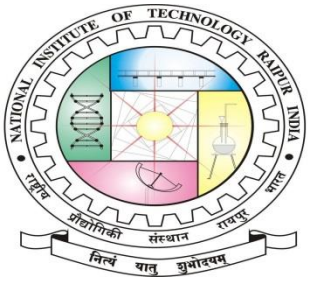


# NATIONAL ISTITUTE OF TECHNOLOGY, RAIPUR

## DATABASE MANAGER

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# ABSTRACT

Active databases have been used in many different fields to accomplish many different tasks. One of the main problems today that still have not been solved is authorization. In some situations it is enough that user knows e.g. password, in other situations it is enough that user posses e.g. a smart card, but, there are also situations where user's unique physical or psychological characteristics need to be measured. In this paper we are

going to put accent on this third possibility. We will show how the concept of complex events presented in the active database theory could be used in order to build a multimodal biometric system. Especially, we will explore the paradigm of active rules and complex events, and apply them in order to implement a multimodal biometric system

# INTRODUCTION

Organization can be defined, as can be found in , as a set of people that are gathered in order to accomplish some common goal or goals that are of great importance for the organization itself. In order to fulfill these goals, people have to use certain resources (data, information, etc.). Some resources are restricted, i. e. known or accessed by only a small number of people. This is just one example why one has to be authorized in order to access some restricted resources. For example, if one wants to use e-mail, one has to have an account (a login name and a proper password), etc.

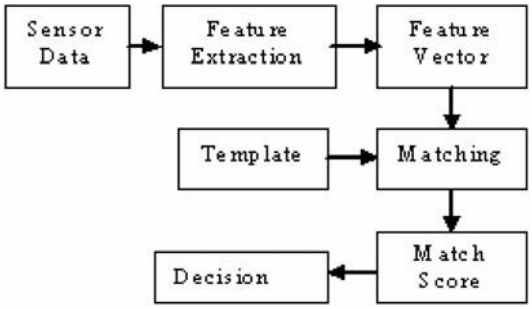
As it was already mentioned, a user could be authorized in three different ways (or their combinations): in some situations it is enough that user knows e.g. password, in other situations it is enough that user posses e.g. a smart card. But, there are situations where user's unique physical or psychological characteristics need to be measured.

When talking about passwords, people usually chose passwords that are easy, intuitive and not complex enough. Registration numbers or birth dates are used as well as names, passwords are usually to easy and written down; so in any case they are not a flawless solution. On the other hand, smart cards (or token) could be stolen.

# BIOMETRICS

As we have already mentioned biometrics relies on who you are and how you behave; this was enough for the introduction, but now we will present some definitions that we have selected although many other, similar definitions can be found as well. Biometrics are automated methods of identifying a person or verifying the identity of a person based on a physiological or behavioural characteristic . Biometrics is a method using physiological or behavioural features of a person for an automated detection and verification of their identity

Many biometric characteristics are being used today, including fingerprint, DNA, iris pattern, retina, ear, face, thermogram, gait, hand geometry, palm-vein pattern, keystroke dynamics, smell, signature, and voice . According to ,the ideal biometric characteristic has to meet the following criteria: it has to be permanent and inalterable in terms of time, the procedure of gathering personal features has to be inconspicuous and conducted by means of devices involving minimum or no contact, it has to enable total automation of the system, and finally, the system has to be highly accurate and its operation speed such that it enables real-time operation. So, previously mentioned biometric characteristics that are being used could not be considered ideal, taking into account these criteria.




Complex events could consist of one or more simple events connected with logical operators, but there are also some special kinds of complex events introduced during the years within many different projects (*REPEAT*, *NEGATION*, etc.). For example, if we had simple events E1 and E2, then E1ÙE2 or E1ÚE2 would represent a complex event.

As it has been already mentioned, when an event occurs the condition is evaluated, and then some actions are executed provided that condition evaluation was successful (Fig. 4). However, it is useful (sometimes) to postpone the condition evaluation or action execution so that they are not performed immediately, which explains why several different rule execution

models exist. Thus the condition does not have to be evaluated or the action executed immediately after the event has been detected and the condition evaluated, respectively, but some time can pass in between. As a result, the condition can be evaluated at the end of the triggering transaction or the action can be executed in a new transaction.

Each active database management system is based upon a passive, conventional database management system. In order to support active functionality each passive database management system has to be extended in a way that different kinds of events can be detected, transactions can be managed because of different rule execution models, etc. A passive DBMS can be extended using integrated, layered or application oriented approach, as can be found in . Due to this difference some tools for performance measurements have been introduced to.

# ACTIVE DATABASES

Active DataBase Management Systems (ADBMS) are database systems capable of reacting to some events of interest that can occur within the database, or outside database. The basic concept on which an ADBMS relies is the concept of ECA (Event Condition Action) or active rules. According to this concept, when certain events occur (ON EVENT), and some conditions are fulfilled (IF CONDITION), as a consequence some actions are performed automatically (THEN ACTION). Each ADBMS has a language that is used for trigger specification (definition), and possesses an execution model that determines how the rules are going to be executed.

