Motivation of the method:
• To extract full definitions from the source ontology associated with the input focus set of concept names.
• To satisfy the proximal primitive modelling guideline that is followed by SNOMED CT, one of the widely used biomedical ontologies in the field.
• To extract a subontology that contains as little as possible of symbols not related to the input focus set, yet it contains all the necessary information related to the input focus set.

Terminology example:
SNOMED CT 20170731
- Logical axiom count: 335 245
- Concept count: 335 225
- Role count: 97

Example
Concept names from the ERA reference set picked according to the common list of SNOMED CT concepts.

Original definition of Hepatorenal syndrome
Hepatorenal syndrome = Acute renal failure syndrome \( \cap \) Hepatic failure \( \cap \) Role group.((Finding site.Kidney structure) \( \cap \) Role group.((Clinical course.Sudden onset AND/OR short duration) \( \cap \) Role group.((Finding site.Liver structure)

Abstracted definition of Hepatorenal syndrome
Hepatorenal syndrome = Acute renal impairment \( \cap \) Renal failure syndrome \( \cap \) Hepatic failure \( \cap \) Role group.((Clinical course.Sudden onset AND/OR short duration) \( \cap \) Role group.((Finding site.Liver structure)

Comparison to the other extracts:

Extract | Logical axiom | Concepts | Roles |
--- | --- | --- | --- |
Subontology | \( \Sigma_2 \) | 17 | 28 |
Bottom module | \( \Sigma_3 \) | 20 | 55 |
UI | \( \Sigma_4 \) | 0 | 0 |

The definition of Hepatorenal syndrome in the bottom module is the original definition.
The definition of Hepatorenal syndrome in the UI is:
Hepatorenal syndrome \( \subseteq \) Acute renal failure syndrome

Empirical Evaluation
Two ontologies used: \( \mathcal{O}_1 \) SNOMED CT 20170731, \( \mathcal{O}_2 \) medical conditions. \( \mathcal{O}_2 \) Gene ontology 20210201, \( \mathcal{O}_2 \) gene slim sets.
We compared the resulting extracts in terms of size and precision rates.

<table>
<thead>
<tr>
<th>Extraction</th>
<th>( \mathcal{O}_1 )</th>
<th>( \mathcal{O}_2 )</th>
<th>( \mathcal{O}_3 )</th>
<th>( \mathcal{O}_4 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precision</td>
<td>( \frac{\text{Size}(\text{extract})}{\text{Size}(\mathcal{O})} )</td>
<td>( \frac{\text{Size}(\text{extract})}{\text{Size}(\mathcal{O})} )</td>
<td>( \frac{\text{Size}(\text{extract})}{\text{Size}(\mathcal{O})} )</td>
<td>( \frac{\text{Size}(\text{extract})}{\text{Size}(\mathcal{O})} )</td>
</tr>
</tbody>
</table>

Conclusion
• Abstracted definitions are based on long canonical forms in SNOMED CT which has many advantages for modelers.
• Abstracted definitions help including only what is truly necessary in the resulting extract.
• Our method ensures the inclusion of full definitions of focus concepts of interest, which can not be achieved with other existing ontology extraction methods.

References