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Robust Video Data Hiding Using Forbidden Zone Data Hiding and Selective Embedding

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ABSTRACT:
Video data hiding is still an important research topic due to the design complexities involved. We propose a new video data hiding method that makes use of erasure correction capability of Repeat Accumulate codes and superiority of Forbidden Zone Data Hiding. Selective embedding is utilized in the proposed method to determine host signal samples suitable for data hiding. This method also contains a temporal synchronization scheme in order to withstand frame drop and insert attacks. The proposed framework is tested by typical broadcast material against MPEG-2, H.264 compression, frame-rate conversion attacks, as well as other well-known video data hiding methods. The decoding error values are reported for typical system parameters. The simulation results indicate that the framework can be successfully utilized in video data hiding applications.

I. INTRODUCTION

Data hiding is the process of embedding information into a host medium. In general, visual and arual media are preferred due to their wide presence and the tolerance of human perceptual systems involved. Although the general structure of data hiding process does not depend on the host media type, the methods vary depending on the nature of such media. For instance, image and video data hiding share many common points; however video data hiding necessitates more complex designs as a result of the additional temporal dimension. Therefore, video data hiding continues to constitute an active research area. Data hiding in video sequences is performed in two major ways: bitstream-level and data-level. In bitstream-level, the redundancies within the current compression standards are exploited. Typically, encoders have various options during encoding and this freedom of selection is suitable for manipulation with the aim of data hiding. However, these methods highly rely on the structure of the bitstream; hence, they are quite fragile, in the sense that in many cases they cannot survive any format conversion or transcoding, even without any significant loss of perceptual quality. As a result, this type of data hiding methods is generally proposed for fragile applications, such as authentication. On the other hand, data-level methods are more robust to attacks. Therefore, they are suitable for a broader range of applications. Despite their fragility, the bitstream-based methods are still attractive for data hiding applications. For instance, the redundancy in block size selection of H.264 encoding is exploited for hiding data. In another approach the quantization parameter and DCT (Discrete Cosine Transform) coefficients are altered in the bitstream-level. However, most of the video data hiding methods utilize uncompressed video data. Sarkar proposes a high volume transform domain data hiding in MPEG-2 videos. They apply QIM to low-frequency DCT coefficients and adapt the quantization parameter based on MPEG-2 parameters. Furthermore, they vary the embedding rate depending on the type of the frame. As a result, insertions and erasures occur at the decoder, which causes desynchronization. They utilize Repeat Accumulate (RA) codes in order to withstand erasures. Since they adapt the parameters according to type of frame, each frame is processed separately RA codes are already applied in image data hiding. Adaptive block selection results in de-synchronization and they utilize RA codes to handle erasures. Insertions and erasures can be also handled by convolutional codes. The authors use convolutional codes at embedder. However, the burden is placed on the decoder. Multiple parallel Viterbi decoders are used to correct desynchronization errors. However, it is observed that such a scheme is successful when the number of selected host signal samples is much less than the total number of host signal samples. 3-D DWT domain is used to hide data. They use LL subband coefficients and do not perform any adaptive selection. Therefore, they do not use error correction codes robust to erasures. Instead, they use BCH code to increase error correction capability. The authors perform 3D interleaving in order to get rid of local burst of errors. Additionally, they propose a temporal synchronization technique to cope with temporal attacks, such as frame drop, insert and repeat. In this paper, we propose a new block-based selective embedding type data hiding framework that encapsulates Forbidden Zone Data Hiding (FZDH) and RA codes in accordance with an additional temporal synchronization mechanism. FZDH is a practical data hiding method, which is shown to be superior to the conventional Quantization Index Modulation (QIM) .RA codes are already used in image and video data hiding due to their robustness against erasures. This

robustness allows handling desynchronization between embedder and decoder that occurs as a result of the differences in the selected coefficients. In order to incorporate frame synchronization markers, we partition the blocks into two groups. One group is used for frame marker embedding and the other is used for message bits. By means of simple rules applied to the frame markers, we introduce certain level of robustness against frame drop, repeat and insert attacks. We utilize systematic RA codes to encode message bits and frame marker bits. Each bit is associated with a block residing in a group of frames. Random interleaving is performed spatio-temporally; hence, dependency to local characteristics is reduced. Host signal coefficients used for data hiding are selected at four stages. First, frame selection is performed. Frames with sufficient number of blocks are selected. Next, only some predetermined low frequency DCT coefficients are permitted to hide data. Then the average energy of the block is expected to be greater than a predetermined threshold. In the final stage, the energy of each coefficient is compared against another threshold. The unselected blocks are labeled as erasures and they are not processed. For each selected block, there exists variable number of coefficients. These coefficients are used to embed and decode single message bit by employing multi-dimensional form of FZDH that uses cubic lattice as its base quantizer.

