and terms

Rigorous and automated analysis and enforcement of UMLS-SKOS integrity requires OWL-2 constructs such as disjoint properties and HasKey
LUIs are not modeled

Provenance of relations and definitions are modeled as reified statements that incorporates

English language terms only (yet). No language tags are currently used to specify language

All attributes (from mrSAT table) are modeled as annotations

Semantic relations are modeled between source specific skos:Concepts and not in the MTH level (between CUIs) to ensure integrity and modularity

Between source relationships (mappings) are not modeled (yet)

SPECIALIST component not modeled (yet)
Conclusions

- Formal representation of the terminological knowledge (using SW technologies) enables unambiguous sharing and reuse of the information in distributed environment and promotes better integration and interoperability.

- SKOS provides a simple to understand, easy to extend framework for representation of terminological knowledge.

- SKOS representation of biomedical knowledge available through UMLS-KS may facilitate access, retrieval and interpretation of information represented within the UMLS-KS by automated processes:
  - Easier to understand and learn
  - Easier to access and retrieve information
  - Easier to extend and map to local vocabularies
  - Easier to manage, maintain and curate
  - Easier to share, distribute and reuse
  - Easier to build automated applications with
Separation of the terminological and domain knowledge (information model) in a consistent and maintainable way, where multiple sources of information can be combined to support semantic processing of data without

- Resource intensive and extensive computational processing for realization of large ontologies

- Logical inconsistencies that may arise by combining multiple incompatible conceptualizations

- Rapid adoption and reuse of new sources of information with minimal effort (adoption of new versions of the same model, new extensions to a model etc)
What do we have now?

- An algorithm to consume UMLS-KS databases and automatically convert to an SKOS representation that conforms to the latest W3C recommendation (as of August 18 2009)

- A Triple-store containing the following RDF graphs:
  - UMLS-Semantic Net in SKOS
  - UMLS-Metathesaurus in SKOS
  - SNOMED in SKOS
  - MeSH in SKOS
  - MedDRA in progress

- Several proof of concept or running applications based on the UMLS-SKOS
450+ MTH Concepts,

300 Common in MeSH and SNOMEDCT
Biomedical Language Understanding and Extraction: A Minimal Syntactic, Semantic Method
Biomedical Language Understanding and Extraction

Evidence Space 1
- Large Blister
  - Large
  - Blisters

Evidence Space 2
- Rash
- Scar
- Face

Evidence Space 3
- Nausea
- Vomiting
- Headache
- Diarrhea
  -Defs: No

contains

precedes

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**Biomedical Language Understanding and Extraction**

A Minimal Syntactic, Semantic Method

Resource Form

- **Name**: C0032145

**Annotations**

**Other Properties**

- **rdfs:label**: Amino_Acid_Peptide_or_Protein
- **Biologically_Active_Substance**
- **skos:altLabel**
  - Inactivators, Plasminogen
  - Inhibitors, Plasminogen Activator
  - PAI
  - PLASMINOGEN ACTIVATOR INHIB
  - PLASMINOGEN INACT
  - Plasminogen Activator Inhibitor
  - Plasminogen Activator Inhibitors
  - Plasminogen Inactivators
  - Plasminogen activator inhibitor
  - Plasminogen activator inhibitor (substance)
  - Plasminogen activator inhibitor, NOS
  - Plasminogen inactivator -RETIRED-
  - Plasminogen inactivator, NOS
  - plasminogen activator inhibitor

**skos:definition**

- Important modulators of the activity of plasminogen activators. Four inhibitors, all belonging to the serpin family of proteins, have been implicated in plasminogen activation inhibition. They are PAI-1, PAI-2, protease-nexin, and PROTEIN C INHIBITOR (PAI-3). All inhibit both the tissue-type and urokinase-type plasminogen activators.
- Synthesized and secreted locally from vascular endothelial cells; primary physiologic inhibitor of tissue plasminogen activator; also inhibits urokinase; implicated in thrombotic and hemorrhagic disorders.

