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Virtual Augmented Reality Application and Research in Police Station Management System with Security Aspects

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Abstract: ***Virtual reality technology has been widely used in various fields, that's let's you create useful IT services. This paper makes exploration of a technical solution and realization methods of virtual reality technology to create a comprehensive and integrated system for enhancing the efficiency and effective policing at all levels and especially at the Police Station level including citizen services, though Common Integrated Police Application (CIPA) tool. Virtual augmented reality technology realizes interaction between users and virtual objects in virtual scenes to automate the existing manual system with the help of computerized equipment and full-fledged computer software. It fulfills the requirements of all policemen so that their valuable data and respective information can be stored for a longer period with ease in accessing the same.***

Keywords: Virtual reality, Common Integrated Police Application Modeling, and Realization

1. Introduction

The VPS is a first-of-its-kind training tool and allows the public to enter a police station virtually and explore every room in 360 degrees. It allows the police and public to learn the key procedures such as arrest, registration of complaints of sexual assault, registration of FIRs, and much more. VPS is a step towards humanizing the functioning of the police as it is important to demystify the police station by exposing citizens to the layers of work management, administration, investigation, going to court, forensics- that the personnel in the police station perform, In the Virtual Police Station, clicking on various icons of the members of police and public, or objects such as registers and phones, prompts a video and text box to open that explains these key procedures, and seminal resources such as case law and legislation are provided for even deeper learning [7]

2. Basic Characteristics of Virtual Technology

- ***Immersive VR***

The users can be placed in a virtual space, cut from the real world on a sensory level just like they are in the real field. Users are allowed this by occupying their whole field of vision what you see, hear, smell, and touch are completely the same as what you feel in reality. It is the core of the virtual reality system. [1]

- ***Interaction VR***

The Interactive capacity [1] between users and various objects in the virtual scene, it can be made possible in several ways. The most common one is the use of a reticle the user control with its head, after entering the virtual environment, users interact with multi-dimensional information through multiple sensors. Users can do some necessary operation, and relevant responses will be made by the virtual environment, which is the same as what is happening in reality. For example, when picking up a basketball in a virtual environment, you can feel its weight and it can bounce after being thrown onto the ground [1]

- ***Imagination VR***

An imaginary space [1] that independently exists in the real world. The medium used to create this space is of course a simulation made of visual elements rendered with computer graphics. Relations and interactions between these elements are defined by the rules set by the creator. It is helpful to deepen concepts, germinate new ideas, and produce a great improvement in understanding it.

2.1 Types of Virtual Technology

Virtual reality technology [1] can be classified into four types according to different forms of users participating in VR and different immersing degrees.

- *Desktop virtual reality*
  Desktop virtual reality[1] uses a personal computer and low-level work station for simulation, Computer screen is used as a window for users to observe the virtual environment. Various input equipment is used to realize the interaction with the virtual environment, including mouse, tacking ball and space ball, and so on. Users are required to make use of input equipment so that they can observe the virtual environment in a range of 360 degrees and operate the objects in it.
- *Immersive virtual reality*
  A high-level virtual reality [1] system can provide a fully immersive experience that makes users feel they are in the virtual environment. Users are in a new and virtual environment generated based on Helmet-Mounted Display and other equipment with a sense of sight, sense of hearing and others all enclosed; Users are absorbed by it and completely immerse themselves in it based on position tracker, data glove, other manual control input equipment and sound, etc and feels like experience in a real area.
- *Virtual reality with augmented reality*
  Virtual reality with augmented reality [1] means that

virtual reality technology is used not only to simulate the real world but also to enhance the feeling of a real environment for users. That is to enhance the feeling that cannot be sensed or are inconvenient to be sensed in real life.

- *Distributed virtual reality*
  A distributed virtual reality system [1] means that many users are connected by a computer network to participate in the same virtual space at the same time and to experience the virtual environment together. Thus, virtual reality is promoted to a higher level. In a distributed virtual reality system, more than one user observes and operates the same virtual environment using the network to achieve the purpose of coordinating work.

