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Agility in Project Management Phases by Scrum Method

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Abstract: Agile methodology is a set of methods that cause the produced software to adjust with customers' needs completely. For combination of agile methodology and project management we sugestion one methodology, This methodology is designed to meet the needs of all segments of the organization as they engage in technical project work. It serves as a guide to the organization as it selects its projects, to project teams as they plan the work, to management as they supply the required oversight, and to Sponsors and Clients as they collaborate in the design and delivery of new business systems. In fact, the customer is fully associated with the project team. Current perceptions and emerging trends of various Software project management practices are reviewed and risks specific to software development projects are identified. Implementing effective project management process will succeed by changing the organizational culture. One method of agile is scrum in which the development team meet the customer at different intervals and deliver them an output of the software and see feedback. Traditional modeling methods are based on documentations and stationary reports which are not responsible for increasing changes of users' needs in environments that are changing rapidly. Pre-development heavy designing and primary comprehensive and majorplanning in traditional methods made experts to think about new methods to develop software
Keywords: Agile, methodology, project management, scrum

1. INTRODUCTION

Software development and agile project management has been rapidly gaining popularity in the software industry over the past two decades (Dingsøyr, Nerur, Balijepally & Ministry of Education; Begel & Nagappanand,2007).

Agile software development is a conceptual framework for undertaking software engineering projects. There are a number of agile software development methodologies e.g. Crystal Methods, Dynamic Systems Development Model (DSDM), and Scrum Most agile methods attempt to minimize risk by developing software in short timeboxes, called iterations, which typically last one to four weeks. Each iteration is like a miniature software project of its own, and includes all the tasks necessary to release the mini-increment of new functionality: planning, requirements analysis, design, coding, testing, and documentation. While an iteration may not add enough functionality to warrant releasing the product, an agile software project intends to be capable of releasing new software at the end of every iteration. At the end of each iteration, the team reevaluates project priorities.

Considering ever growing of internet users all around the world, software demands are expanding as well. Due to technologies changes and innovations in operating systems, the demands of users for creating and updating the software are changing in an uncontrolled manner[10].

Agile methods emphasize realtime communication, preferably face-to-face, over written documents. Most agile teams are located in a bullpen and include all the people necessary to finish the software. At a minimum, this includes programmers and the people who define the product such as product managers, business analysts, or actual customers. The bullpen may also include testers, interface designers, technical writers, and management.

2. PROJECT AND PROJECT MANAGEMENT

A *project* is defined as "a temporary endeavor undertaken to create a unique product or
service" (PMI, 2000). A project is undertaken when work is best accomplished through
methods that fundamentally differ from those of everyday operations. A list of the key
characteristics of a project can further clarify that definition:

- Temporary endeavor with a beginning and an end
- Often broken into subprojects (or phases)
- Creates a unique product or service
- Done for a purpose
- Has interrelated activities (tasks)
- Is an instrument of change

A project usually has certain aspects or key components which include project-related
management, a common vocabulary, project-related methods and tools, teamwork, a plan,
trade-offs (involving scope/deliverables, time, cost, and quality), identified requirements
(needs) and unidentified requirements (wants or expectations), and stakeholders.
The *stakeholders* involved with a project may be many and possibly diverse in several
respects including interests, needs, expectations, and priorities. Satisfying the stakeholders
is one of the key objectives of the project and the project manager. Key
stakeholders include the organization and people doing the work, who are called the
"performing organization," and the people or organization benefiting from the work (and
also usually paying for the work), who are called the "benefiting organization." These

two organizations may or may not belong to the same corporation. In below we define project management phases for agility [9].

2.1. PHASE1-PROJECT INITIATION

Projects may come about for a variety of reasons and they may present themselves at any time. The selection process is carried out during Initiation. The Initiation Process is that time in the lifecycle of a project when the project idea is defined, evaluated, and authorized. The executive committee at UNCG is our Project Review Committee (PRC) that meets on a weekly basis. Each division at the University creates a ranked list of projects. During the PRC meetings, the highest ranked projects in each division are selected for "sizing & scoping" effort to determine which resources are needed and if the project is feasible given available resources. This process gives management and other stakeholders an opportunity to validate the project's potential benefits realization [8].

2.2. PHASE2 – PROJECT PLANNING

Project Planning follows the Project Initiation phase and is considered to be the most important stage in project management. Project Planning is not a single activity or task. It is a process that takes time and attention. Project Planning defines the project activities and describes how the activities will be accomplished. Time spent up-front identifying the proper needs and structure for organizing and managing projects saves countless hours of confusion and rework in the Managing (Execution and Controlling) phase of the project.

2.3. PHASE3–PROJECT MANAGING

Once a project moves into the Execution & Controlling phase, the project manager's main focus during this phase shifts to monitoring the work being done. Managing the project plan ensures that planned project activities are carried out in an effective and efficient manner. A missed activity finish date may require adjustments to the entire project schedule, resource staffing, and other impacts [5].

2.3.1. Manage Scope

Scope control is a straightforward concept. The intent of implementing a scope control process is to identify and manage all elements (e.g., people and requirements) inside and outside of the project that increase or decrease the project scope beyond the required or defined need of the original, agreed-upon project Scope Statement.

Scope changes will come from the perceived need for a change in a project deliverable that may affect its functionality and in most cases the amount of work needed to perform the project. A scope change is a very crucial occurrence.

A scope change could require a change in resources time, and/or project funding. All scope change requests should be submitted in writing using the change control process and form. The Project Manager will review the change with the project sponsor and other major stakeholders to determine that the change is necessary and the additional resources are available. Any changes that are agreed upon must be approved by the project sponsor, technical lead, and/or clients as a matter of formal scope control. This can be an email or a change of scope document. A change of scope may cause changes to be made to other project documents such as the schedule/task list and budget. All changes must be communicated to the project team and stakeholders.