**skos:prefLabel**

- Plasminogen Inactivators
Biomedical Language Understanding and Extraction
A Minimal Syntactic, Semantic Method
Biomedical Language Understanding and Extraction

A Minimal Syntactic, Semantic Method
Biomedical Language Understanding and Extraction

Tokens:

- Left
- Arm
- Pain
- Spatial Concept
- Body Loc. Or Region
- Sign Or Syndrome

UMLS-SKOS:
- C0205091
- C0446516
- C0030193

InfM:
- Spatial Modifier
- Locus
- Sign Or Syndrome

correspondsToCUI

rdf:type

rdfs:subClassOf

modifies

hasLocus
Biomedical Language Understanding and Extraction

A Minimal Syntactic, Semantic Method

BLUE - Text
Biomedical Language Understanding and Extraction

A Minimal Syntactic, Semantic Method

WHERE {
  ?erm:hasManifestation ?M.
  Optional {?M erm:isModifiedBy ?Op .}
  Optional {?Op erm:hasModifier ?ModifierConcept .}
  Optional {?ModifierConcept erm:hasMetaString ?ModifierString .}
  ?erm:hasLocus ?L.
  ?erm:hasMetaString ?Locus.
}
a 13 years old teenager with nausea and vomiting after drinking bad milk. has taken Reglan that made her drowsy and confused. no fever and headache. Feels tingling on finger tips and around her mouth. dry skin in observation.
BLUE-Text: Encoding and Standards Based Extraction

WHERE {
  ?erm hasManifestation ?M. 
  ?M aboutObservation ?ObservationCUI. 
  ?ObservationCUI hasConceptString ?ObservationString.
  Optional {
    Optional {
      ?ModifierConcept hasConceptString ?ModifierString.
      UNION (?ModifierConcept def:hasTextForm ?ModifierString).
    }
  }
  Optional { ?M erm hasLocus ?Locus.
    ?Locus hasConceptString ?BodyLoc. }
}

<table>
<thead>
<tr>
<th>ModifierConcept</th>
<th>ModifierString</th>
<th>ObservationCUI</th>
<th>ObservationString</th>
<th>Locus</th>
<th>BodyLoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>erData:C0013144</td>
<td>Drowsiness</td>
<td>S</td>
<td>S</td>
<td>erData:C1281584</td>
<td>Entire finger</td>
</tr>
<tr>
<td>erData:C0042963</td>
<td>Vomiting</td>
<td>S</td>
<td>S</td>
<td>erData:C0851278</td>
<td>Fingers not including thumb</td>
</tr>
<tr>
<td>erData:C0027497</td>
<td>Nausea</td>
<td>S</td>
<td>S</td>
<td>erData:C0016129</td>
<td>Fingers</td>
</tr>
<tr>
<td>erData:C0234211</td>
<td>Pins and needles (finding)</td>
<td>S</td>
<td>S</td>
<td>erData:C1278910</td>
<td>Entire oral cavity</td>
</tr>
<tr>
<td>erData:C0234211</td>
<td>Pins and needles (finding)</td>
<td>S</td>
<td>S</td>
<td>erData:C1267547</td>
<td>Entire mouth region</td>
</tr>
<tr>
<td>erData:C0234211</td>
<td>Pins and needles (finding)</td>
<td>S</td>
<td>S</td>
<td>erData:C0226896</td>
<td>Oral cavity</td>
</tr>
<tr>
<td>erData:C0009676</td>
<td>Confusion</td>
<td>S</td>
<td>S</td>
<td>erData:C1123023</td>
<td>Skin</td>
</tr>
<tr>
<td>erData:C0018681</td>
<td>no</td>
<td>S</td>
<td>S</td>
<td>erData:C1278993</td>
<td>Entire skin</td>
</tr>
<tr>
<td>erData:C0205222</td>
<td>Dry</td>
<td>S</td>
<td>S</td>
<td>erData:C1123023</td>
<td>Skin</td>
</tr>
<tr>
<td>erData:C0205222</td>
<td>Dry</td>
<td>S</td>
<td>S</td>
<td>erData:C1278993</td>
<td>Entire skin</td>
</tr>
<tr>
<td>erData:C0205222</td>
<td>Dry</td>
<td>S</td>
<td>S</td>
<td>erData:C1123023</td>
<td>Skin</td>
</tr>
<tr>
<td>erData:C0205222</td>
<td>Dry</td>
<td>S</td>
<td>S</td>
<td>erData:C1278993</td>
<td>Entire skin</td>
</tr>
</tbody>
</table>

Results - Output representation
WHERE {
  ?Evidence  a  erm:hasManifestation .
  ?Manifestation  a  erm:aboutObservation .
  ?ObservationCUI  a  umls:correspondsTo .
  ?SABCode  a  umls:correspondsTo .
  ?SABCode  a  skos:fromConceptScheme .
  ?SABCode  a  umls:SNOMEDCT .
  ?SABCode  a  erm:hasText .