2.2 Application of Virtual Technology

Define Using virtual reality technology to cut through the chaos and workload, by innovating system notifies every personnel with the application on his android phone, about the release of an offender, including the other details.

It eliminates the existing issue where the department of police of different areas of jurisdiction remains unaware of the release of the criminal and his/ her extra details, by creating a notification every time there is a release of a criminal. This approach can thereby reduce the effort of the police and save their time, which could be used productively.

2.3 Realization

Virtual reality will become even more accessible within everyday jobs with people using it for medical training, new building designs, training and learning, and other experiences**.** The following aspects are considered for system implementation.

- Provide detailed context-sensitive help material for all the possible actions and scenarios on all user interfaces in the application
- To capture and store violations (i.e. A user's attempts to access a case to which he is denied access), and (where violations can validly be attempted) attempted violations, of access control mechanisms.
- Allow changes to security attributes for groups or users (such as access rights, security level, privileges, password allocation, and management) to be made only by the system administrator.
- The ability to capture basic identifying information about a subject. It also permits you to track a subject address and telephone number history and any alias names that the subject has been known to use.
- To capture information found on a typical incident/crime reported to the Police. The modules should contain the tracking of the Incident/Crime report status as it is moving through the established workflow.

2.4 Implementation Details

Realization models

This system can help in storing records related to criminals, cases, complaint records, case history, and so on. This can allow a person to enter or delete the records if necessary. All these records can be maintained in a single database. Security is maintained to ensure that only the authorized users will have access to the system. This application will be one of the useful projects that the police can rely on. This website can help in getting information about the criminals of many years back. It can also help in minimizing most of the work of the police. The features that can be included in this website are as follows:

- Criminal record:
  This website can contain details related to criminals in a particular case.
- Complaint registration:
  The details of the complaints that are registered can also be stored through this website.
- Police database management:
  The details of the police in the particular police station can be maintained through this website.
- Complaint registration:
  The details of the complaints that are registered can also be stored through this application.

System Modules

The police management application can help in storing the records related to the criminals, cases, complaint records, case history, and so on. This can allow a person to enter or delete the records if necessary. All these records can be maintained in a single database. Security is maintained to ensure that only the authorized users will have access to the system. This application will be one of the useful projects that the police can rely on. This application can help in getting the information of the criminals of many years back. The system involves the following different modules

Station module:

- Each of the stations must first register with the website.
- Once the prospective station registers with the website they can avail of the existing records.

Citizen module:

- Each of the citizens, who has a complaint to register, must first register on the website
- Once the registration is complete, the citizen can sign-in to the website & register their complaints

Crime module:

This module is used for entering all details about the crime. This application can contain details related to the criminals in a particular case.

Administrators Module:

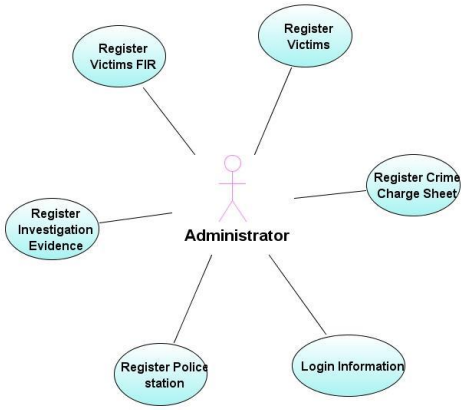
- The module will be focusing on maintenance like Master Data Maintenance, Removal of old and outdated data from the software, etc.
- The details of the police in the particular police station can be maintained through this application.