MODULES:-

- **Encryption module**
- **Decryption module**

MODULES DESCRIPTION:

- **Encryption Module:**

In Encryption module, it consists of Key file part, where key file can be specified with the password as a special security in it. Then the user can type the data or else can upload the data also though the browse button, when it is clicked the open file dialog box is opened and where the user can select the secret message. Then the user can select the image or video file through another open file dialog box which is opened when the cover file button is clicked. Where the user can select the cover file and then the Hide button is clicked so that the secret data or message is hidden in cover file using Forbidden Zone Data Hiding Technique.

- **Decryption Module:**

This module is the opposite as such as Encryption module where the Key file should be also specified same as that of encryption part. Then the user should select the encrypted cover file and then should select the extract button so that the hidden message is displayed in the text area specified in the application or else it is extracted to the place where the user specifies it.

Module I/O:

Module Input:

We give original content as input with watermark data embedding. We view flipping an edge pixel in binary images as shifting the edge location one pixel horizontally and vertically.

Module Output:

The output of the project is we reconstruct the pixel horizontally and vertically .we can see the original watermarked data and embedding content.

II. LITERATURE SURVEY

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor, economy n company strength. Once these things r satisfied, ten next step is to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration r taken into account for developing the proposed system.

Forbidden Zone Data Hiding (FZDH) is introduced in [8]. The method depends on the Forbidden Zone (FZ) concept, which is defined as the host signal range where no alteration is allowed during data hiding process. FZDH makes use of FZ to adjust the robustness-invisibility trade-off

The mapping function in (2) states that the host signal is modified by adding an additional term, which is a scaled version of the quantization difference. In 1-D, this additional term is scalar, whereas in N-D host signal is

moved along the quantization difference vector and towards the reconstruction point of the quantizer. Hence, embedding distortion is reduced and became smaller than the quantization error.

In order to fulfill the requirement of mutual exclusion, the reconstruction points of the quantizers that are indexed by different *m* should be non-overlapping, which can be achieved by using a base quantizer and shifting its reconstruction points depending on *m*, similar to Dither Modulation. A typical embedding function that uses a uniform quantizer.

SYSTEM ANALYSIS

EXISTING SYSTEM:

- In special domain, the hiding process such as least significant bit(LSB) replacement, is done in special domain, while transform domain methods; hide data in another domain such as wavelet domain.
- Least significant bit (LSB) is the simplest form of Steganography. LSB is based on inserting data in the least significant bit of pixels, which lead to a slight change on the cover image that is not noticeable to human eye. Since this method can be easily cracked, it is more vulnerable to attacks.
- LSB method has intense affects on the statistical information of image like histogram. Attackers could be aware of a hidden communication by just checking the Histogram of an image. A good solution to eliminate this defect was LSB matching. LSB-Matching was a great step forward in Steganography methods and many others get ideas from it

PROPOSED SYSTEM:

- Data hiding in video sequences is performed in two major ways: bit stream-level and data-level.
- In this paper, we propose a new block-based selective embedding type data hiding framework that encapsulates Forbidden Zone Data Hiding (FZDH)
- By means of simple rules applied to the frame markers, we introduce certain level of robustness against frame drop, repeat and insert attacks.

Advantages:

- ♣ User cannot find the original data.
- ♣ It is not easily cracked.
- ♣ To increase the Security.
- ♣ To increase the size of stored data.
- ♣ We can hide more than one bit.

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ♦ ECONOMICAL FEASIBILITY
- ♦ TECHNICAL FEASIBILITY
- ♦ SOCIAL FEASIBILITY

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client.

The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

UML DIAGRAMS:

The Unified Modeling Language allows the software engineer to express an analysis model using the modeling notation that is governed by a set of syntactic semantic and pragmatic rules.

A UML system is represented using five different views that describe the system from distinctly different perspective. Each view is defined by a set of diagram, which is as follows.

- User Model View
  i. This view represents the system from the users perspective.
  ii. The analysis representation describes a usage scenario from the end-users perspective.

- Structural model view
  i. In this model the data and functionality are arrived from inside the system.
  ii. This model view models the static structures.

- Behavioral Model View
  It represents the dynamic of behavioral as parts of the system, depicting the interactions of collection between various structural elements described in the user model and structural model view.

- Implementation Model View
  In this the structural and behavioral as parts of the system are represented as they are to be built.

- Environmental Model View
  In this the structural and behavioral aspects of the environment in which the system is to be implemented are represented.