  OPTIONAL {
    ?Manifestation  a  erm:isModifiedBy .
    ?Operand  a  erm:hasModifier .
    ?ModifierConcept  a  erm:hasText .
  }

  OPTIONAL {
    ?Manifestation  a  erm:hasLocus .
    ?bodyLoc  a  umls:correspondsTo .
    ?bodyLoc  a  umls:SNOMEDCT .
    ?LocusSABCode  a  skos:fromConceptSchema .
  }
}
BLUE-Text: Dehydration due to Gastrointestinal Problems (1)
BLUETEXT: Dehydration? (1)

Patient1

Dehydration

Gastrointestinal_Syndrome

Dry_Skin
BLUE-Text: Dehydration? (1)

Class Form

Name: Dehydration

Annotations

Class Axioms

dfs:subClassOf

GastroIntestinalSyndrome

owl:equivalentClass

(erm:hasEvidence some (erm:hasManifestation some (uims:indicates some DrySkin))) and GastroIntestinalSyndrome

owl:disjointWith

Dehydration
BLUE-Text: Food Poisoning? Why?

Gastrointestinal_Syndrome ∩ (hasContext some (umls:Food_Context ∩ (hasContext some StatusPost)))

Obs2

Obs4

Nausea

Vomiting

umls: C0027497

umls: C0042963

Food_Poisoning

Gastrointestinal_Syndrome

context1

context2

modifiedBy

hasContext

Food_Context

Milk

Qualitative_Modifier

Bad

hasContext

Temporal_Context

After

Status_Post

umls: Food

umls: C0260159

umls: C0026131

umls: C0231390

umls: C0042963

umls: C0027497

Results - Output representation
Food_Poisoning

Gastrointestinal_Syndrome

patient1

umls: C0027497

Nausea

Vomiting

umls: C0042963

umls: C0026131

Milk

Bad

umls: C0260159

Qualitative_Modifier

umls: Food

Status_Post

After

Results - Output Representation

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Food_Poisoning

Gastrointestinal_Syndrome

SELECT DISTINCT ?obsCUI ?observationName ?temporal ?context ?contextName
WHERE {
  ?fo erm:hasMetaString ?contextName.
  ?Manifestation erm:aboutObservation ?obsCUI.
  ?obsCUI erm:hasMetaString ?observationName.
  filter(?context != erm:hasContext).
}

Food: Bad
Milk: Qualitative_Modifier
Status_Post: After
AdverseReaction hasContext Neurological_Syndrome

patient1 hasContext Drowsiness

Neurological_Syndrome hasContext Confusion

Reglan hasContext Pharmacological_subs.

uMLS: C0013144

Confusion

BlueT ext: Drug Adverse Reaction? Why?
• Find candidate cases for a clinical research
• Patients with an adverse reaction to any “Dopamine Receptor Antagonist” and have indications of a “Neurological Syndrome” as a result
• All evidence pertaining to the conclusions made
Neurological Syndrome

(umls:Disease_or_Disorder or umls:Trauma_or_Injury) and (erm:hasManifestation some (umls:indicates some erm:NeurologicalSignorSymptom))

Adverse Reaction to Dopamine_Receptor_Antagonist

Neurological_Syndrome and (hasMedicationContext some Dopamine_Receptor_Antagonist))

Eligible Case for My Research

Neurological-Syndrome and Adverse_Reaction_to_Dopamine_Receptor_Antagonist
Neurological Syndrome and Adverse Reaction to Dopamine Receptor Antagonist

CONSTRUCT {
  ?cui hasText ?Problem.
  ?cui erm:hasMedicationContext ?drugcui.
  ?Patient suggestedTherapy Recommendation.
WHERE {
  ?Evidence erm:hasManifestation ?Manifestation.
  ?cui erm:hasConceptString ?Problem.
  ?cui rdf:type erm:NeurologicalSignorSymptom.
OPTIONAL {
  ?Manifestation erm:hasMedicationContext ?drugcui.
}
}
A Structured Data Entry (SDE) platform for health data collection