2.3.2. Manage Schedule

Schedule control is one of the most important activities within project control. It is important for the Project Team to know where the project stands with respect to project schedule (i.e., Is the project ahead of, or behind, schedule, or what tasks do I need to complete by what date?). It becomes key for Project managers to obtain statuses from the team members on a regular basis.

As part of the status collection, the Project Manager should:

Validate that task *start* and *end* dates are still accurately reflected.
Validate that task dependencies (or relationships) are still valid.
Validate work effort (or task duration) is still valid in the schedule. If this changes, obtain accurate start and finish dates of completed tasks or estimates to complete work for ongoing tasks.

Schedule control is something that typically is managed at the project level by the Project Manager. However, it is very important to make the client aware that a schedule change has occurred. Furthermore, the client needs to be made aware of what is being done to fix the issue and the impact it will have on the project's performance and deliverables. It is a good practice for Project Managers to hold regular project schedule reviews [7].

It is standard practice to baseline the schedule at the start of the project. This allows all schedule changes to be displayed against the original project schedule. If schedule slippage becomes severe it may be advisable to re-baseline the project. As this involved change to one of the project baselines, it should only be done through a formal Change Control Process.

2.3.3. Manage Issues

The Issue Management process should give everyone involved with, or affected by, the project a way to report issues or problems. The Issues Log format provides fields for documenting the problem, assessing the impact of the problem, making recommendations and determining the cost (people and assets) and time required for resolving the problem.

Any of the Project Team members, customers, or Stakeholders can submit an issue. This will be recorded on an Issue log or meeting minutes. All issues should be reviewed on a regular basis (e.g., in the project status meetings, since this group will typically meet on a weekly or biweekly basis).

Typically, when the issue or problem has been resolved and verified, recording the actual date the problem was resolved and the approval authority closes the issue. Some issues may need executive management approval. The appropriate processes will be followed to update contracts and baseline documents.

2.3.4. Manage Communications

The project Communications Plan is an important factor in the Managing phase. A large part of a Project Manager's responsibility during this stage of the project is keeping the Stakeholders informed of project status. There are many facets to project communications. Some examples follow:

Generate status reports to the team and perhaps to executives on a regular basis.
Meeting minutes should be made available to Stakeholders along with any "to-do" lists that may have been generated during the meetings.
The project schedule and other project documentation should be available to the Stakeholders.
Hold regular status meetings.
In addition to these formal communications, a Project Manager should also stay in communication with the team on an informal basis. Informal discussion is sometimes the best way to determine team morale, true project status, looming difficulties, etc.

2.3.5. Manage Cost

Projects may fail to control costs, or go over budget, for many reasons. Often it is not a single problem but a series of small problems that, combined, permit cost control to be sacrificed and prevent the project from being completed successfully. Project Managers should monitor the costs as outlined in the Procurement Plan. If costs increase, the PM should search out the "why" and take appropriate action and inform the stakeholders of the authorized changes. Cost control is not simply a reporting process.[4]

UNCG and each of its departments will have a defined set of guidelines and policies that provide the infrastructure for project purchasing that should be integrated within the Procurement Plan. These guidelines will outline the policy for solicitation, source selection and contract administration. Although the solicitation and contracting responsibilities may not always be managed by the Project Manager, it is still important that the Project Manager have a fundamental understanding of the department's contracting and procurement policies.

The Project Manager may be responsible for ensuring that the vendors, once contracted to do the work, meet the contractual agreements specified within their contracts. Project Managers will also be responsible for tracking, reviewing and analyzing the performance of contractors on a project. This performance reporting will be the basis for any contractual changes that need to be made during the life of the contract. Finally, Project Managers may play an important role in oversight and review of any contract changes that will affect the project [3].

2.3.6. Manage Risk

Risk identification, monitoring and resolution are important tools for successfully completing a project. Larger projects may need a Risk Log, documenting known risks and any mitigation for those risks. One type of risk on IT projects is the development and implementation of technology equipment and software that might become obsolete very quickly. Technology is evolving rapidly with increases in speed and capabilities. Accordingly, risk is increased when implementing high dollar or homegrown technology systems. To alleviate this issue, the Project Manager must make sure that the efforts of the Project Team are aligned with the technology and business strategy of the department. Researching future needs, capabilities, and integration requirements of the products will be helpful [5].

2.3.7. Manage Quality

Quality assurance incorporates a process of evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards. Quality control should be performed throughout the project. Project results include both product results, such as deliverables, and management results, such as cost and schedule performance. Quality control is often performed by user acceptance testing. During User Acceptance Testing, Clients should identify how the results will be verified. Depending on the nature of the project, it is recommended that the Client develop a Testing Plan that includes Test Scripts, Testing Schedule, and Testing Signoff [6].

2.3.8. Managing the SDLC (Systems Development Life Cycle)

The Systems Development Life Cycle is the framework in which the actual development of the software or procedures occurs. The tasks on the project schedule should reflect the development, testing, and implementation during the Execution phase of the project. See the Appendix for more details.

3. THE ROLE OF A PROJECT MANAGER IN AN AGILE PROJECT

Agile projects not only follow a slightly different process than a tradition waterfall project, but some of the roles within the project team are slightly different as well. In some of the Agile methodologies, there is no specified "Project Manager" role. Instead, terms such as Scrum Master are used, as is the case in the Scrum Methodology. Team Lead is another term often used in Agile project team structures.

In agile projects, schedules (more specifically the content or deliverables of an increment or "sprint"), are more fluid. With the initiation of each new "sprint", the goal and expected output of the sprint is determined by analyzing a combination of the project's requirements, also referred to as a backlog, feedback from the customer regarding the current state of development, and any reprioritization of project objectives, needs, requirements, etc.[4]

While it's important to understand the objectives of the overall project, and to have a high-level idea in mind regarding the output of each sprint, project teams must be flexible and able to adjust to changing requirements, and/or re-prioritization of requirements.