Actors of the project

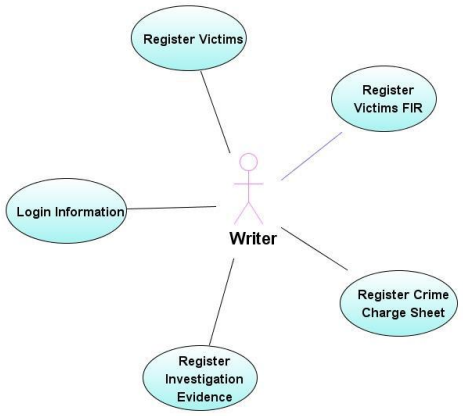
An actor is a user or external system with which a system being modeled interacts. The actors involved in this project are as follows:

- **User**: Posting the complaints, Posting the reminders, and View the status of his complaint.
- **Administrator**: Responsible for ensuring that a project management system is available for a project.t Viewing the complaints, viewing reminders, Generating the reports.
- **Department:** Detect the criminals and punish them according to the police laws.
- **Investigating officer**: He is the actor who can practically work upon the existing data in the police station only for view purposes.

Administrator: He is the actor who has the full-length potentiality and privilege to carry out transactions upon the system. He is authorized to maintain consistency within the information.

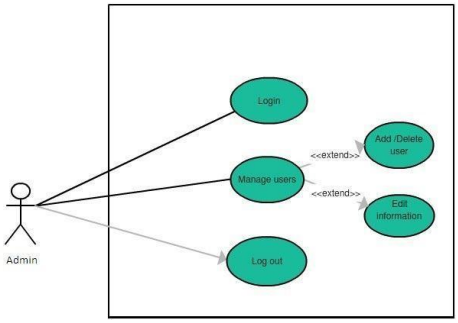


Writer: He is the actor who can enter all the details of the crime or evidence. Once entered cannot be edited. Only the administrator can edit or delete the record from the database.



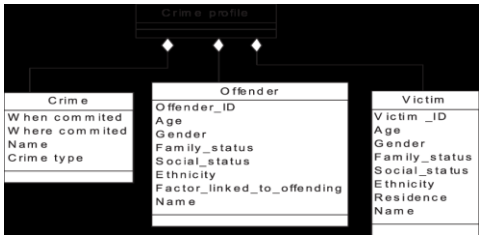
Use-case 1: Login

- Primary-actor: Admin/administrator
- Description: A user, who possesses an admin username and password, owns administrative rights.
- Precondition: username and password.
- Basic use-case flow: Admin/user needs to provide the username and a password.
- Main scenario: Admin/user enters a valid username and password. After verification, the user will be logged in as an admin and can use all the administrative rights.
- Exception: occurs if a user provides the wrong username/password



Class Diagram

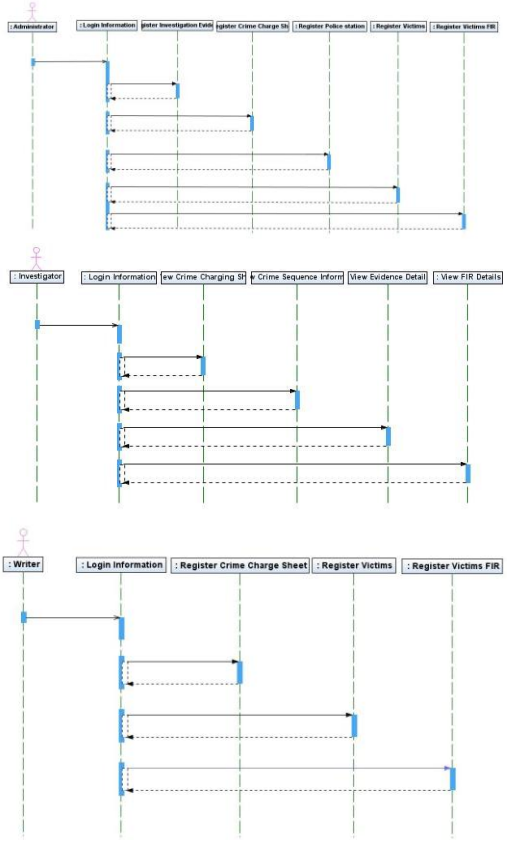
The class diagram is chosen to explain the design phase of the system. A class diagram describes classes of the system, attributes, and operations and relationships of the classes in a better way. We can also say that class diagrams are used to justify the structure or behavior of use cases of the system. Class diagrams best explain the conceptual model of the system in terms of entities and their relationships. The class diagram looks like the shape of a rectangle, comprising three compartments stacked vertically. The first top box comprises the class name, the second middle box contains the attributes of the class, and third the last box contains the methods or functions performed by that class. The first compartment /box of the name is compulsory while the rest of the two can be omitted to simplify the diagram. So, in any class diagram, the first compartment must be drawn while the second two compartments are optional.



