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# Approximating the Standard Essentiality of Patents
## A Semantics-Based Analysis

## Motivation

Assessing the standard essentiality of patents (SEPs) poses considerable challenges for scholars and practitioners. The lack of transparency in standard-setting leads to strategic incentives for firms to declare SEPs or to delay patenting.

**Strategic behavior of firms**
- SEP over-declaration (Bekkers et al. 2011)
- Just-in-time patenting (Kang & Bekkers 2015)

**Engineering studies assessing true essentiality of SEPs**
- 21% of declared SEPs for 3G (Goodman & Myers 2005)
- 35% of declared SEPs for LTE (Stitzing et al. 2017)

## Methodology



Semantic comparison of full text for all patents and standard documents

ETSI EN 301 489-3 V1.6.1 (2002-08)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz

ETSI Standard

Similarity data: 3,000 most similar patents for roughly 62,000 ETSI standards texts
→ dataset with 187 million observations comprising patent family, standard document, similarity score and rank

N ≈ 37 million patent families

N ≈ 62,000

**Hypothesis:** Semantic similarity correlates with true essentiality of patents to standards.

## Illustrative Example

**Standard document (2009-01)**
ETSI TS 126 192 V8.0.0
Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE

The encoder first determines how stationary background noise is. Dithering is employed for non-stationary background noise. The information about whether to use dithering or not is transmitted to the decoder using a binary information ($CN_{dith}$-flag).

The binary value for the $CN_{dith}$-flag is found by using the spectral distance $\Delta S_i$ of the spectral parameter vector $\mathbf{f}(i)$ to the spectral parameter vectors $\mathbf{f}(j)$ of all the other frames $j=0,\ldots, l_{dtx}-1, j\neq i$ within the CN averaging period ($l_{dtx}$).
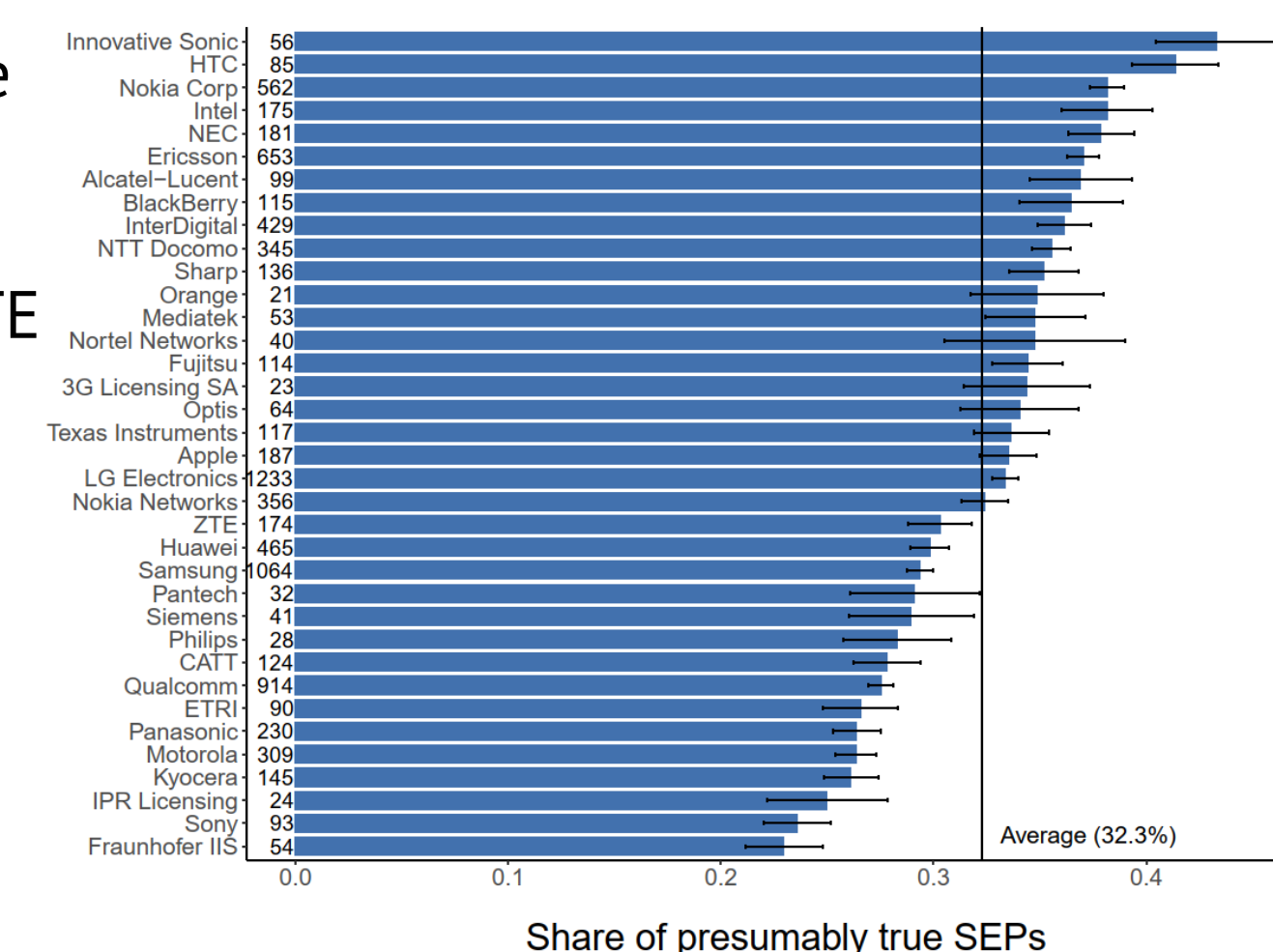
**Patent document (2003-12-09)**
US6662155B2
Method and system for comfort noise generation in speech communication

**Declaration date: 18-06-2009**

The background noise can be classified as stationary or non-stationary based on the spectral distances $\Delta D_i$ from each of the spectral parameter (LSF or ISF) vectors f(i) to the other spectral parameter vectors f(j), i=0,..., $l_{dtx}-1$, j=0,..., $l_{dtx}-1$, i≠j within the CN averaging period ($l_{dtx}$).

