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Secure and User Authentication in OnlineBanking

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Abstract—Online banking is on the up each day with a persistent rise in the number of people using this novel service tocarry out their financial transactions.This amplified interest in the use of online banking has consequently raised the concerns over the security. This has raised the need to protect online banking in to guard these transactionsas well as establishing secure mechanisms for information exchange that prevent fraud and safeguardthe personal data. With the internet nowpopularamong allagegroups, onlinebanking has become a necessity.Security mechanisms are, therefore a must for the proper functioning of online banking. In addition to this, all the users are requiredto manage multiple passwords and devices. Security which are provided by the extensively usedsystemsnamely knowledge-based security and token-based security can beeasilybreached when onerevealshispassword and hiscards are stolen.In order toovercome this, biometrics are used.Banks havestartedusingsinglebiometric systemsfor financial transactions.In order to provide furthersecurity for online banking transactions, the proposed system introduces the use ofmultiple(face and fingerprint)biometrics for online financialtransactionwhereboth are requiredforauthentication of log-in- process and one biometric is used for transaction process,thuswouldhelpovercometraditional vulnerabilities. Further,this proposed researchfurtherexplores the matching atthefeature level,whichofcourse isaunder studied problem. Here inthis approach,the feature setsextracted from multiple data sources would be fused to create a new feature set to represent the individual. Since the feature set contains better-off informationabout thefresh biometric data compared to the match score level or the final decision, combination at this level is possible to provide better authentication results.Initial resultsindicate that the planned technique can leadtolargeimprovementinmultimodal matching performance.

Index Terms—Unimodal biometrics, multimodal biometrics, OTP.

I. INTRODUCTION

Anumberofaspects,including lessercostofnetwork devices,largerInternetandmobileInternetpenetration, availabilityofdevicesandincreaseduseofthesmartphones have goneintocommercialising onlinebankingaroundtheworld. Thecircumstanceremainsthatinspiteoftheadvancements insecuritytechnology, vulnerablity stillexist.Studiesshows thatmanyphishingandsocialengineering attackstakeplace aroundtheworldeverymonth.Though therearemanythreats andvulnerabilities,averystrongauthenticationmechanism forcustomersandtransactionswilladdressmostfraudrelatedissues.Apartfromincorporating strongauthentication mechanism, certainbankslimitthenumberofonlinebanking operationsthatacustomercanperformeachday. Biometrictechnologyensurestherobustandsafetechnique tomakeSecureauthentications ofpersons.Alargeportionof systembreachesarecausedbyauthentication failure,either duringtheloginprocessorinthetransaction processwhich existduetothelimitationsaccompanyingtheexistingauthentication methods[7].Currentauthentication methodsarenot userorientedandarethusanendangertousers security. Inthecurrentworld,authentication ofonlinebankingusersis doneusingthefollowingmethods:[1]

A.KNOWLEDGEBASED

This method, which is the most popular and common, askstheuserstoauthenticate byenteringtheirUserIdand password. Thebanksafeguards thesecuritybyensuringthat theusershaveastrongpassword andthatarechangedata frequentintervalswhichisassignedtobeforfewdays.

B.TOKENBASED

Tokenbasedmethodiscurrently usedinalmostallonline banktransactions.Thismethodauthenticatestheusersbased ontheknowledge basedidentityandsomething elsethatthey have. ThisisusuallydoneusingOTP(OneTimePassword), or tokendevices.

II. RELATEDWORKS

A.UNIMODALBIOMETRICS

The unimodal biometric systems rely on the evidence of a single source of information for authentication of person. Though these unimodal biometric systems have manyadvantages, ithastofacewithvarietyproblemslike Noisydata,Intraclassvariation, Interclasssimilarities, on universality,Spoofingetc[6].

B.TYPESOFMULTIMODAL SYSTEMS

Depending onthetraits,sensorsandfeaturesetsmany differenttypesofmultimodal systemsarethere.These include:[2]

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1)Single biometric trait, multiple sensors: Multiple sensorsareusedtorecordthesamebiometric characteristic. Therawdatatakenfromdifferent sensorscanthenbe combined at the feature level or matcher score level to improvetheperformanceofthesystem. [4] discussed about a method, End-to-end inference to diagnose and repair the data-forwarding failures, our optimization goal to minimize the faults at minimum expected cost of correcting all faulty nodes that cannot properly deliver data. First checking the nodes that has the least checking cost does not minimize the expected costin fault localization. We construct a potential function for identifying the candidate nodes, one of which should be first checked by an optimal strategy. We proposes efficient inferring approach to the node to be checked in large-scale networks.