‣ Automates design, implementation and deployment of a distributed and collaborative data collection instruments

‣ Eliminates Programming/Database Design phase

‣ Supports change throughout life-cycle of a project without loss of data

‣ Establishes and maintains a consistent and robust shared data dictionary

‣ Automates integration of survey data within and between projects

‣ Supports repurposing and reuse of existing multi-source data
SODS Ontologies at a Glance

**SODS ADMIN**

User 1

- Group 1
  - Group 2
  - Group 3

- Site 1

Project 1

Survey 1

- Device 1
  - Device 2
  - Device 3

**Therapeutic or Preventive Procedure**

- Blood Transfusion

- Boolean Value Set

- Blood Transfusion ?
  - Yes
  - No

- Infusion

- Blood Product

- Amount

- Start time

- End time

**UMLS - SKOS**

- C0005841
- MSH:M0002721
- SNOMEDCT: 233557002
- LNC:LP32812-7

**Domain Ontologies (context)**

**SODS Form Templates**

**SODS GUI**

- Enum
- Datetime
- Text Box
- Numeric
- Radio
- Checklist
- Combo
- Checkbox
- Style
- Blue
- Arial

**FormTemplate 1**

**Qx**

**Blood Product**

**Amount**

**Infusion**

**LNC:LP32812-7**

**UMLS - SKOS**

**Domain Ontologies (context)**

**SODS Form Templates**

**SODS GUI**

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Designer Services
Admin Projects
Manage Question

SODS Services at a Glance

Prospective, Observational, Multi-center Massive Transfusion Trial

Manage Forms

<table>
<thead>
<tr>
<th>Version</th>
<th>Name</th>
<th>Design Form</th>
<th>Properties</th>
<th>Results</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Form 10: Cumulative ICU</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
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<td>Form 11: Clinical Labs</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
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<tr>
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<td>Form 12: Medical Rec</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 1: Eligibility</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 2: Trauma Pager</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 3: EMS</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 4: ED</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 5: Infusions</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 6: OR</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>1.0</td>
<td>Form 7: IR</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 8: Acute ICU</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>2.0</td>
<td>Form 9 Daily ICU</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
<td>Delete</td>
</tr>
<tr>
<td>1.0</td>
<td>Form 9: Daily ICU</td>
<td>Update</td>
<td>Properties</td>
<td>Results</td>
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</tr>
</tbody>
</table>
SODS Services at a Glance

Designer Services
Admin Projects
Manage Question
SODS Services at a Glance
SODS Services at a Glance

Designer Services
Admin Projects
Manage Question

Ontology Services
UMLS-SKOS
Local Vocab.
SODS Services at a Glance

Designer Services
- Admin Projects
- Manage Question

Ontology Services
- UMLS-SKOS
- Local Vocab.

Client Services
- Authenticate
- Project Profile
- Submissions

Screen Shot:

2.1. OR arrival date/time
   Dec. 1, 2009 17:34

Initial vital signs

2.3. Systolic blood pressure
   108

2.4. Diastolic blood pressure
   71

2.5. Heart rate (bpm)
   120

2.6. Is the Patient Intubated
   - No
   - Yes

2.6.1. Respiration rate (/min)
   70

2.6.2. Not done

2.7. Temperature
   100

2.8. Temperature unit
   - C
   - F

2.9. Life-saving intervention performed (non-surgical)?
   - No
   - Yes

2.10. Surgical interventions performed?
   - No
   - Yes

2.11. Intraoperative therapeutic intervention performed?
   - No
   - Yes

2.12. Discarded blood drawn for PROMMTT in OR?
   - No
   - Yes

2.13. Vasopressors given in OR
   - No
   - Yes
SODS Services at a Glance

Form 5: Infusions (Version 2.0)

1. Study ID
   20020

2. New Infusion

- Infusion start date-time
- Infusion end date-time
- Type of Infusion
- Amount
- Unit
- Location of infusion
- DO or MR

Example entries:
- Aug 12, 2009 13:07
  - Aug 12, 2009 15:05
  - Crystalized Normal saline
  - mL
  - ED
  - Direct Observation