In order to facilitate this approach, a person managing these processes must be flexible and ready to make adjustments quickly, rather than concentrate on adherence to a pre-defined plan.

4. SCRUM METHODOLOGY

Scrum is an agile method for project management developed by Ken Schwaber[4]. It's goal is to dramatically improve productivity in teams previously paralysed by heavier, process-laden methodologies. Its intended use is for management of software development projects as well as a wrapper to other software development methodologies such as Extreme Programming.

Scrum is characterised by: A living backlog ofprioritised work to be done. Completion of a largely fixed set of backlog items in a series of short iterations or sprints. A brief daily meeting (called a scrum), at which progress is explained, upcoming work is described, and obstacles are raised. A brief planning session in which the backlog items for the sprint will be defined. A brief heartbeat retrospective, at which all team members reflect about the past sprint. Scrum is facilitated by a scrum master, whose primary job is to remove impediments to the ability of the team to deliver the sprint goal. The scrum master is not the leader of the team (as they are self-organising) but acts as a productivity buffer between the team and any destabilising influences.

Scrum enables the creation of self-organizing teams by encouraging verbal communication across all team members and across all disciplines that are involved in the project. A key principle of scrum is its recognition that fundamentally empirical challenges cannot be addressed successfully in a traditional "process control" manner. As such, scrum adopts an empirical approach - accepting that the problem cannot be fully understood or defined, focusing instead on maximising the team's ability to respond in an agile manner to emerging challenges.

5. ORGANIZATION STANDARD METHOD OF PROJECTS AND MULTI-PROJECTS:

Nowadays, waterfall model is considered a standard method for development process software.
In 1970, Winston W. Royce introduces method of dividing software development process into two stages for small projects, analysis and programming and into seven consecutive stages for big projects (Royce, 1970).This is a straight forward model, right now it is again transferred as waterfall model. Even if Royce's implicit repeat that was developing products with required complex plans, waterfall model is usually used to develop software has been formed for the year.
In 1990s, some style methods such as scrum have been planned as alternative for traditional driven approaches.A high modern framework for software engineering is called scrum 6, 7, 8 against waterfall model that is in a so gradual and iterative approach during the software development. The general goal of the project is divided into sub-goals that have been added to total product.Role is scrum in classic hierarchy in the company. Shareholders are in head of the hierarchy. Product owner and product commission
He is responsible for product and connector between beneficiaries and product. On the next level sub-owner of product scrum master, a type of project manager and connecting link between product owner and real development team that has been determined scrum team. Depending on the project size to implement, several scrum masters and several development team can work on a project.Real development occurs during so called two speeds. These two speeds have been defined in a time framework in which requirements have been implemented by developers. After two speeds ended, the current situation has been evaluated and refinement in total product is possible. Two speeds again have been divided to daily scrum that during it briefly was discussed in the past day in where problems have occurred and solutions had been found was conducted. In addition, a plan for what should have been conducted in the day. This form of organization leading to parallel and transparency in working is possible due to frequent good rhythm meetings of evaluation.
Advantages of using the method are clear focus on solving certain tasks and as a result implementing the general solution and without high organizational cost. However, due to relatively unavailable communication and consulting between developers, high losing of economic welfare exists. Major problems of this organization evaluation development model and lost coordinating among sub-team. In the second mode, significantly intensifying development of sub-project is with powerful dependence. In addition, there is an evaluation of results that usually has been conducted by self-developers.
Agility is higher than flexibility and adaptability. Agility is modifiability and adaptability in a turbulent environment which is with intelligence, creativity and innovation. Some qualitative attributes have been briefly explained in table 1.

Table 1. Explaining some qualitative attributes [12].

Agility	Agility: modifiabilityand adaptability in a turbulent environment + intelligence, creativity and innovation
Modifiability or Changeable	Modifiability that includes portability and reusability and some other features. It is a modifiable or changeable if the least possible number of its separate elements are involved in process of changes. A changeable system has a wide concept and using that about a system has some ambiguities.
Adaptability	Adaptability is a qualitative features of software that some systems need it due to special conditions that environment force to them. Adaptability is a special type of flexibility and it is raised when a system with a high frequency requires changes. An adaptable system needs a adaptable architecture. Adaptability about behavioral aspects is harder than adaptability about structural aspects. Behavioral aspects are too complex and those actions which will be needed in future are not predictable.
Flexibility	Flexibility is responsiveness to specified changes. Root of many problems in a turbulent organization is

	that nothing remains fixed there. The only fixed case is the own change.

So comparing agile with available methodologies is not a useful work because they are neither aligned nor family. Even rup can be used within agile but not their rup but our custom-made rup (organization). So instead of comparing we should think about how can we become agile [9][10].

6. CONCLUSION

Although agility project management is a daunting task, organizations that implement effective processes proved to be successful, while those that fail in this effort will be unsuccessful. The nature of software projects creates many risks that must be managed diligently to avoid the common drawback of many projects. The perceptions and attitudes towards risk management activities compound difficult challenges for implementing a risk management strategy.Formal risk management process is recommended to manage complex issues associated with software development projects.

Many risk management processes have been created to aid organizations, but integrating the processes into organizations was not successful. The theoretical aspects of the process must be reconciled with the practical challenges of the organization to implement risk management successfully. Effective risk management process will succeed by changing the organizational culture to motivate the individual. Cultural changes require time and repetition before they are firmly embedded into the organization.