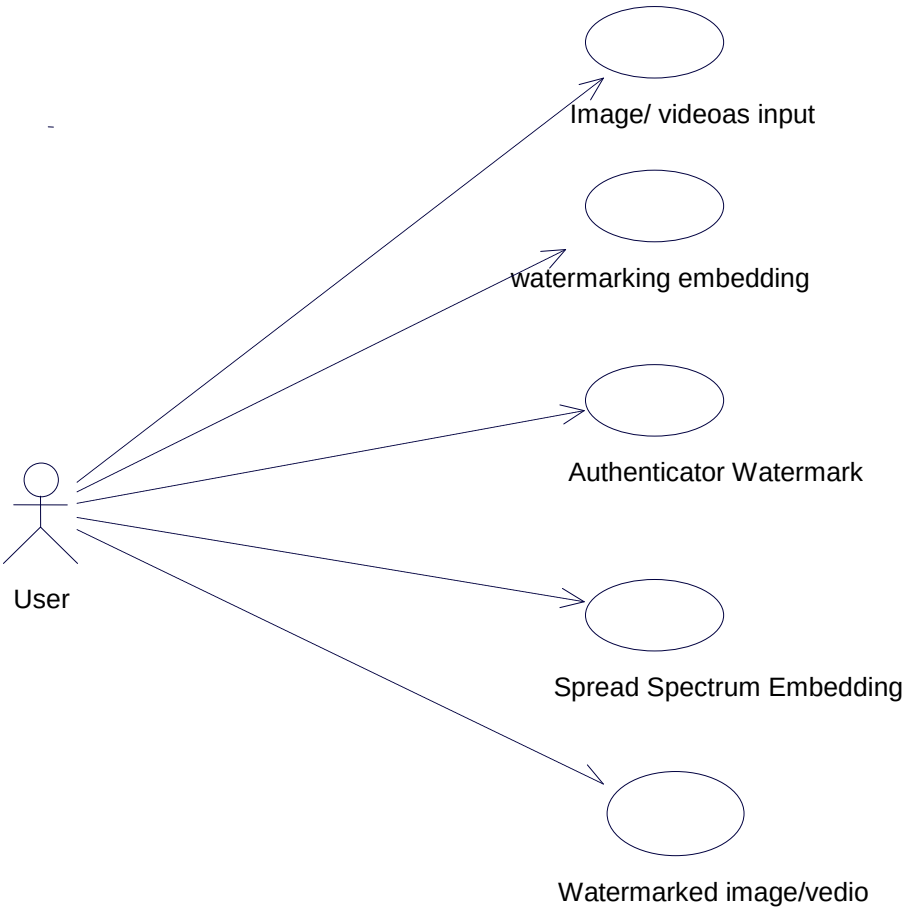
UML is specifically constructed through two different domains they are:

- UML Analysis modeling, this focuses on the user model and structural model views of the system.
- UML design modeling, which focuses on the behavioral modeling, implementation modeling and environmental model views.

USE CASE DIAGRAM

Use Case: Use case describes the behavior of a system. It is used to structure things in a model. It contains multiple scenarios, each of which describes a sequence of actions that is clear enough for outsiders to understand.

Actor: An actor represents a coherent set of roles that users of a system play when interacting with the use cases of the system. An actor participates in use cases to accomplish an overall purpose. An actor can represent the role of a human, a device, or any other systems.



SEQUENCE DIAGRAM:

This diagram is simple and visually logical, so it is easy to see the sequence of the flow of control. It also clearly shows concurrent processes and activations in a design.

Object: Object can be viewed as an entity at a particular point in time with a specific value and as a holder of identity that has different values over time. Associations among objects are not shown. When you place an object tag in the design area, a lifeline is automatically drawn and attached to that object tag.

Actor: An actor represents a coherent set of roles that users of a system play when interacting with the use cases of the system. An actor participates in use cases to accomplish an overall purpose. An actor can represent the role of a human, a device, or any other systems.

Message: A message is a sending of a signal from one sender object to other receiver object(s). It can also be the call of an operation on receiver object by caller object. The arrow can be labeled with the name of the message (operation or signal) and its argument values

Duration Message: A message that indicates an action will cause transition from one state to another state.

Self Message: A message that indicates an action will perform at a particular state and stay there.

Create Message: A message that indicates an action that will perform between two states.