2) Multiple biometrics: Multiplebiometrictraitssuchas fingerprints andfacecanbecombined.Differentsensorsare usedforeachbiometriccharacteristic.Theinterdependency ofthetraitsensuresasignificant improvementinthe performanceofthesystem.

3)Multipleunits, single biometric traits: Two or more fingersofasingleusercanbeusedasabiometrictrait.It isinexpensivewayofimprovingsystemperformance, asit doesnt require multiple sensors or incorporatingadditional featureextraction ormatchingmodules.Iriscanalsobe includedinthiscategory.

4) Multiplesnapshotsofsinglebiometric: Inthismore thanoneinstanceofthesamebiometric isusedforthe recognition.Fore.g.multipleimpressionsofthesamefinger ormultiplesamplesofthevoice.

5) Multiplematchingalgorithmsforthesamebiometric: Initdifferentmethodscanbeappliedtofeatureextraction andmatchingofthebiometriccharacteristic.

C.FUSIONLEVELSINMULTIMODALBIOMETRICS

Therearethreefusionlevelsinmultimodal biometrics: featurelevelfusion,matching scorelevelfusionanddecision levelfusionrespectively. Thethreelevelsoffusionare describedasfollows:[3]

1)FEATURE LEVEL FUSION: In the feature level fusion, features from different biometrictraits are initially processedandthefeaturevectorsareobtainedareextracted and combinedto forma compositefeaturevector.Thisis thencombined toformafeaturevectorthatisusedfor classification.

2)MATCHINGSCORELEVELFUSION: In matching scorelevelfusion,individualmatchingscoreisfoundbased onvariousbiometric traitsandthesematching scoresare gatheredtomaketheclassification.

3)DECISIONLEVELFUSION: Indecisionlevelfusion, eachbiometric traitsarecapturedandfeaturesareextracted fromthecapturedtraits.Thefinal decisionofacceptorreject basedonthecombination oftheoutcomesfromdifferent biometricmodalities.

D.MATCHINGALGORITHMS

Based on the pattern of the matching algorithm, the matchingspeedcanvary.Inabiometricrecognitionsystem, theindividualitycorresponding totheprobeisclasically determined bymatchingitagainstthetemplatesofall individualitiesinthegallery.[5]

E.FINGERPRINTMATCHINGTECHNIQUES

Foraccuratepersonalidentification,considering allthecurrently used biometric techniques, fingerprintauthentication systemisthewidelyusedandappropriate.Theexistingpopular fingerprintmatchingtechniquescanbebroadlyclassifiedinto threecategoriesdependingonthetypesoffeaturesused:[4]

1)Minutiae-based:
2)Correlation-based:
3)Euclideandistance-based:

III. PROPOSEDSYSTEMDESIGN

In the proposed system, the online banking system ensuresrobustandsecureauthentication mechanismbyusing themultimodalbiometrics.Multimodal systemincluding Fingerprintandfaceareusedforthelogin process.Astheft canoccuratanypointoftransaction process,fingerprint authentication isagaindoneduringtransactionprocess. Efficient encryptionanddecryptionmethodsareusedfor providingthesecurityofdatatransmitted andstoringthedata inthedatabase. Thustheproposed systemensuresimproved securityinonlinebankingbyusingthemultimodal biometric system.

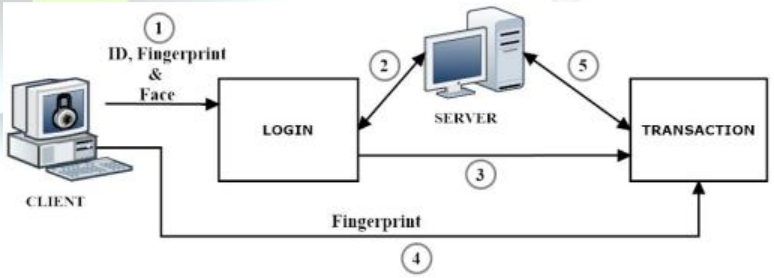

Figure1.
Highleveldesign

Figure1describes theoverallscenariointheproposed system.Theplannedsystemconsistsofaclientsystemwhichis the userdoingthe onlinetransaction.Thebankserverencloses thedatabasewithwhichthedetailshastobecompared. The usercanloginwiththeuserid,andrecognising selfwith fingerprint andface.Thesedetailsarecomparedwiththe

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databaseintheserver.Oncetheloginissuccessful,theuser canmakethenecessarytransactionbyauthenticating withthe fingerprintonceagain.Thedetailsareagaincomparedwith theserver.

