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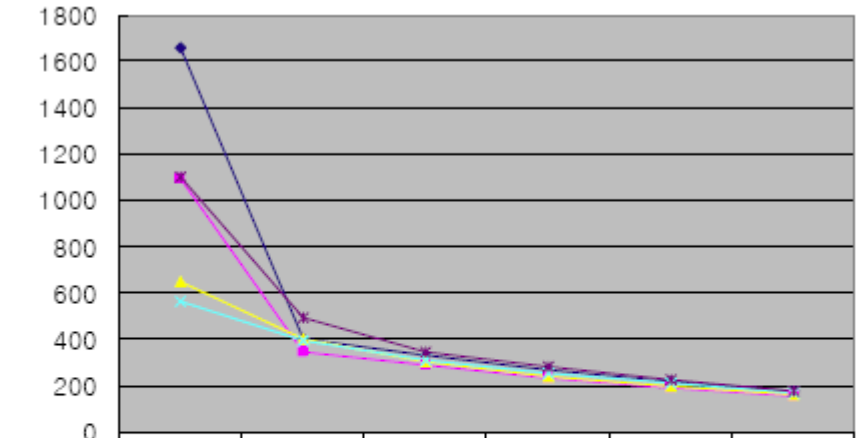
Fast mode

Using Fast Mode to speed up 1:N identification

In a new firmware version 1.4 recently released for SFM3000/3500 modules, a fast mode was added to accelerate one to many fingerprint identification speed. The use of a fast mode can accelerate the identification speed up to 10 times at the sacrifice of relatively small degradation of authentication accuracy. The following figure shows the average matching time for 1 to 1000 genuine matching.

Figure 1 1:1000 genuine matching time (ms)



	Normal	Fast Mode 1	Fast Mode 2	Fast Mode 3	Fast Mode 4	Fast Mode 5
OP	1662	405	329	267	221	176
TC1	1097	343	288	233	190	154
TC2	652	402	306	237	195	159
FL	566	393	312	253	210	168
FC	1101	491	343	279	226	175

The fast mode has 5 different levels from mode 1 to 5. From the genuine matching result of Figure 2, the followings can be said :

- In normal mode, matching time varies a lot with sensor types. For example, the matching time of OP is 3 times longer than that of FL.
- The use of fast mode dramatically accelerates matching speed, roughly from 5 to 10 times.
- Using the fast mode, matching time depends less on sensor types. See the matching time at fast mode 5.
- Even the use of fast mode 1 presents 3 ~ 4 times faster matching speed for sensors like OP or TC1.

Table 1 1:1000 genuine identification time (ms)

	Feature Extraction	Normal Mode	Fast Mode 1	Fast Mode 2	Fast Mode 3	Fast Mode 4	Fast Mode 5
OP	792	2454	1197	1121	1059	1013	968
TC1	675	1772	1018	963	908	865	829
TC2	483	1135	885	789	720	678	642
FL	506	1072	899	818	759	716	674

	Feature Extraction	Normal Mode	Fast Mode 1	Fast Mode 2	Fast Mode 3	Fast Mode 4	Fast Mode 5
FC	815	1916	1306	1158	1094	1041	990

Compared with considerable gains in matching speed, performance degradation is relatively small. The following table shows the average FRR (false reject rate) in the use of the fast mode. The FAR (false acceptance rate) does not change with fast mode and only affected by security level. In this test, the security level is set to FAR of 1/100,000.

Table 2 False Reject Rate (%)

	Normal Mode	Fast Mode 1	Fast Mode 2	Fast Mode 3	Fast Mode 4	Fast Mode 5
FRR	1.31	1.44	1.45	1.57	1.77	1.95

From Table 2, the followings are observed:

- Fast mode 1 or 2 shows only a small degradation of FRR in spite of 3~4 times of improvement in matching speed for some sensors.
- The level of FRR degradation of Fast mode 5 can be also in an acceptable level for many applications considering its benefit of a fast matching speed.

Even though the performance degradation is not much, the fast mode does not need to be used in identification of small database, say less than 100 templates. In that case, the difference of matching time between a normal and a fast mode is not significant.