ICFHR–2010 Tutorial:

Multimodal Computer Assisted Transcription of Handwriting Images

Ilp – CATTI in practice

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Tutorial Contents and Schedule

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Color Notation used for CATTI Output

References

- **Green text** denotes the reference text of the sample being transcribed.
- **Red text**: denotes the user introduced/corrected words (by keyboard).
- **Blue text**: denotes the error-free prefix validated by user before introducing/correcting the following word.
- **Cyan text**: denotes the whole prefix (the validated part plus the corrected word) used by CATTI to suggest the new suffix continuation.
- **Black text**: denotes the output hypothesis/suffix from CATTI.

CATTI Experiments: *"Spanish Number Corpus"*

- Multi-writer corpus.
- Character HMMs: 6 states, 2 Gaussian densities per state
- Language models: Bi-grams

	Train	Test	Total	Lexicon
# writers	18	11	29	–
# sentences	297	187	484	–
# words	1 300	827	2 127	52

LM traning data: 20 920 sentences (91 760 **running words**)

WER (%)	WSR (%)	Effort-Reduction (%)
18.74	17.53	6.45

CATTI Experiments: IAMDB

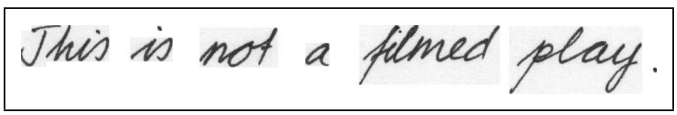
- Multi-writer corpus.
- No case distinction or diacritics; no punctuation marks.
- Character HMMs: 6 states, 64 Gaussian densities per state
- Language models: Bi-grams

Number of:	Training	Test	Total	Lexicon	OOV	Tr. Ratio
writers	448	100	548	–	–	–
sentences	2 124	200	2 324	–	–	–
words	42 832	3 957	46 789	**8 017**	921	128
characters	216 774	20 726	237 500	78	0	2 779

LM traning data: approx. 10^6 **running words** from the LOB corpus

WER (%)	WSR (%)	Effort-Reduction (%)
25.8	21.8	16

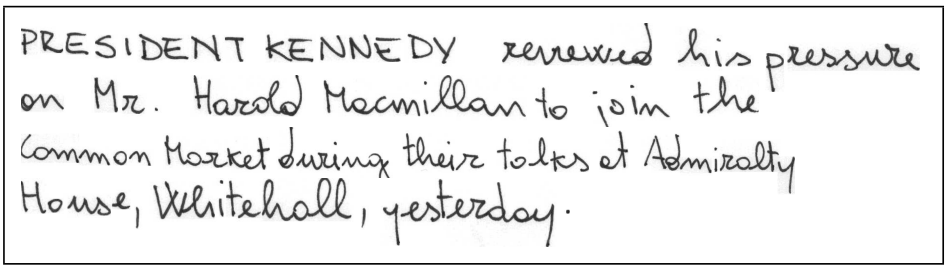
CATTI on IAM DB: Example 1 - ID: c03-003d-s00



Reference:	this is not a filmed play
Hypothesis:	this is not [] allowed play
Errors:	D=1 S=1 I=0
Prefix 1:	this is not a
Hypothesis 1:	this is not a filmed play
Final Result:	this is not a filmed play

Post-editing WER: 2/6 (33%)
Interactive WSR: 1/6 (17%)
Estimated effort reduction: $1 - 17/33$ (48%).

CATTI on IAM DB: Example 2 - ID: a04-000-s00



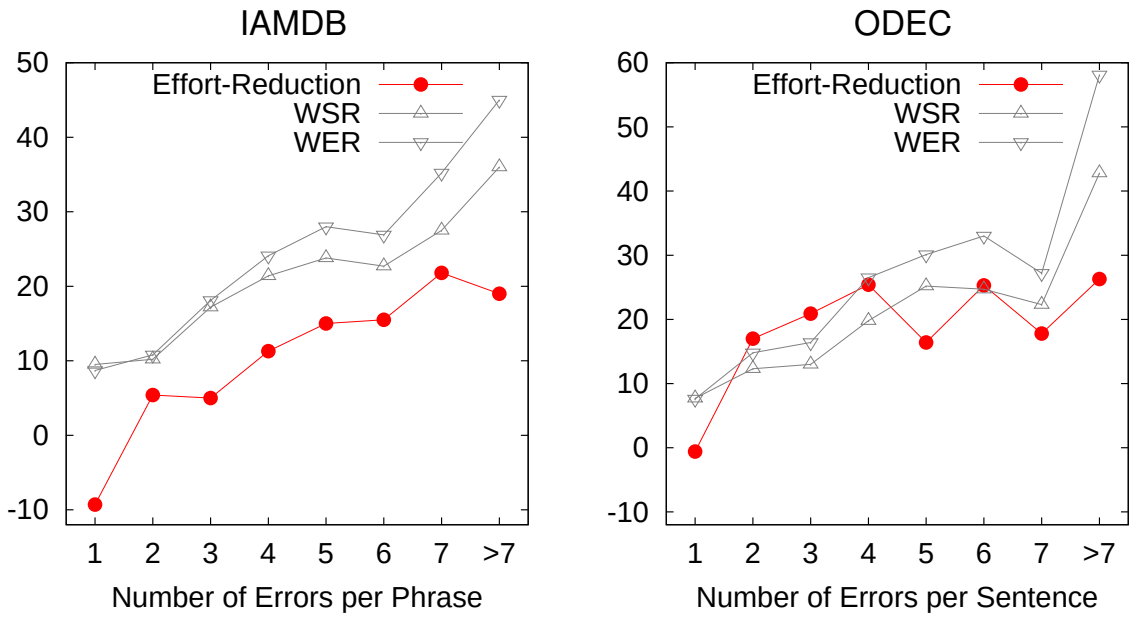
Reference:	president kennedy renewed his pressure on mr harold macmillan to join the common market during their talks at admiralty house whitehall yesterday
Hypothesis:	[this] [per] cent clay renewed his pressman [] is harold macmillan to join the common market during their talks at admiralty house whitehall yesterday
Errors:	D=1 S=4 I=2