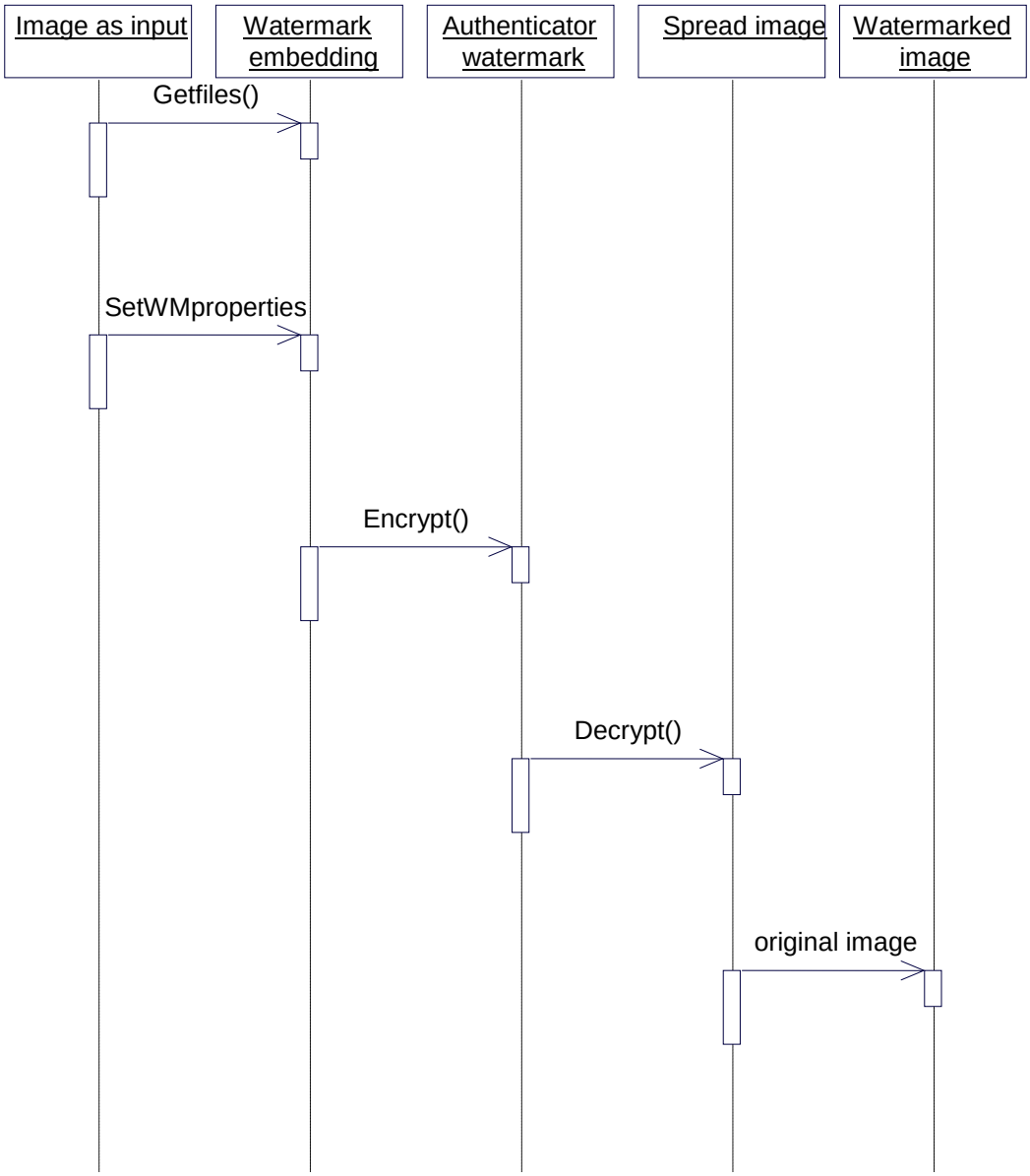
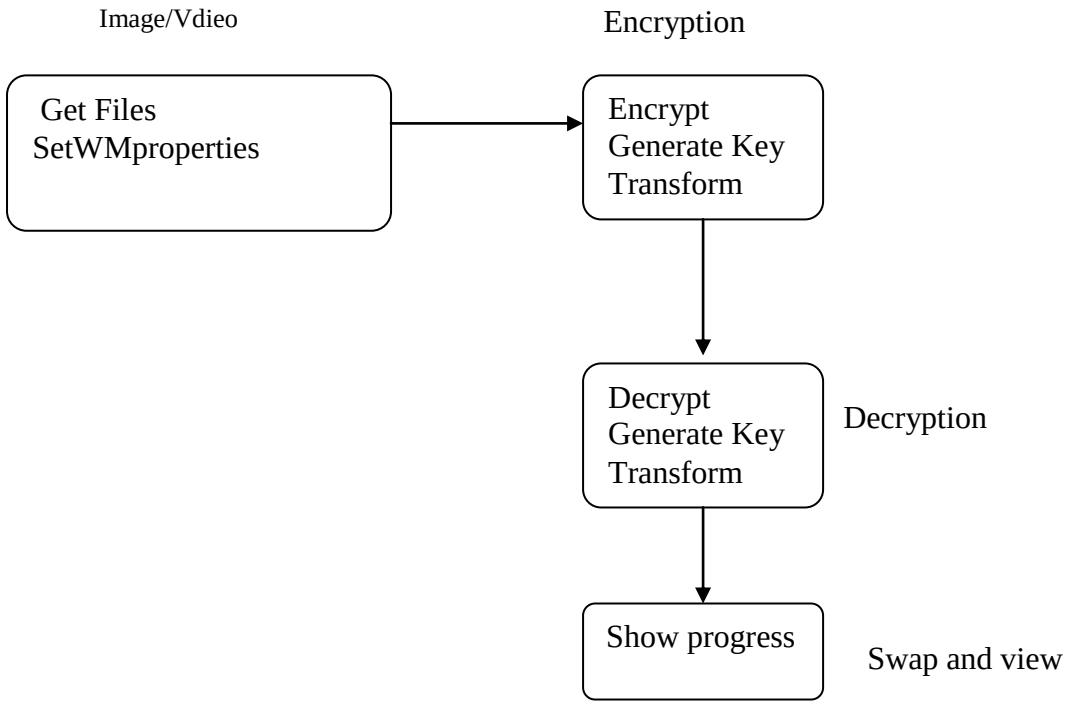


