Unlocking Knowledge in Maintenance Work Orders with Echidna and Redcoat

Michael Stewart
Research Fellow, ARC Training Centre for Transforming Maintenance through Data Science

TLP Community of Interest Workshop,
2021 Model-Based Enterprise Summit, NIST, April 12 - 16, 2021

Data Science Transforming Maintenance

Outline

1. Overview and Motivation
2. **Echidna** - a knowledge graph that supports the visualisation and querying of maintenance work orders
3. **Redcoat** – an annotation tool supporting technical language processing

Overview

- Maintenance management systems capture a significant amount of important **structured information**, such as:
  - Functional Locations (FLOCs)
  - Costs
  - Dates
  - Downtime events

Overview

- However, a **significant volume of knowledge** in a MWO is **unstructured** and therefore inaccessible – it is buried within the **short text description.**
- The short text often contains indicators of **failure modes**, and **end of life events** which are directly tied to **mean time to failure** (MTTF) values.
- Short text is **seldom used to support routine analysis,** despite the significant information held within.

Example Maintenance Work Orders

StartDate	FuncLocDesc	ShortText
10/07/2005	hydraulics	repair cracked hydraulic tank
27/07/2005	engine	engine wont start
15/01/2008	air conditioning system	a/c blowing hot air

Motivation

- **Knowledge graphs** are the perfect tool for combining structured and unstructured data.
- Constructing a knowledge graph that captures the knowledge in the unstructured text and structured fields allows for vital information to be **highly accessible**, such as:
  - How many times have pumps in <location> been replaced in the last month?
  - Are the pumps failing in ways we didn't expect?

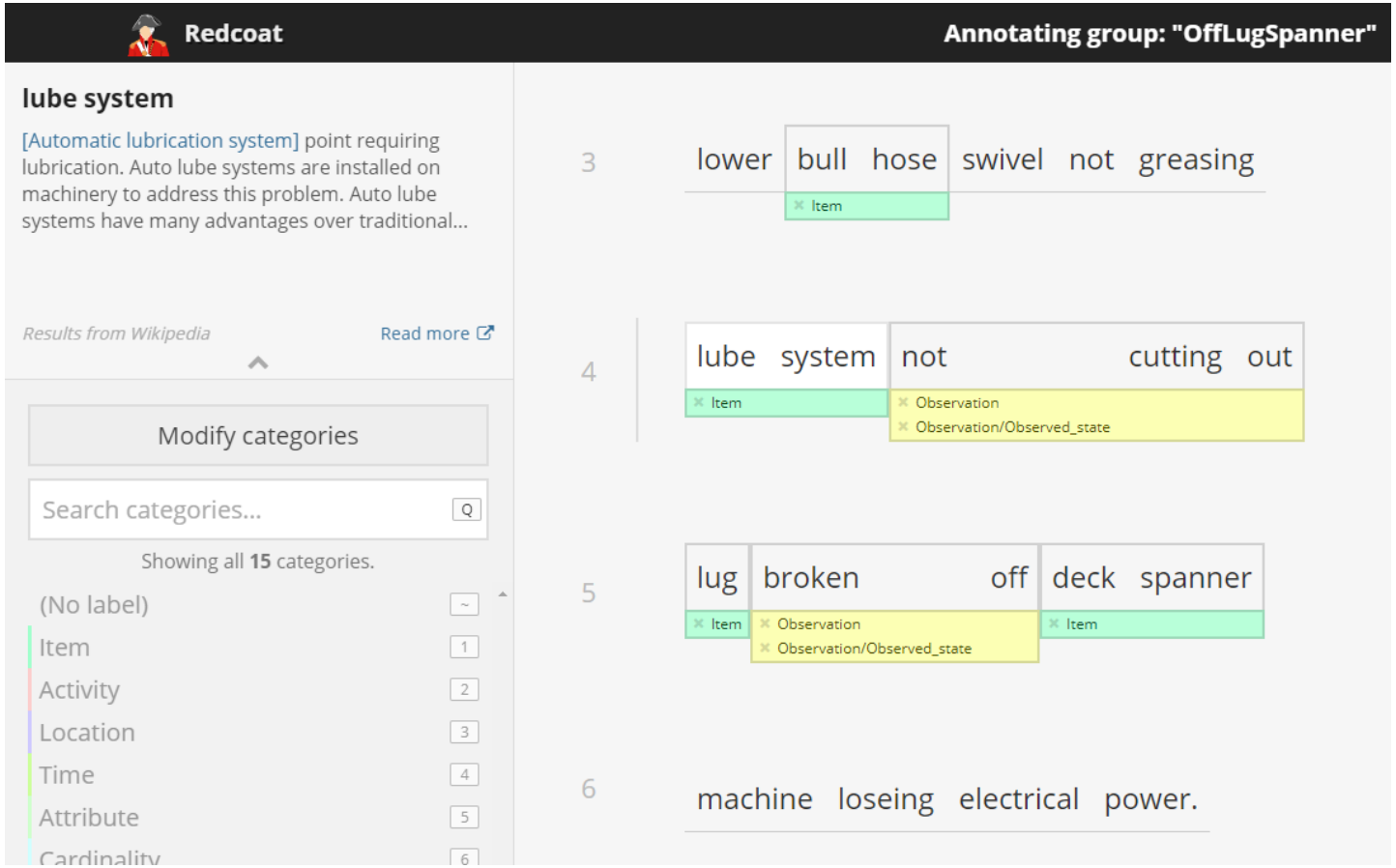
Echidna – Knowledge Graph for Maintenance

https://nlp-tlp.org/echidna

The need for labelled training data

» To build the knowledge graph and provide decision support, the underlying model must be fed **high quality labelled data.**

Redcoat – a Collaborative Annotation Tool



https://nlp-tlp.org/redcoat

Conclusion

- In this presentation we have presented our work on unlocking maintenance knowledge via two powerful tools: **Echidna** and **Redcoat**.
- These tools create a knowledge graph that provides reliability engineers with the ability to **easily access** and **query** their maintenance work orders, providing unprecedented decision support.

Thank you

Email: michael.stewart@uwa.edu.au

CTMTDS
https://maintenance.org.au

UWA NLP-TLP Group
https://nlp-tlp.org

Echidna – Demo
https://nlp-tlp.org/echidna

Redcoat – Demo
https://nlp-tlp.org/redcoat