An event can be defined as a state change of interest that requires intervention. Events can be divided into two categories: simple and complex events. Complex events are mostly based on simple ones, and simple events can be divided as follows (authors mostly agree on these basic types of events):

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# COMPLEX EVENTS AND AUTHORIZATION

As it can be seen in already presented biometric models (Fig. 1, Fig. 3), sample processing and decision- making are performed out of the database. The module responsible for comparison and decision-making is placed out of the database and the system operates as a passive application [8]. It means that data must be extracted from the database and data processing (as well as decision-making) is performed out of the database. One has to have in mind that, when discussing multimodal biometric systems, even more data has to be extracted. So basically, while the database contains the data, an extra tier is added that is responsible for authorization. In such a case time needed for authorisation is significantly bigger because the data has to be pulled out from the database; one has to have in mind that we are not pulling out just integers or characters, but large amount of data (Binary Large OBjects) that makes the whole process very much dependent on network and database performances. In our solution this extra tier is being removed, and the multimodal biometric system functionality is being implemented and placed within the database.

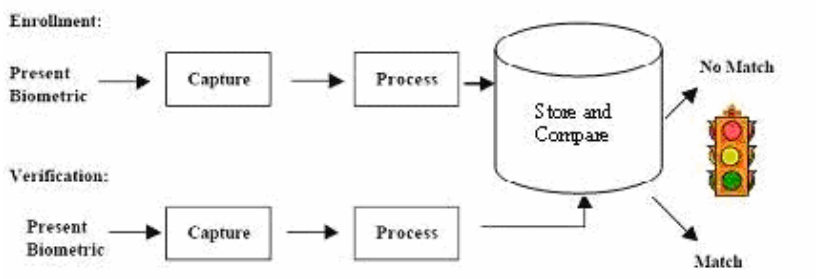
One can conclude that existing biometric systems are passive applications, and that it makes sense to try to convert them into active applications, as we have already described (active applications possess better performances, triggers are easier to maintain, etc.).

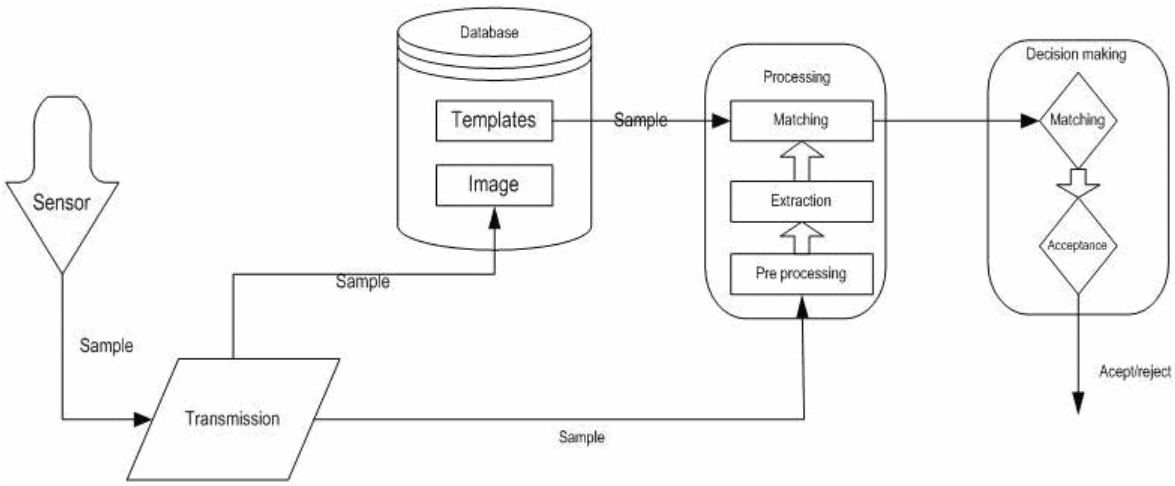
So, the main idea is to place the decision-making module within the database and to express the functionality of multimodal biometric system (borrowing terms used in the active database theory) as a *real-time complex event detection*. We define a complex event that consists of several (*n*) simple events and each simple event represents a fact that the user was identified by means of one biometric feature that multimodal biometric system comprises of. Instead just to store the data in the database, the idea is to place the logic into the database as well. It has been already mentioned that speed is very important when talking about biometric systems, and we hoped to develop a better (faster) solution. The rest of the paper will show how this was done, and present some preliminary results.

Since a multimodal biometric system uses several biometric features in order to authorise a person (*n* features), we have defined a complex event *User_authorization* that consists of *n* simple events and could be written as follows:

$$User\_authorization = Biometric\_feature_1 \text{ Ù } Biometric\_feature_2 \text{ Ù } \ldots \text{ Ù } Biometric\_feature$$

So, the user is authorised if he has passed all biometric features checks (the first biometric feature, the second biometric feature, and so on, including the last biometric feature).



# CONCLUSION

In this paper we proposed the implementation of fingerprint database management system. Thus, the project to automate employee attendance is completed successfully in four modules using Matlab as front end, and MS access as backend, with the functional components of the project and the minimum requirements satisfied. Monitoring can be done easily with this system as any details about the employee is available easily.The project reduces the time consumption and the stress of attendance marking manually.