Image as input
Watermark embedding
Authenticator watermark
Spread image
Watermarked image
Getfiles()
SetWMproperties
Encrypt()
Decrypt()
original image

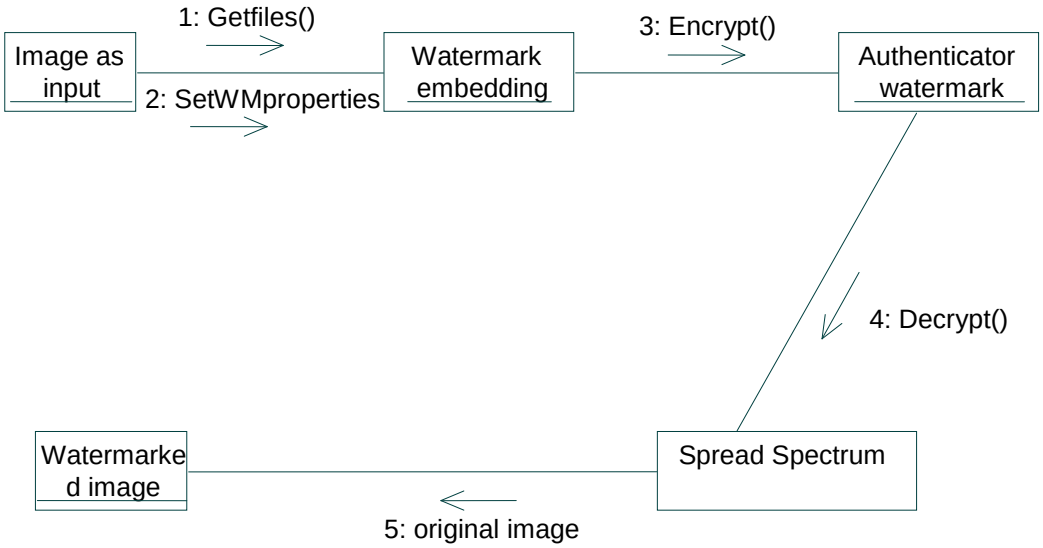
Object Diagram:



COLLABORATION DIAGRAM:

The elements of a system work together to accomplish the systems objective and a modeling language must have a way of representing this. The Uml collaboration diagram is designed for this purpose. it is an extension of the object diagram .in addition to the association among objects the collaboration diagram shows the messages the objects send each other.

An arrow near the association line between two objects represents the message. The arrow points to the receiving object.



CLASS DIAGRAM:

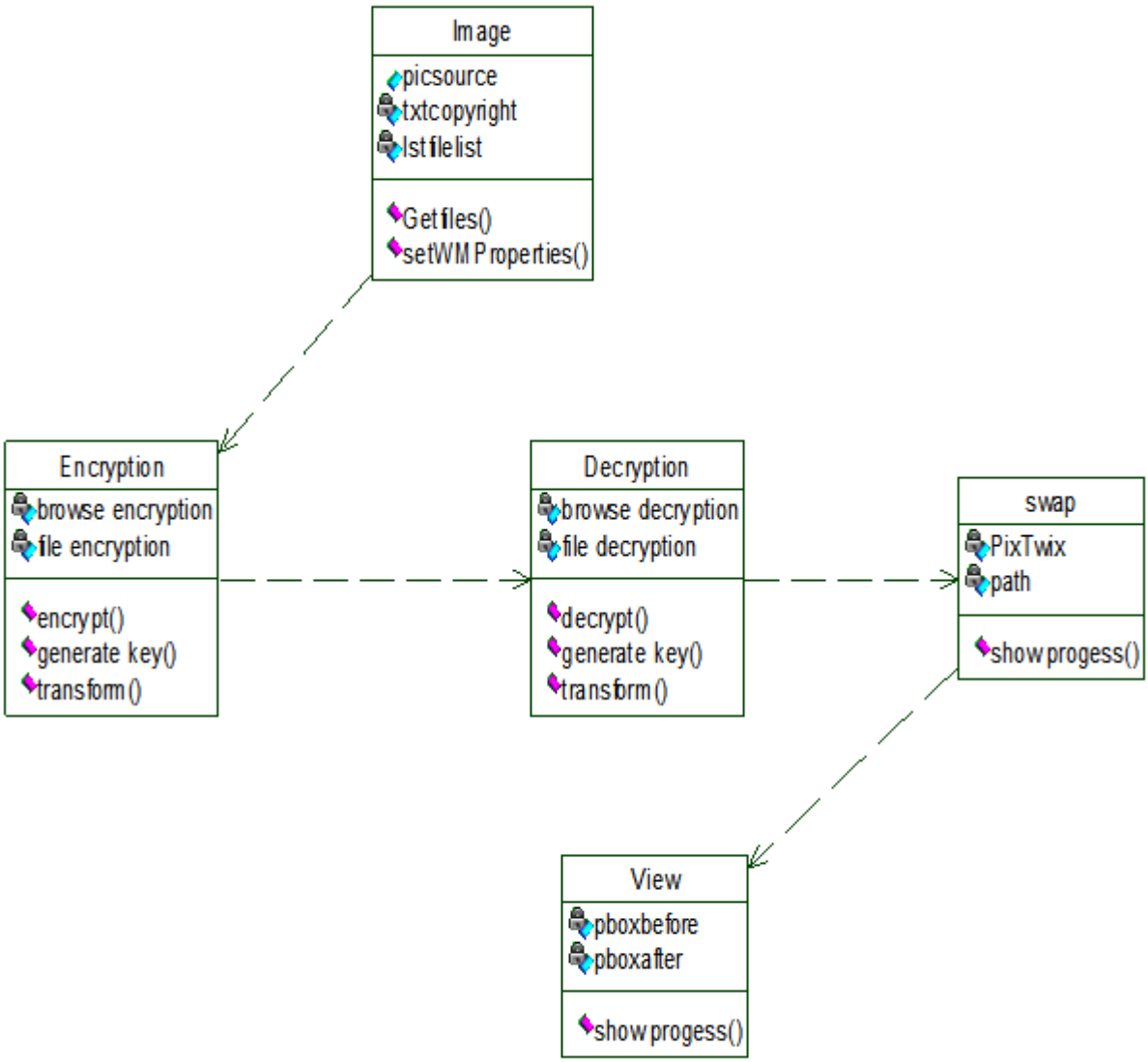
Class: A Class is a description for a set of objects that shares the same attributes, and has similar operations, relationships, behaviors and semantics.

Generalization: Generalization is a relationship between a general element and a more specific kind of that element. It means that the more specific element can be used whenever the general element appears. This relation is also known as specialization
or inheritance link.

Realization: Realization is the relationship between a specialization and its implementation. It is an indication of the inheritance of behavior without the inheritance of structure.

Association: Association is represented by drawing a line between classes. Associations represent structural relationships between classes and can be named to facilitate model understanding. If two classes are associated, you can navigate from an object of one class to an object of the class.

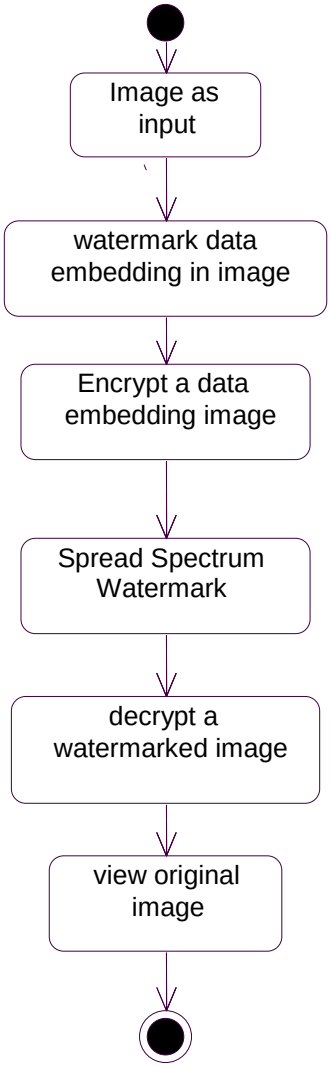
Aggregation: Aggregation is a special kind of association in which one class represents as the larger class that consists of a smaller class. It has the meaning of "has-a" relationship.



STATE CHART DIAGRAM:

At any given time, on object is in a particular state. The Uml state diagram captures this bit of reality. The symbol at the top of the figure represents the figure represents the start state and symbol at the bottom represents the end state. State chart diagrams describe the behavior of an individual object as a number of states and transitions between these states. a state chart represents a particular set of values for an object. The sequence