- Aug 12, 2009 14:52
  - Aug 12, 2009 15:03
  - Blood product: Plasma fresh frozen
  - mL
  - OR
  - Direct Observation

- Aug 12, 2009 15:04
  - Aug 12, 2009 15:15
  - Blood product: Red blood cells (packed)
  - mL
  - OR
  - Direct Observation

- Aug 12, 2009 14:52
  - Aug 12, 2009 15:30
  - Crystalized Normal saline
  - mL
  - ED
  - Direct Observation
SODS Services at a Glance

Survey on Demand System

Patient ID | Form Title | Last Modified Date | Date Modified By | Status
---|---|---|---|---
0012 | Form 9: Daily Follow-up | 11/09/2009 05:41:09 | cbleakem | In Progress
123456787 | Form 9: Daily Follow-up | 11/09/2009 05:41:09 | cbleakem | In Progress
20 | Form 9: Daily Follow-up | 11/09/2009 05:40:57 | cbleakem | In Progress

20001

20002

Form 10: Medical Record
dgomea | 11/16/2009 08:53:16 | In Progress
Form 5: Infusions
cbleakem | 11/09/2009 05:42:54 | In Curation
Form 9: Daily Follow-up
cbleakem | 11/09/2009 05:42:54 | In Curation
Form 2: Trauma Pager
cbleakem | 11/09/2009 05:42:46 | In Curation
Form 8: Acute ICU
cbleakem | 08/14/2009 10:46:45 | Reviewed


Search: [Search] [Refresh History]
SODS Services at a Glance

Before invocation

After invocation
SODS Services at a Glance

Designer Services
- Admin Projects
- Manage Question

Ontology Services
- UMLS-SKOS
- Local Vocab.

Client Services
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- Submissions

Form 1: Eligibility (Version 2.0)

1. Study ID
   12345

2. Received directly from scene?
   - No
   - Yes

3. Prisoner?
   - No
   - Yes

3.0. This patient is not eligible

4. Greater than 20% burn injury?
   - No
   - Yes

4.0. This patient is not eligible

5. Severe Inhalation injury?
   - No
   - Yes

5.0. This patient is not eligible

6. Observed/reported pregnancy?
   - No
   - Yes

6.0. This patient is not eligible

7. More than 5 minutes of CPR given pre-hospital?
   - No
   - Yes
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- RDF Transformer
- Relational Map
- OPAL
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Harris County
Public Health & Environmental Services

Safeguarding your health is our full time job.
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I2B2 is an NIH-National Centers for Biomedical Computing platform for integration of biomedical observations

Limited detail representation to achieve better integration and faster retrieval

Does not interoperate in a network of distributed collaborators seamlessly

Data is meaningful only if inside the system but looses context immediately after it leaves the system, and needs to be contextualized again to be used by secondary applications...
Steps

- Semantic Representation of Vocabulary Services to enable reuse and sharing of common concepts and unambiguous and precise extensions to support local needs

- Semantic model representing the minimalistic approach I2B2 has taken to represent biomedical observation but:
  - Enable local extensions to support local needs without breaking the interoperability
  - Consistent mapping to semantic vocabulary services to enable consistent extraction of information in distributed environment

- Building a semantic query formulation and execution API based on the SKOS and S-I2B2 backend

- Semantic Wrapper API to facilitate porting data into S-I2B2 by novice and programmers not familiar with RDF/OWL
Future Work

- A more robust namespace and IRI assignment
- A more robust (re)modeling of the MTH relations to make it conform to the SKOS (maps, label relations, concept relations)
- A more elaborate reification to better support RUIs and their provenance
- A secondary method: CUI based model where all relations and descriptions are attached to the CUI object
- User interfaces to navigate and explore UMLS-SKOS
- SOAP and REST based web services for remote invocation of UMLS-SKOS vocabulary services
- Modeling toolkit for the extension and reuse of the UMLS-SKOS
This work is funded in its entirety by the Telemedicine and Advanced Technology Research Center (TATRC) through “the Texas Technology and Training for Terrorism and Trauma (T5)” and “the Texas Science, Humanitarian Intervention, Education and Leadership in Disasters (TexSHIELD)” programs.
Thank You