Agile teams have confirmed for faster increase in 37% profit and producing income 30 percent more than non-agile companies, higher speed, flexibility and productivity have been obtained. However, always there is a place for variety. Depending on our goals and business needs, we may still benefit waterfall model or a combination of both of them. Goal of this article is finding a suitable method for project teams. Rugby is a simple game and has simple rules for learning and it is accurate and regular.Traditional modeling methods are based on documentations and stationary reports which are not responsible for increasing changes of users' needs in environments that are changing rapidly.Pre-development heavy designing and primary comprehensive and major planning in traditional methods made experts to think about new methods to develop software. A solution to solve these problems is using agile modelings that are specified by two indexes of adaptability and flexibility. Unlike traditional methods that believe in existence of solution for each problem. In agile method, idea is that tailored to needs and tastes of each person a different solution can be provided to solve the problem. In this article, some challenges of traditional methods are evaluated and existing problems are explained. In following, some methods for agile development and then advantages of using these methods are explained.

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A New Approach of Color Image Encryption Based on RC4 algorithm and Chaotic Map

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Abstract: Image Encryption is important for protecting image information, In this paper A chaos based on RC4 algorithm has been proposed to encrypt color Images, It is chaotic Henon function have created three keys , depending on the initial conditions to generate numbers dynamic function of the chaotic conditions in addition to the user's desire three dimensions of which mechanically operated from within the initial condition , and then working process distortion of the bits of the three keys Using the RC4 algorithm and results new in the process of XOR them to generate a unique key of binary bits one and zero and then turn it into a digital fracture and after the intervention to Phase image to encrypted so they generate the keys again, and the size of the desired image In order to encrypt it.
the performance of the algorithm has been analyzed and results show that the algorithm has a very long key space, and high sensitivity for small changes in key which makes the algorithm Immune to Brute force attacks, and it can resist the differential and statistical attacks, in addition to having very high encryption and decryption speed, the receiver can detect any changes to the encrypted image during transmission. the algorithm has been implemented and analysis done by using Matlab R2008a software.

Keywords: Chaos theory, Image Encryption, henon map, symmetrical encryption.

1. INTRODUCTION

Multimedia communications; such as, images, audio and video has become significantly more important, since communications of digital products over the network (wired/wireless) has expanded [1]. There is therefore, Any information shared over Internet needs high level of protection from intruders [2].

The cryptography was used only for the military purposes and diplomatic circles, Cryptography itself divides into two broad categories which are: Asymmetric key algorithms and Symmetric key algorithms [3,4].this paper is used as symmetric key cryptography [5] in which a single secret key is used for both, encryption at sender's end and decryption at receiver's end.

Chaotic maps are very complicated nonlinear dynamic systems, which are applied for encryption [6], because they are very sensitive to initial conditions and can generate good pseudorandom sequences.

Chaotic systems have many important properties, such as the sensitive dependence on initial conditions and system parameters.
pseudorandom property, non-periodicity and topological transitivity,[7],Recently, a number of chaos-based encryption schemes have been proposed. Some of them are based on three-dimensional chaotic Henon maps For image encryption. This paper is organized as follows. Section 2, presents an overview on Henon chaotic map system. In section 3 we will discuss the proposed algorithm (RC4 with Chaotic map). Section 4 will present experimental results and analysis. In section 5 we conclude the paper.

2. AN OVERVIEW ON HENON CHAOTIC MAP SYSTEM

In this section, an overview on Henon chaotic map system as important one of the 3-D chaotic map systems, which is used in this work. Henon chaotic map system is described by formula 1 which illustrates a set of the three function of Henon chaotic map system. [8,1]

$$x(i+1)=a-(y(i)^2)-b*(z(i)) \quad |$$
$$y(i+1)=x(i) \quad |\ldots\ldots\ldots\ldots(1)$$
$$z(i+1)=y(i) \quad |$$

when initial values $1.54<|a|<2$, $0<|b|<1$. and $-0.9<=(x \text{ or } y \text{ or } z)<=1$

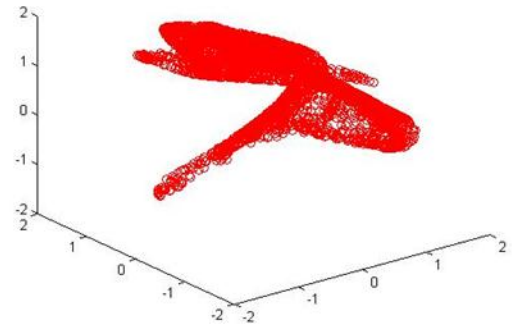
x(1)=1; y(1)=0;z(1)=0; %% Initial conditions The initial value are x=1, y=0.1, z=0,

N=5000; %% let N is the number of iterates example

a=1.6;b=0.2; %% Sets the parameters example

it has a chaotic attractor as shown in Fig.1. It has been experienced that Henon chaotic system is relatively difficult due to the prominent three-dimensional and complex dynamic property[9].

.



Fig(1) three dimension henon map

3. A PROPOSED CHAOTIC MAP AND RC4 ALGORITHM

This paper is dedicated for the designing and implementation of the proposed digital image encryption system. generally, the proposed system encrypts a colored squared digital image using the advantage of chaotic properties to make the encryption more secure and robust against the most known attacks represents the block general diagram for the proposed system in figure(3.2).