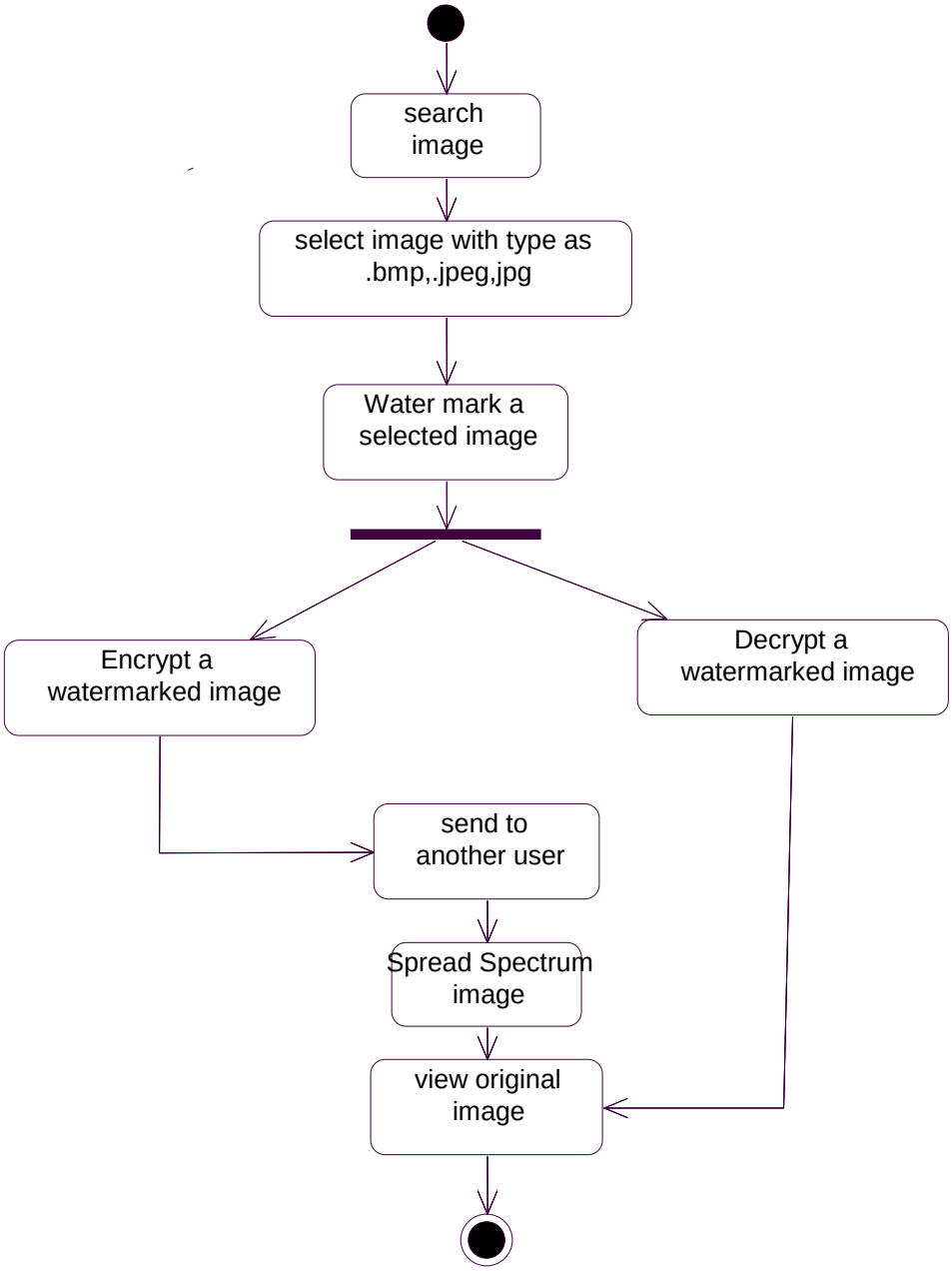
diagram focuses on the messages exchanged between objects, the state chart diagrams focuses on the transition between states.



ACTIVITY DIAGRAM:

