

Case Study L1-010

Semantic Precision & Register Alignment

The "Windows & Doors" Trap (Architecture vs. MedTech)

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Case Study Metadata

Dataset ID: L1-010

Category: Semantic Precision — Level 1

Focus: Register Mismatch / Polysemy
Resolution

Model: Generic NMT

Domain: MedTech / Orthopaedic Surgery

1 The Context: High-Velocity Medical Impacts

In the design of orthopaedic power tools, an "Impactor" utilizes a high-velocity mechanical drive to deliver controlled forces to implants or bone. Terminology must strictly adhere to the **Mechanical/Percussion** register to differentiate these medical devices from architectural or residential hardware.

Key Concept

The Register Mismatch:

The term "Strike" or "Strike Assembly" is highly polysemous across different technical domains:

- **Locksmithing/Architecture:** A "strike plate" (gâche) is the metal plate on a door frame that receives a bolt.
- **Mechanical Engineering:** An "impact/strike assembly" (ensemble de frappe) is a series of moving parts that deliver a blow.
- **Surgical Tools:** Refers specifically to the high-precision mechanism of an orthopaedic impactor.

Generic NMT models frequently activate the highest-frequency architectural vector, resulting in a "Gâche Hallucination."

2 The Glitch: The "Residential Hardware" Hallucination

Generic NMT engines interpret "Strike Assembly" through the lens of general housing hardware. The model defaults to the terminology of door locks, describing a surgical power tool as if it were a household window frame.

Critical Issue

The Terminological Violation:

Translating "Strike Assembly" as *ensemble gâche* is a catastrophic register error. A surgeon using an orthopaedic impactor is not interacting with door hardware; they are operating a precision mechanical strike mechanism. Using architectural terms in a medical patent creates a nonsensical description that suggests physical impossibility in a clinical setting.

3 The Translation Failure

Source (English)	AI Hallucination (Failure)	Golden Rewrite (Correct)
"...a strike assembly (126) comprising a striker..."	<p>✗ Architectural Register:</p> <p>"...un ensemble gâche (126)..."</p> <p><i>(Literal: A door/window strike plate)</i></p>	<p>✓ Mechanical Standard:</p> <p>"...un ensemble de frappe (126)..."</p> <p><i>(Industry Standard for Impact Tools)</i></p>

Table 1: Semantic Hallucination: Register Failure in MedTech Claims

4 Alignment Methodology

4.1 Register Locking & Dictionary Match

To override the model’s architectural default, we implement a **Domain-Aware Disambiguation** workflow.

Alignment Methodology

Alignment Methodology:

1. **Domain Tagging:** The device is tagged as MEDTECH_ORTHOPAEDICS, triggering the specific mechanical percussion vector.
2. **Negative Constraint:** We explicitly flag architectural terms like *gâche* as forbidden when the device is an "impactor" used for "implants."
3. **Register Enforcement:** The term "Strike" is mapped to its mechanical functional equivalent (*Frappe* or *Percussion*), ensuring terminology reflects the physical movement described in the claim.
4. **Verification:** Cross-reference with the "striker" component to ensure the agent and the assembly maintain a unified mechanical register.

5 Key Insights

Key Concept

What This Case Study Demonstrates:

1. **Register Mismatch Invalidates IP:** Using door-lock terminology for a surgical tool destroys technical precision and creates indefiniteness in the claim.
2. **High-Frequency Bias:** Models favor the "Average" (Architecture) over the "Specific" (Orthopaedics) without active alignment. [cite_s *tart*]
2. **Consistency with Action:** If the striker "moves so as to impact," the assembly must be a "frappe" mechanism, not a stationary door "gâche."

Portfolio: Patent Translation AI Alignment Framework

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