Theproposedsystem usesamultimodalbiometricsystem.It consistsoftwomainmodulesnamely,

A.Enrolment module

Here,theuserhastoregister atthebankwiththenecessary details.Thisincludesthebiometrictraitsaswellasother

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informationneededfortheauthentication.

B.Authenticationmodule

Here, the user has to authenticatehim/herselfusing the multibiometric traitsusedforthelogin processandunimodal biometric,usedfortransactionprocess.The Authentication moduleconsistoftwomainprocesses.

1)LoginProcess: Here,theuserhastologinusingthe useridfollowedbytherecognitionoffaceandfingerprint forauthentication .Oncetheuserlogintothesystemtheuser canonlyviewtheaccountdetails.

2)Transaction Process: Here, the user has to again authenticatehim/herselfusingthefingerprint authentication. Onlywhentheuserauthenticatewiththefingerprintdetails, thetransactioncanbedone.

The authenticationmechanism includes the processes at boththeclientandserverside.Theclientsideprocess include capturingthefinger andfaceimage,followedbyfeature extractionandfusionofthefeatureextracted,encrypting the Euclidean distancecalculated andsendingittotheserver.This isdepictedinFigure2.

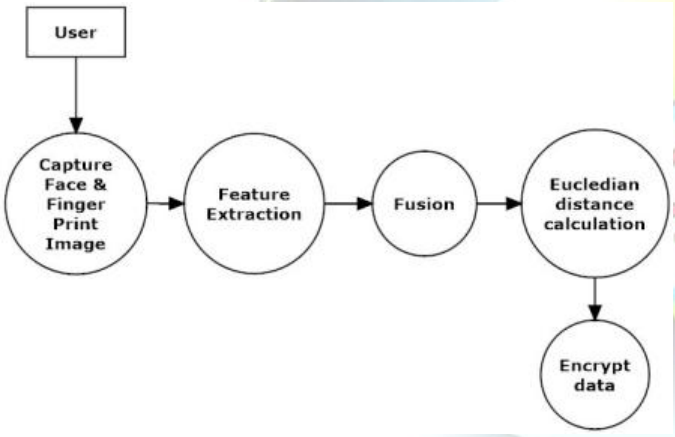

Figure2.
Clientside

Figure 3 illustrates the server side process. The server sideprocessinclude,decrypting theencrypteddata,and comparingthestoreddatainthedatabase.

IV. CONCLUSION

Today,theauthentication mechanisminonlinebanking includetwofactorauthentication whichisthetokenbased authenticationmechanism.Thisneeds an externaldeviceto dynamicallyauthenticatetheuser.However,thechancestothe devicebeingmisplacedorlosscancauseacompromisetothe bankaccounttransactiona.Therearemanyvulnerabilitiesstill concerning thisarea.Soarobustandsecureauthentication mechanismtobeusedinonlinebankingisessential.This canbeachievedbyusingmultimodalbiometrics.Thereare

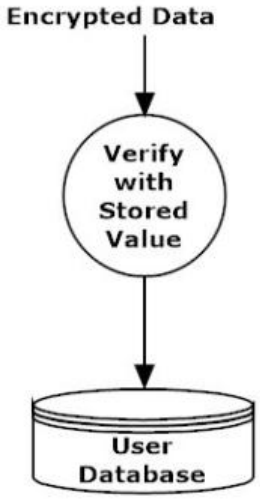

Figure3.
Serverside

variousspoofing attacksthatcanoccurwhileusingunimodal biometrics. Thusmultimodal biometrics ensuresanefficient methodforauthentication inonlinetransaction.Certainthreats including hacking,phishingetccanalsobedispensed when usingmultimodalbiometrics.

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