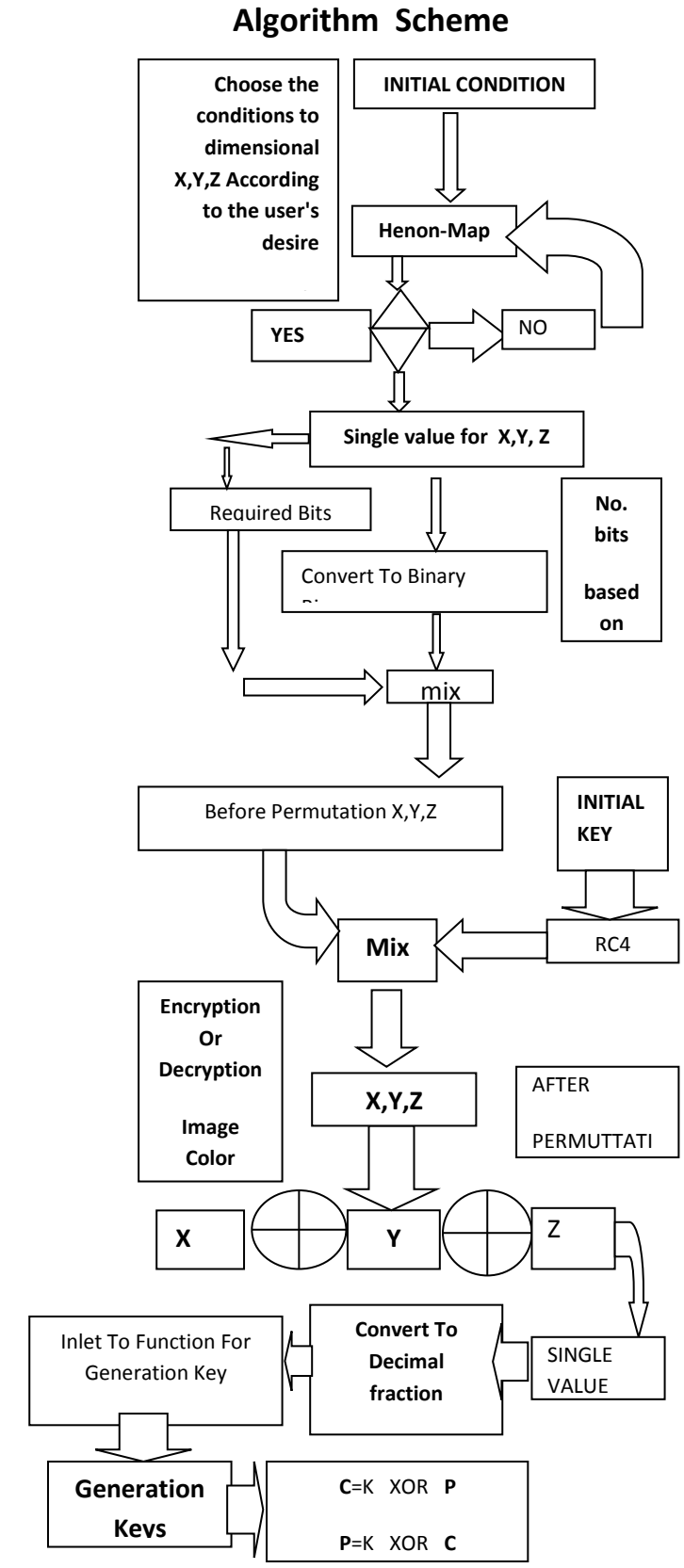


Fig.(3.2) block diagram of the proposed Chaotic and RC4

The steps for the chaotic and RC4 can be outlined as follows:

Step 1: here used chaotic Henon map three dimension then Select proper initial values and system parameters to create chaotic variable sets .

x > -0.9) or x < 1.0))
(y> -0.9) or (y < 1.0)
z > -0.9) or (z < 1.0))
else
'Input out of range!' print ,'Error'

Or Desire User's Within This Conditions

Step 2: Prepare the chaotic sequences for range iteration number.

N=number of iteration
a = 1.4 initial value parameter
b = 0.3 initial value parameter

step 3: Extracting a single value from step 2

single value for x and single value for y and z

Through the use of condition in step 1 for desire of user condition

step 4: convert results of step 3 to binary

by using function convert decimal fraction to binary

step5: Determine the number of bits specified by the RC4

To create the integer numbers values BY number of bits required BEFORE the PERMUTATION process for X ,Y and Z

step6: Process RC4 Private with permutation is:

part of RC4 algorithm used

```
function [s]=RC41(m) [10]
s=[1:m+1];
T=[1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7];
j=0;
for i=1:m-1 have access.
a=j+s(i+1)+T(i+1);
   j=mod(a,m+1);
   x=s(i+1);
  ; (s(i+1)=s(j+1
 ;  s(j+1)=x
end
end
```

where Initial Permutation = S and T= Initial state

step7: link step4 with step 6 for X,Y and Z

for example 4 bit to step6 is spaced.

Z=t(yy)	Y=v(yy)	X= k(yy))
2	1	2
1	4	3
4	2	1
3	3	4

where yy=1 to 4 but step 4 binary for X,Y and Z

Z	Y	X
0	0	0
1	1	0
0	1	1
1	0	1

then have been obtain

Z	Y	X
1	0	1
0	1	0
1	0	0
0	1	1

step 8:operation XOR between X,Y and Z We obtain with binary bits is XYZ(i) where i number of bits

step 9: convert result for step 8 to decimal fraction By

```
format long
bb=0;
  for i=1:m
     bb=bb+XYZ(i)*2^(-i);
  end
  bb
```

step 10:send result from step9 to function generation key

where bb=result from step 9

nn=p*q ….p=image width q=image height

```
key = keyGen(bb,nn);
function [key] = keyGen(bb,nn)
n = nn*8;
bi = zeros(n,1,'uint8');
NN= 0;
for m = 1 : n
  NN = 1 - 2* bb* bb;    %based on 1-2*bb^2
   if (NN > 0.0)
     bi(m) = 1;
  end
   bb =  NN;
end
%Intended to produce a binary bits the size of the
%image *8……..>>>bi
key = zeros(n/8,1,'uint8'); %Reset keys
for k = 1 : n/8
   for j = 1 : 8 % here reason to use 8
   key(k) = key(k) + bi(j*k)* 2 ^ (j-1); %based on levels color 2^8
 end
end
```

here generated keys by size nn=p*q ….p=image width q=image height

step 11: stage encryption

When we got the keys to the image size from step 10 for p*q then we will encryption image and so based on Operation XOR for keys from step 10 with each component of the three color components red ,green and blue Based on these relations Confusion

step 12:stage decryption

take the image encryption based on the same key for plain image with XOR operation to obtain plain image.

