

# Testing the SMART System

## Technical Report for Evalita-2009 Forensic SIV

Maria Tucci<sup>1</sup>

Phonetics Laboratory -Department of Linguistics - University of Calabria  
Via P. Bucci cubo 20/A, 87036 Arcavacata di Rende (CS), Italy  
tucci.maria@libero.it  
<http://www.linguistica.unical.it/labfon/Home.htm>

### Technical report

The SMART III System is a formant based method using an implemented decisional approach with a reference population of 305 male Italian speakers containing fundamental frequency and first three formant values for the vowels /a, e, i, o/.

The features extraction (by means of extraction algorithms such as Cepstrum, LPC and FFT) has been carried out considering 5 samples of stressed vowels /a, e, i, o/ for each voice to be analyzed and compared. For the TR data set the 8kHz files were used.

The four files for S1 and S2 were merged into single files (i.e. TR\_S1 and TR\_S2).

The OST data set has been segmented following the guidelines given by the organizers of the Forensic SIV task. Six speakers were identified. Their productions in the OST file have been collected in six different files (OST\_1, OST\_2, OST\_3, OST\_4, OST\_5, OST\_6), each of them representing one voice.

The submitted results include identification score *yes/no*, *a-posteriori* false acceptance (FA) and false rejection (FR) error, distance between known speaker and reference population, distance between known speaker and anonymous.

---

<sup>1</sup> Maria Tucci (from the Phonetics Laboratory – Dept. of Linguistics - University of Calabria) has been actively involved, as part of the research group, in all the steps of the SMART (Statistical Methods Applied to the Recognition of the Talker) I-II-III project. SMART is a research project funded by the EU. The SMART III system is exclusively used by the Italian Scientific Police Service.

**Table 1.** Results and scores for the comparisons involving S1 with the CST files

Anonymous speaker	Known speaker	yes/no	False Acceptance (FA)	False Rejection (FR)	Distance between known speaker and population	Distance between known speaker and anonymous
CST_008_S_N_LR3	TR_S1	NO	99,67%	0%	2.4591	11.1765
CST_011_I_N_LS	TR_S1	NO	9,53%	0%	2.3842	3.5188
CST_013_S_N_LR3	TR_S1	NO	36,68%	0%	2.469	4.6733
CST_018_A_N_LR2	TR_S1	NO	69,59%	0%	2.4168	5.8509
CST_019_A_N_LR2	TR_S1	NO	100%	0%	2.3655	9.6337
CST_022_I_N_PS	TR_S1	NO	6,55%	0%	2.3643	3.4295
CST_027_I_N_PS	TR_S1	NO	65,06%	0%	2.3727	5.6194
CST_028_I_N_PS	TR_S1	NO	10,19%	0%	2.4364	3.6058
CST_030_I_N_LS	TR_S1	NO	99,37%	0%	2.3837	10.4739
CST_044_S_N_LR3	TR_S1	NO	99,67%	0%	2.4743	12.801
CST_049_S_N_LR3	TR_S1	NO	11,43%	0%	2.4243	3.5479
CST_054_A_N_LR2	TR_S1	NO	24,49%	0%	2.4811	4.2862
CST_055_I_N_LS	TR_S1	NO	31,52%	0%	2.3843	4.5016
CST_068_I_N_PS	TR_S1	NO	99,67%	0%	2.4447	12.0382
CST_072_I_N_LS	TR_S1	NO	60,09%	0%	2.4381	5.6043
CST_081_A_N_LR2	TR_S1	NO	61,16%	0%	2.4531	5.3695

**Table 2.** Results and scores for the comparisons involving S2 with the CST files

Anonymous speaker	Known speaker	yes/no	False Acceptance (FA)	False Rejection (FR)	Distance between known speaker and population	Distance between known speaker and anonymous
CST_008_S_N_LR3	TR_S2	NO	100%	0%	3.0263	16.6797
CST_011_I_N_LS	TR_S2	NO	28,78%	0%	2.9856	7.3372
CST_013_S_N_LR3	TR_S2	NO	88,43%	0%	3.0322	10.9561
CST_018_A_N_LR2	TR_S2	NO	0,32%	0%	2.9719	3.3839
CST_019_A_N_LR2	TR_S2	NO	99,34%	0%	3.0323	14.5033
CST_022_I_N_PS	TR_S2	NO	53,25%	0%	3.0482	8.3742
CST_027_I_N_PS	TR_S2	NO	0,33%	0%	3.0462	4.0095
CST_028_I_N_PS	TR_S2	NO	23,82%	0%	2.8903	7.1729
CST_030_I_N_LS	TR_S2	NO	100%	0%	2.8209	16.0241
CST_044_S_N_LR3	TR_S2	NO	99,34%	0%	3.04	13.6235
CST_049_S_N_LR3	TR_S2	NO	43,49%	0%	3.0328	7.9209
CST_054_A_N_LR2	TR_S2	NO	39,38%	0%	2.8137	7.7356
CST_055_I_N_LS	TR_S2	NO	29,12%	0%	2.8902	7.276
CST_068_I_N_PS	TR_S2	NO	100%	0%	2.8128	17.6443
CST_072_I_N_LS	TR_S2	NO	0,33%	0%	2.8404	3.4478
CST_081_A_N_LR2	TR_S2	NO	95,05%	0%	2.813	11.1083

**Table 3.** Results and scores for the comparisons involving S1 and S2 with the voices present in the OST file

Anonymous speaker	Known speaker	yes/no	False Acceptance (FA)	False Rejection (FR)	Distance between known speaker and population	Distance between known speaker and anonymous
OST_0001	TR_S1	NO	4,65%	0%	2.3778	3.3313
OST_0001	TR_S2	NO	36,6%	0%	3.0432	7.7165
OST_0002	TR_S1	NO	24,09%	0%	2.444	4.2811
OST_0002	TR_S2	NO	76,45%	0%	3.0282	9.1902
OST_0003	TR_S1	NO	99,67%	0%	2.3852	11.0635
OST_0003	TR_S2	NO	100%	0%	2.9669	15.742
OST_0004	TR_S1	NO	89,11%	0%	2.4328	6.2619
OST_0004	TR_S2	NO	0,33%	0%	2.8306	3.7634
OST_0005	TR_S1	NO	16,43%	0%	2.6215	3.9239
OST_0005	TR_S2	NO	56,28%	0%	3.0777	8.8588
OST_0006	TR_S1	NO	49,56%	0%	2.5098	5.0195
OST_0006	TR_S2	NO	32,98%	0%	2.9604	7.4951