CATTI on IAM DB: Example 2 - ID: a04-000-s00 (cont)

Prefix 1:	president
Hypothesis 1:	president kennedy renewed his pressman is harold macmillan to join the common market during their talks at admiralty house whitehall yesterday
Prefix 2:	president kennedy renewed his pressure
Hypothesis 2:	president kennedy renewed his pressure on the harold macmillan to join the common market during their talks at admiralty house whitehall yesterday
Prefix 3:	president kennedy renewed his pressure on mr
Hypothesis 3:	president kennedy renewed his pressure on mr harold macmillan to join the common market during their talks at admiralty house whitehall yesterday
Final Result:	president kennedy renewed his pressure on mr harold macmillan to join the common market during their talks at admiralty house whitehall yesterday

Post-editing WER: 7/22 (32%)
Interactive WSR: 3/22 (14%)
Estimated effort reduction: $1 - 14/32$ (56%).

CATTI Results: impact of number of errors per sentence



CATTI performance for sentences with different number of errors

CATTI Results: impact of number of errors per sentence

- **Estimated effort reduction** increase significantly with the number of errors per sentence.
- CATTI efficacy correcting more than one error per interaction step in sentences with several initially misrecognized words.
- For the special case of sentences with only one initial error, post-editing the single error does not risk unwished changes of other correct words.

Statistics of Final Results for *"Spanish Number Corpus"*

#Er/Phr	#Samp	#Err	#Iter	Long-Ref	WER	WSR	EFR
*0	97	0	0	426	0.00	0.00	0.00
*1	55	55	58	232	23.71	25.00	-5.45
2	18	36	38	84	42.86	45.24	-5.56
3	11	33	26	57	57.89	45.61	21.21
4	3	12	7	14	85.71	50.00	41.67
5	1	5	3	6	83.33	50.00	40.00
6	2	12	4	8	150.00	50.00	66.67

GLOBAL: WER=18.50 WSR=16.44 EFR=11.11 (D=7 S=127 I=26)
GLOBAL: WER=57.99 WSR=46.15 EFR=20.41 (D=4 S=73 I=25) without considering *

Statistics of Final Results for IAMDB

#Er/Phr	#Samp	#Err	#Iter	Long-Ref	WER	WSR	EFR
*0	22	0	0	211	0.00	0.00	0.00
*1	32	32	35	369	8.67	9.49	-9.38
2	28	56	53	518	10.81	10.23	5.36
3	20	60	57	332	18.07	17.17	5.00
4	20	80	71	332	24.10	21.39	11.25
5	12	60	51	215	27.91	23.72	15.00
6	14	84	71	313	26.84	22.68	15.48
7	17	119	93	338	35.21	27.51	21.85
8	5	40	33	146	27.40	22.60	17.50
9	9	81	65	176	46.02	36.93	19.75
10	2	20	21	39	51.28	53.85	-5.00
11	3	33	29	73	45.21	39.73	12.12
12	7	84	65	183	45.90	35.52	22.62
13	1	13	8	37	35.14	21.62	38.46
14	3	42	33	106	39.62	31.13	21.43
15	1	15	12	30	50.00	40.00	20.00
18	1	18	13	26	69.23	50.00	27.78
20	2	40	30	76	52.63	39.47	25.00
22	1	22	16	32	68.75	50.00	27.27
24	1	24	22	27	88.89	81.48	8.33

GLOBAL: WER=25.79 WSR=21.74 EFR=15.71 (D=118 S=695 I=110)
GLOBAL: WER=29.71 WSR=24.77 EFR=16.61 (D=116 S=665 I=110) without considering *

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