4. EXPERIMENTAL RESULTS AND ANALYSIS

In this paper , a practical programs of a proposed algorithm and a practical programs of all experimental and security analysis tests are designed by using MATLAB language release R2008a for 64bit Windows 7 Home Premium operating system. The computer used to perform these tests is a Dell Laptop with Intel (R) Core™ i3-3217u CPU@ 1.8GHz and 6 GB installed memory.

4.1 Statistical Analysis

4.1.1 Histogram Analysis

Histogram analysis of three channels (red, green, and blue) of the plain and encrypted images is given. Figure (4.1.1)

shows the histograms of the 512*512 plain and encrypted. It is observed that the histograms of the encrypted image are significantly different from that of the plain image(lena.png).

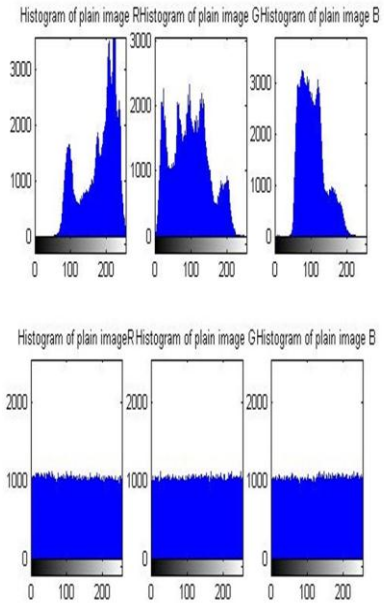


Figure (4.1.1) shows the histograms of the 512 × 512 plain and encrypted.

4.1.2 Correlation coefficient Analysis

In this section the horizontal, vertical and diagonal correlation coefficient of the pixels studied. To do this we choose 2048 pairs of horizontal, vertical and diagonal adjacent pixels randomly. Figure (4.1.2) show the distribution of two horizontally, vertically and diagonally adjacent pixels in plain image and encrypted image[11]

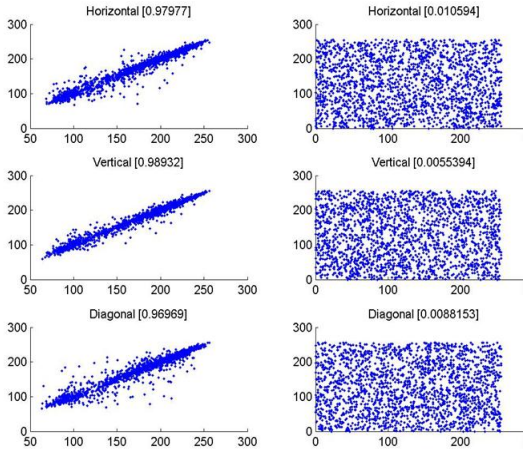


Figure (4.1.2) Correlations of two diagonal, horizontally and vertical adjacent pixels in the plain image and in the cipher-image

The correlation coefficient of two adjacent pixels calculated using in[12,11] formula 2

$$E(x)=\frac{1}{N}\sum_{i=1}^{N} xi$$

$$D(x)=\frac{1}{N}\sum_{i=1}^{N}(xi - E(xi))$$

$$cov(x,y)=\frac{1}{N}\sum_{i=1}^{N}\big(xi - E(xi)\big)\big(yi - E(yi)\big) \quad .....(2)$$

$$Rxy=\frac{cov(x,y)}{\sqrt{D(x)}\sqrt{D(y)}}$$

where x and y are the value of two adjacent pixels in the image and N is the total number of pixels selected from the image for the calculation[21] ,following results for found for various standard images in table(1).

Table (1) Correlation coefficient of two adjacent pixels in plain image and encrypted image for 'lena.png' 256*256*3 size image

state	Plane image	Encrypted image
Horizontal	0.9798	0.0106
Vertical	0.9893	0.0055
Diagonal	0.9697	0.0088

In Table (1) have been obtain the correlation coefficient for the plain and encrypted images shown in figure 4.1.2(a,b,c) , It is clear from the Table (1) that there is negligible correlation between the two adjacent pixels in the encrypted image . However, the two adjacent pixels in the plain image are highly correlated.[11]

4.1.3 The Information Entropy Analysis

Entropy is a measure of uncertainty association with random variable. As for an image, the encryption decreases the mutual information among pixel values and thus increases the entropy value. A secure system should satisfy a condition on the information entropy that is the cipher image should not provide any information about the original image.[13]. It is defined as follows in formula 3:

$$H(X) = -\sum_{i=0}^{255} p(X_i) \log 2\, p(X_i) \quad \text{.....(3)} \quad ,$$

where X is a discrete random variable, p(x) is the probability density function of the occurrence of the symbol x .Its value for gray scale encrypted image should be very close to ideal value 8. Information entropy analysis is applied on the standard test images and their encrypted images. The results are listed in the Table (2). The values listed in the Table (2) are the average value for the three color bands for the plain images and the encrypted images.