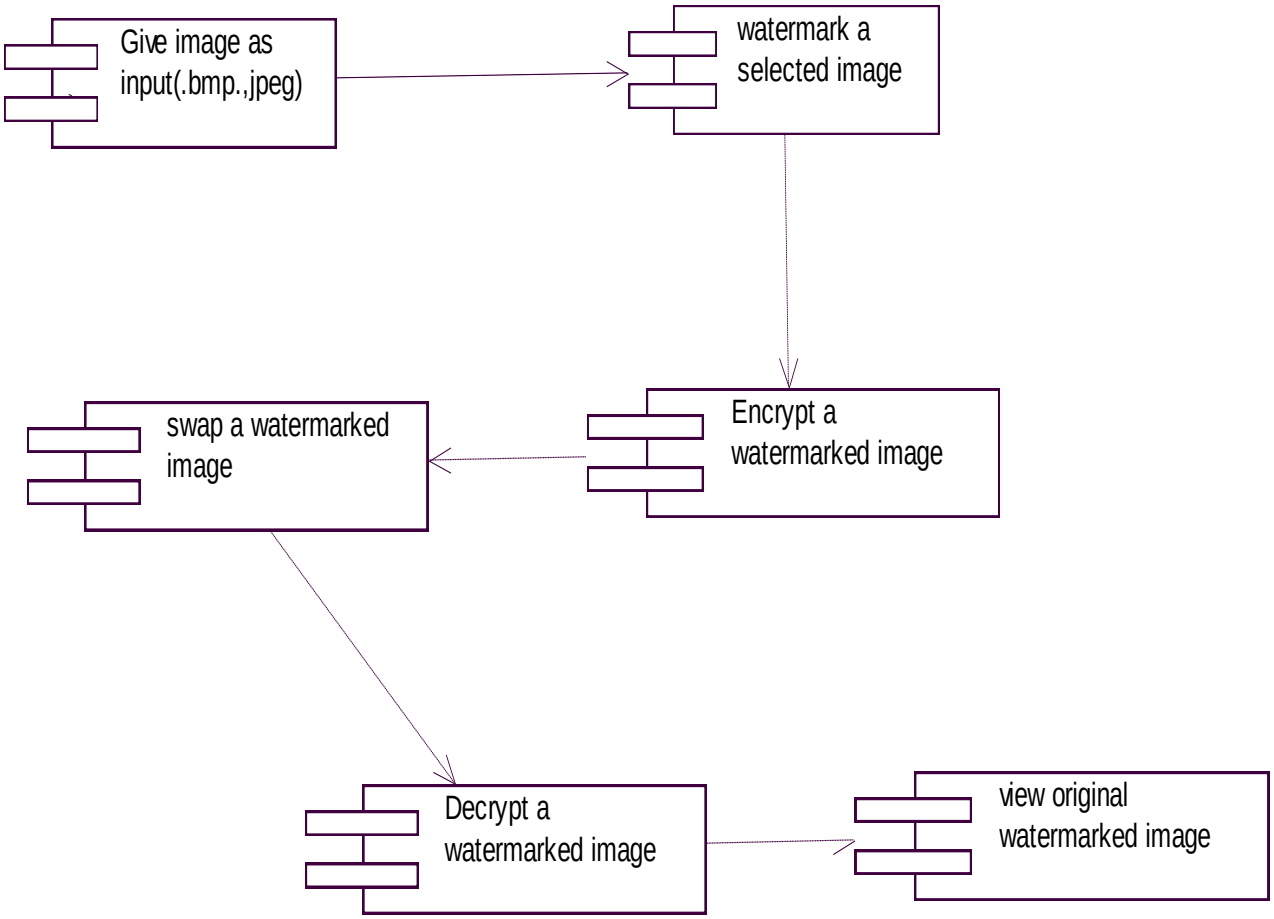
The activities that occur within a use case or within an objects behavior typically occur in a sequence .an activity diagram is designed to be simplified look at what happens during an operations or a process.

Each activity is represented by a rounded rectangle the processing within an activity goes to compilation and than an automatic transmission to the next activity occurs. An arrow represents the transition from one activity to the next. The activity diagram has a starting point represented by a filled in circle, and an endpoint represented by a bull's eye. An activity diagram describes a system in terms of activities. Activities are the state that represents the execution of a set of operations. These are similar to flow chart diagram and dataflow.



COMPONENT DIAGRAM

A component diagram shows the organization and dependencies among a set of component diagrams address the static implementation view of a system. They are related to class diagrams in that a component typically maps to one or more classes, interfaces or collaborations.



III. CONCLUSION

In this paper, we proposed a new video data hiding framework that makes use of erasure correction capability of RA codes and superiority of FZDH. The method is also robust to frame manipulation attacks via frame synchronization markers. First, we compared FZDH and QIM as the data hiding method of the proposed framework. We observed that FZDH is superior to QIM, especially for low embedding distortion levels.
The framework was tested with MPEG-2, H.264 compression, scaling and frame-rate conversion attacks. Typical system parameters are reported for error-free decoding. The results indicate that the framework can be successfully utilized in video data hiding applications. For instance, Tardos fingerprinting, which is a randomized construction of binary fingerprint codes that are optimal against collusion attack, can be employed within the proposed framework with the following settings. The length of the Tardos fingerprint is $AC2\ 0In\ 1\ \varepsilon 1$, where A is a function of false positive probability ($\varepsilon 1$), false negative probability, and maximum size of colluder coalition, (Co).

The minimum segment durations required for Tardos fingerprinting in different operating conditions are given in Table VI. We also compared the proposed framework against the canonical watermarking method, JAWS, and a more recent quantization based method. The results indicate a significant superiority over JAWS and a comparable performance with. The experiments also shed light on possible improvements on the proposed method. First, the framework involves a number of thresholds ($T0$, $T1$, and $T2$), which are determined manually. The range of these thresholds can be analyzed by using a training set. Then some heuristics can be deduced for proper selection of these threshold values. Additionally, incorporation of human visual system based spatio-temporally adaptation of data hiding method parameters as in remains as a future direction.

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Good Teachers are worth more than thousand books, we have them in Our Department

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