Sequence Diagram

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the Logical view of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

A sequence diagram shows, as parallel vertical lines (*lifelines*), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged [12]between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner. The sequence diagram for our project are as follows:

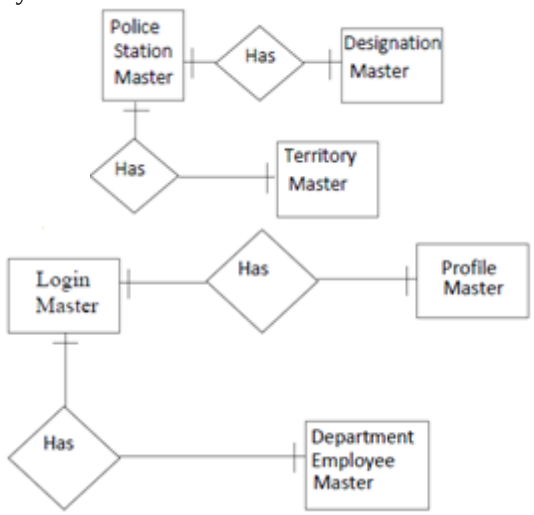


The entity Relationship Diagram (ERD) depicts the relationship between the data objects. The ERD is the notation that is used to conduct the data modeling activity the attributes of each data object noted in the ERD[11] can be described resign a data object descriptions. The primary purpose of the ERD is to represent data objects and their relationships.

A basic ER model consists of objects called entities and specifies the relationship among those entities. The purpose of this diagram is not to define any functionality rather to show association and dependency among entities. ER diagram is drawn with "rectangular boxes" as entities and the "straight lines" showing the relationship between these boxes.

- Data object
- Relationships
- Attributes
- Various types of indicators.

Employee Information



a) Realization tools

- Criminal record: This website can contain details related to the criminals in a particular case.
- Complaint registration: The details of the complaints that are registered can also be stored through this website.
- Police database management: The details of the police in the particular police station can be maintained through this website.
- Complaint registration: The details of the complaints that are registered can also be stored through this application.

b) Station module:

- Each station must first register with the website.
- Once the prospective station registers with the website they can avail of the existing records.

c) Citizen module

- Each of the citizens, who has a complaint to register, must first register on the website
- Once the registration is complete, the citizen can sign-in to the website & register their 13 complaints.

d) Crime module:

- This module is used for entering all details about the crime.
- This application can contain details related to the criminals in a particular case.

e) Administrators Module:

- The module will be focusing on maintenance like Master Data Maintenance, Removal of old and outdated data [9]from the software, etc.
- The details of the police in the particular police station can

be maintained through this application.

f) Key points in the design

- User: Posting the complaints, posting the reminders, and view the status of his complaint.
- Administrator: Responsible for ensuring that a project management system is available for a project's Viewing the complaints, viewing reminders, Generating reports.
- Department: Detect the criminals and punish them according to the police laws

3. Virtual Building and Environment

The design [1] is made to automate the existing manual system with the help of computerized equipment. Refinement of data structure, program structure, and procedural details are developed reviewed, and documented. System design can be viewed from either a technical or project management perspective. From the technical point of view, the design is comprised of four activities – architectural design, data structure design, interface design, and procedural design.

The system architecture [4,5] of this system is divided/split into two parts. One is client-side and the other is server-side. Client-side is the user interface whereas the server-side is the combination of web pages written by PHP and the MySQL database. PHP pages contain the written SQL queries which make access to the database possible.

The developed software is working efficiently and effectively, results in regular and timely action against crime reported. In result found that the information can be obtained easily and accurately. Application Software is made user friendly to the maximum so that anyone can use the software provided he/she could access the system via the login password. It strongly believes that teamwork is highly useful and beneficial to the organization and that teamwork towards the way forward to reduce crime and disorder.