According to the results shown in Table (2) , the proposed system achieved a high permutation and substitution, and it is strong enough against the Entropy Attack because the information entropy value for the encrypted images are very close to the idealism value mentioned above.[14]
Table(2)The Information Entropy for the Plain and Encrypted Image

Plain image	Entropy for plain image	Entropy for Encryption image
	6.6638	7.9920
	7.7502	7.9918

4.2 Security Differential Attack Analysis

One minor change in the plain image causes large changes in the cipher image then differential analysis may become useless thus, much difference between encrypted forms is expected in order to keep high security[15] It is a common measure used to check the effect of one pixel change on the entire image. this will indicate the percentage of different pixels between two images[16]Often the attacker slight change such as changing the value of a pixel one point in the image the encrypted using the algorithm and concludes the relationship between the two pictures encryption image before and after the change, this is called chosen plaintext attack (differential attack) attack to find a certain relationship between the encrypted image and the original image to infer the secret key according to this differential attacks do not be successful relationship, If a major change is the work the following differential analysis to measure the efficiency of the algorithm against differential attacks[17,18] so that used : NPCR and UACI

NPCR measures the percentage of different pixels numbers between two cipher-images whose plain images only have one-pixel difference. UACI measures the average intensity of differences between two cipher images. to resist difference attacks, the values of NPCR and UACI should be large enough Value has changed one bit of image Baboon The calculated ratios before and after change And bring the same accounts after changing the value of a pixel one point or 8 bits, and the results obtained were within the specified percentages Ideal for encryption in[19].Table(3)show the results obtained.

Table(3)values of NPCR and UACI at change pixel I(250,250,2) FROM 147 TO 2

compound color	NPCR	UACI
R	99.5841979980469	33.2961452708525
G	98.6638011	32.9332814
B	99.6021270751953	33.2787173402076
TOTAL	99.6093750000000	33.4635416666667

4.2.1 Key space analysis

The used key must not be long or short . short key can be easily obtained when applying brute -force attack or analysis . security encryption system that is dependent on the key according to the laws Kirchhoff As long key reduces the speed of system performance This is undesirable because the encryption of important specifications for the design speed of the encryption system. Must not be less than the key space 2^100, to provide a high level of safety. In the proposed algorithm has been used chaotic Henon function maps were generated keys, and each requires a series initial value and control value for chaotic map. where they are used as keys for encryption, if the primary control variables and values accurately in 10^14, the total area of the key

10^14*10^14*10^14*10^14*10^14=10^70=2^232 that length 232 bit very good for resistant brute attack.

In addition to the keys to the sensitivity of algorithm RC4 FOR X,Y,Z

for example in X DIMENSION

T=[1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7 1 2 3 7];

in RC4 ,and also

Y DIMENSION

T=[5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6 5 2 3 6];

and also

Z DIMENSION

T=[1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6 1 2 5 6];

Any change in the value of values the keys will be sensitive to those changes decryption when change any value key in case of attack. then the total area of the keys

10^14*10^14*10^14*10^14*10^14*10^14*10^14*10^14=10^112=2^372

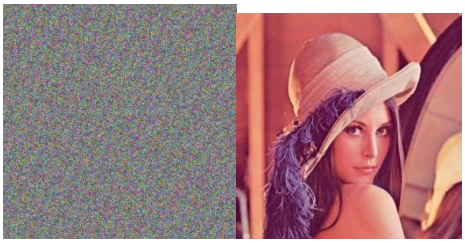
These keys are the very least it is possible to the increment depend on user's desire. As well as sensitivity to the number of iterations and the number of bits required for all anti-brute force attacks.

4.2.2 Key sensitivity analysis

In addition to being long enough to give the key safety system, the ideal encryption system must be very sensitive to any A slight change in the secret key , and any slight change in the used key must lead to the generation of an entirely different encrypted image before the change in the key image encrypted, and this ensures that the system resistant to brute force attack, done several experiments to test Over the system's sensitivity to a change in the key as follows[20]:

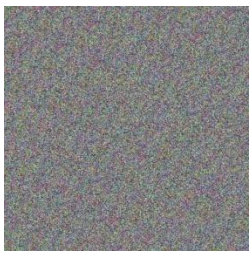
1. initial value use as X as a key to generate a first series of numbers chaotic , It was obtained on image encryption fig(4.2.2.b)from plain image (4.2.2. a)

2. use the same key with a few difference by X+$10^{(-13)}$ as an experiment to decode the encrypted to image encryption, but we got another encrypted image to fig(4.2.2. c). This shows how the algorithm immunity against brute force attacks as the slight change in the key 1* 10^{-14} To extract the original image failure.



plain image **encryption image by use key X**

FIG(4.2.2.a) **FIG(4.2.2. b)**



Fig(4.2.2.c)image extract after using the wrong key By Differentiate a little by .00000000000001 for the correct key the same processes as possible having to RC4 for X or Y or Z DIMENSIONS.

4.3 Performance analysis

Encryption of the important requirements of the system performance of the system speed after a safety investigation, the table (4) Includes average time it takes Windows 7 environment within Matlab R2008a to encrypt and decrypt images standard listed in the table using a program 6GB RAM processor 1.8 Ghz and Intel core quickly on a personal calculator has the following specifications in table (4)

Image and size 512*512*3	Time of encrypted	Time of decode the encrypted
Lenna.png	13	4
Baboon.png 512*512*3	12	4
Airplane.png 512*512*3	11	4

table(4) The average time taken to implement encryption

5. Conclusions

It has been proposed algorithm to encrypt the image of color, Using chaotic theory with part of the algorithm RC4. Henon function used of three dimensions of the function chaotic, The encryption and decryption process images very successful so that and by work of procedure the statistical analyzes and differential, And measuring and analyzing the efficiency of encryption key length and its sensitivity to change and measure the speed of implementation of the algorithm. the results showed robustness against the attacks statistical, the sensitivity is sufficient to change the secret keys for resist generally brute force . as well as the results proved to possess the speed of implementation of the algorithm high of close to real time. While providing a mechanism if it's been encrypted during transfer to a change in the values of image points, or manipulated by knowing NPCR and UACI

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Color Detection and Mixing System

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Abstract: The detection of the color value and the automation of its production is very useful for many industrial applications. [3, 4]. We have developed a microcontroller-based system that detects colors and controls the mixing of the primary colors to get the matching colors. The system can be used as a tool to determine the compositions of chosen colors and produce a matching colors that meets the requirement of the required colors. The system can make the production of the colors much faster, more reliable and more consistent. This document describes the design, the implementation of the system. The system can be used as a tool in different industries such as digital printing, textile, cosmetics, wallpaper, gift-wrap, building materials, signage, etc [3, 4].