## Validation

- Logit framework to construct predictors of standard essentiality

- Manual assessments of patents based on the U.S. court case *TCL v. Ericsson*

- Similarity score is strongest predictor

| | LTE | UMTS | GSM |
|---|---|---|---|
| Similarity score | 0.0762*** | 0.1244*** | 0.1360*** |
| | (0.0125) | (0.0176) | (0.0311) |
| Length claim 1 | −0.0005** | −0.0000 | −0.0005 |
| | (0.0002) | (0.0003) | (0.0005) |
| # NPL references | 0.0009*** | 0.0001 | 0.0000 |
| | (0.0003) | (0.0003) | (0.0005) |
| # SEP US fwd. cit. (5yrs) | 0.0034*** | 0.0005 | −0.0026 |
| | (0.0012) | (0.0022) | (0.0045) |
| Section-specific decl. (d) | 0.0976*** | 0.0430 | 0.1383** |
| | (0.0269) | (0.0382) | (0.0601) |
| Pseudo $R^2$ | 0.05 | 0.06 | 0.07 |
| AUC | 0.66 | 0.66 | 0.67 |
| Observations | 1,441 | 731 | 280 |

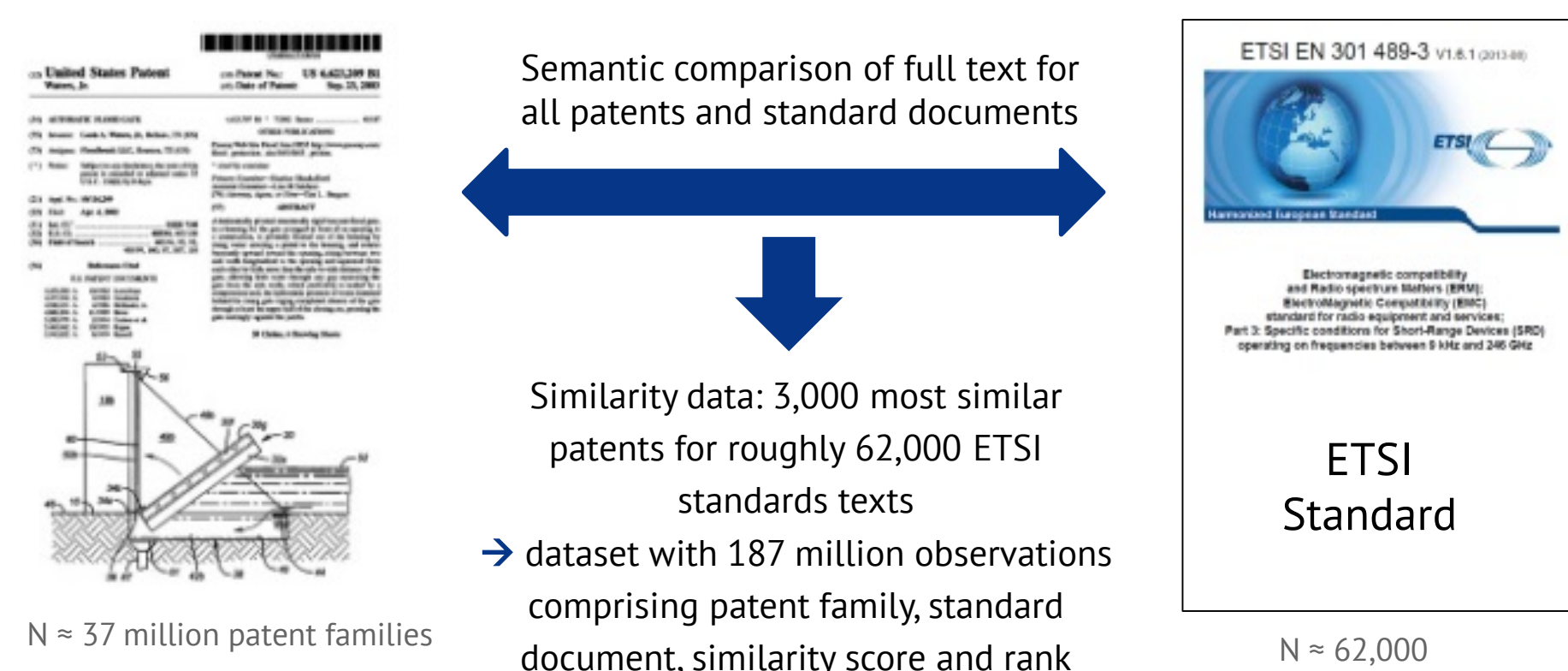Dependent variable: essential (y/n)
Significance levels: * p<0.1, ** p<0.05, *** p<0.01

## Use Case

- Predicting share of true SEPs in firm patent portfolios for LTE standard

- Firm-level differences are statistically and economically substantial



Share of presumably true SEPs

## Conclusion

- Automated large-scale comparison of more than 36,000 standard documents from ETSI (4.5 million pages of text) with practically the entire patent universe

- First evidence for the identification of truly standard-essential patents based on semantic similarity

- Semantic similarity correlates with technical experts' manual assessments of standard essentiality

- SEP firm portfolio predictions suggest substantial firm-level differences

**Selected References**

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