4. Results and Discussions

4.1 Functional requirements

This section of the Report addresses the proposed system by describing the specifications for the proposed integrated web-based crime and justice information system. The objective of this proposed system would be to computerize and digitize the data collection and analysis processes of the Primary Actors especially where such computerization and digitization do not exist. The second step would be to integrate the information systems of these Primary actors in such a way that they can share relevant data while at the same time preserving the confidentiality and data integrity of each system. The proposed web-based integrated[6,7] crime and justice information system should be developed using independent but data connected institutional systems that are hosted and managed by their respective organizations.

The Incident/Crime Report Module is the heart and soul of any law enforcement records management system. This module is designed to capture information found on a typical incident/crime reported to the Police. The modules should contain the tracking of the Incident/Crime report status as it is moving through the established workflow. This Module should capture the following data:

- Incident Number or Case Number
- Address where incident/crime was said to occur
- Date and Time when Incident/Crime was reported
- Date and Time when incident/crime was said to occur Offenses Location characteristics of a subject can be maintained. You can also store multiple photos of the subject referenced by date.

The fields to be captured include:

- Name
- Date of Birth
- Address
- Home, Work Cell number and/or email
- Sex
- Occupation

Person Registry Module Unlike most master indexes, the Master Name Index Module is a true Master reference for a person. This module provides you with the ability to capture basic identifying information about a subject. It also permits you to track a subject address and telephone number history[9,10] and any alias names that the subject has been known to use. This module also utilizes a Known Offender concept where specific traits and

4.2 The non-functional requirements

The proposed police station specifies the information attributes such as user-friendliness, and performance of the system that is critical for the increased user-acceptance of the system.

- The proposed system should provide detailed context-sensitive help material for all the possible actions and scenarios on all user interfaces in the application
- The proposed system should provide an interface for the user to log any defects or enhancement requests on the application and track them thereafter
- The proposed system must be able to capture and store violations (i.e. A user's attempts to access a case to which he is denied access), and (where violations can validly be attempted) attempted violations, of access control mechanisms.
- The proposed system must allow the user to limit access to cases specified by users or user groups.
- The proposed system should provide for role-based control for the functionality within the system.
- The proposed system must allow a user to be a member of more than one group.
- The System must allow only admin users to set up user profiles and allocate Users to groups.
- The proposed system must allow changes to security attributes for groups or users (such as access rights, security level, privileges, password allocation, and management) to be made only by the system administrator.
- The proposed system can be used in police stations over a city where notifications are sent to the police when the criminal is released from jail.

- The system at any point in time can provide the details of the police station and the employees.
- The system at any point of time can provide the details of victims and the registered FIR's
- The system at any point in time can provide the details of evidence and its sequence.
- The system at any point in time can provide the details of existing charge sheets and their statuses.

The existing system that is being used by the police department about the information of the prisoners, stores the name of the prisoners, information of the crime, date of FIR, a background of the criminal, and duration of the prison. However, once the period comes to an end, and the individual is released, it becomes difficult for the personnel serving the police forces to keep a track of the date and time of the release of the particular offender. Since the information on the release date of the offender is not present with every personnel, they are not notified on time, leading to chaos.

4.3 Limitations of the existing system

- A fast recording is not possible.
- Time-management is an issue in the existing approach.
- Consumes a large volume of paperwork.

4.4 Overview of the Proposed System

The proposed system aims to cut through the chaos and workload, by innovating the current system. The proposed system notifies every personnel with the application on his android phone, about the release of an offender, including the other details. It eliminates the existing issue where the department of police of different areas of jurisdiction remains unaware of the release of the criminal and his, her extra details, by creating a notification every time there is a release of a criminal. This approach can thereby reduce the effort of the police and save their time, which could be used productively.

4.5 Advantages of the proposed system

- It ensures information accuracy
- This is a time-efficient approach.
- It minimizes manual information passages.
- The possibility of getting the work done is quite certain.
- It reduces redundancy.

5. Acknowledgment

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