that this system is perfectly able to find the identity of genuine user and intruders. This test applied on genuine users and fake users both.

- Test applied on genuine user's data (Keystroke data and Touch data) and these test did not get any significant difference between registered data and login data. Hence it proves the data has collected during login time is the data of the genuine users.
- Test applied on fake users also, to give them genuine users email id and password to check the validity of the system. The test got differences between registered data and login data. Therefore it makes system accurate that fake user cannot login the application if their keystroke data is not match with registered data.

It also determine that keystroke pattern and touch patterns are unique, no one can copy or steal typing and touch pattern of the users. This test proved that the algorithm which is designed to develop this system is perfectly working with full efficiency.

4.3. FAR and FRR Analysis

The KDSmart system is achieved FAR and FRR value through the pass-value for each user to get the system's performance. FAR and FRR applied on both the phases login phase and final phase. Table 1 shows the analysis of FRR where 208 user has tried to login the application and use the application and it shows that how many authenticate users were rejected as a fake user and Table 2 shows the analysis of FAR to check validity of the KDSmart system that how many fake users were accepted as a genuine users. This FAR method applied on both the phases login phase and final testing phase.

No Of User	FRR
208	6.73%

Table 1: FRR analysis

No Of User	FAR
60	1.66%

Table 2: FAR analysis

EER Analysis

The dataset is analyzed using the FAR and FRR which calculates the EER value, where the pass-value is variable, i.e. it is determined separately for each subject (Typing Speed, Flight Time, Dwell time, touch size and Error Rate). The analysis is done on timing feature data only. The EER results in Table 3 shows the EER value.

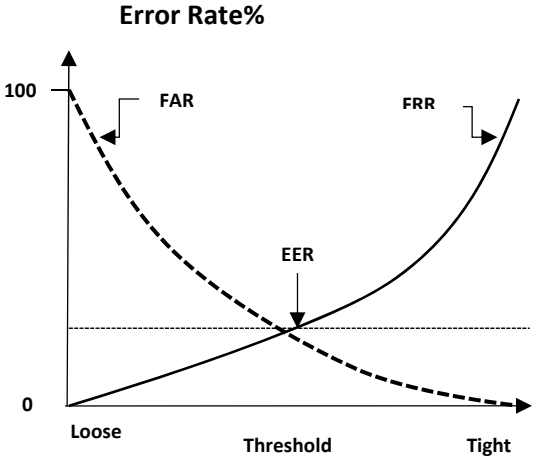

Fig. 1 Equal error rate

FAR	FRR	EER
60 Users	208 Users	4.1%

Table 3: EER Analysis

4.3.1 Result of FRR, FAR and EER

FRR result is 6.73% and FAR is 1.66%. The percentage of FRR and FRR determines system's performance. If FRR percentage is high then it can be consider but if FAR percentage is high then it cannot be consider because it is dangerous for the system. EER is 4.1% which shows the accuracy of the system. Therefore it confirms that KDSmart system accuracy is high and it is appropriate for authentication system in smartphone.

5 Conclusion

Author proposed KDSmart system, it has been developed to use continuous authentication through keystroke dynamics and touch dynamics for smart devices. This system developed to make strong authentication process and secure mobile data. Both the technology keystroke dynamics and touch dynamics used in KDSmart system, are very secure, efficient and trustworthy. Author designed an algorithm to improvise the authentication process, this algorithm can be apply in any android based application. Author implemented *Pared T test* for result analysis to check the KDSmart system authenticity and FAR, FRR and EER method also applied to check the validity of the system. Test results proved that designed algorithm is working efficiently KDSmart system is capable to identify the identity of the genuine user and intruders because FAR result was 1.6% and after login the application user can be identified through their touch behavior on smartphone.

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