Keywords: Digital paint, Color making and mixing, digital printing, paint products.

1. INTRODUCTION

All colors that we can see can be composed from a set of primary colors [5,6,7]. Detection of the composition of chosen color and its automated generation has a wide range of applications [3,4]. A color models (known as color spaces) can represent a chosen color using a set of primary colors mapped to the color model in discrete values. Many color models are used to describe colors, each model is used for different purposes and different areas of applications. We are going to focus on two of the most normally used color models, the RGB model and the CMYK model [6, 7]. The two models are shown in shown in figure 1.

The RGB color model is composed from three different colors, red, green and blue, this model used for sensing, and display in electronic systems, such as televisions and computer monitor.

The CMYK color model is composed from four different colors, cyan, magenta, yellow, and key (black), this model most commonly used for professional color printing. To produce any degree of color on the colors scale, our system uses five primary colors (the four CMYK colors and the fifth color is a white color (W), the white color is used to adjust the brightness of the color.

2. RGB / CMYK Color Space Conversion:

RGB color has to be converted to CMYK color format before they are sent for mixing. In this work, the following formulas are used to convert the RGB color space to CMYK color space [1,2].

"R'=R/255

G'=G/255
B'= B/255
K= 1-max(R', G', B')
C= (1-R'-K) / (1-K)
M= (1-G'-K) / (1-K)
Y= (1-B'-K) / (1-K)

Cmax = max(R', G', B')
Cmin = min(R', G', B')
Δ = Cmax - Cmin
Lightness calculation:
L = (Cmax + Cmin) / 2 "

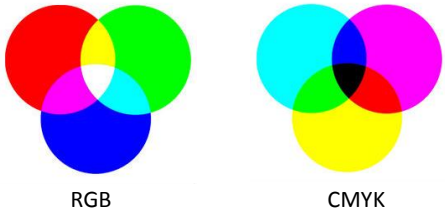


Figure. 1 The RGB and the CMYK Color models.

3. The System Description

The color Mixing System has been designed and implemented as a result of integrating various hardware and software technologies. Figure. 2 shows the overall block diagram of the system, the diagram illustrates how the system interact with each other. Figure 2 shows a general flow chart of the system software, the control program for the color mixing system is integrated in the controller, the program control the mixing of CMYK and white colors.

The system consists of a color sensor, a microcontroller circuit board, a GSM shield, a peristaltic pumps, a scale sensor, a primary color containers, and a mobile phone [8, 9, 10, 11]. Figure 3 shows a general flow chart of the system software, which control the system.

The system detects the RGB value of the chosen color and compose the required color by mixing the primary color in the right proportions to get the exact match of the color. The color sensor determines the RGB value of the chosen color, also the RGB value of the chosen color can be determined by mobile phone using the mobile phone camera. In addition, the mobile application allows the user to enter the RGB value of the chosen color manually. We have used android mobile smartphone to implement this application.

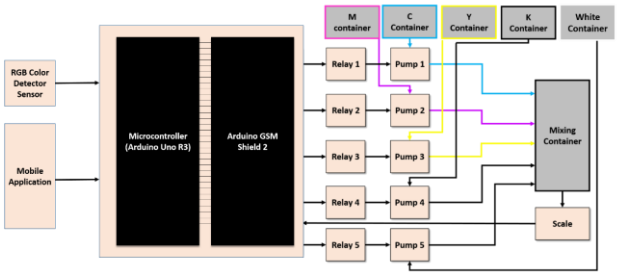


Figure. 2 The system functional block diagram.

The color sensor is connected to the microcontroller and its RGB reading is directly conveyed to the Microcontroller, the mobile application sends the RGB values to the microcontroller via GSM shield. The microcontroller convers the received RGB value to CMYK values. In addition, the microcontroller determines the amount of the CMYK and white colors which will be mixed together to get the exact color.

The system uses five tanks of primary colors to generate the chosen color, the primary colors are, cyan, magenta, yellow, black and white W colors. Each tank has independent peristaltic pump connected to its outlet pipe. Under the supervision of the microcontroller, the pumps gets the appropriate amount of color from the appropriate thank and dispense it into the mixing container.

A scale sensor is used to senses the quantity of paint inside the mixing container and gives a feedback to the microcontroller about the precise amount inside the mixing container; this is to get the exact quantity of the chosen paint. The delivery of the primary colors to the mixing container stops once it reached the right quantity.

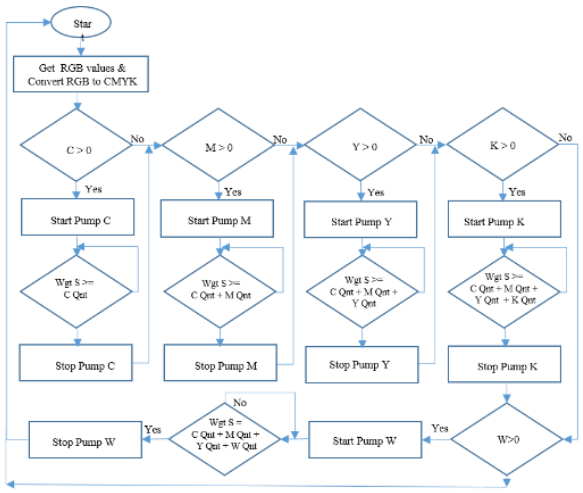


Figure.3 The system general flow chart.

The microcontroller software implements the equations that converts the RGB color model to the CMYK color model and controls the mixing of the required color. We have used C Programming to implement these equations. The general flow chart of the system software is shown in figure 3. Figure 4 shows the general flow chart of the mobile application.

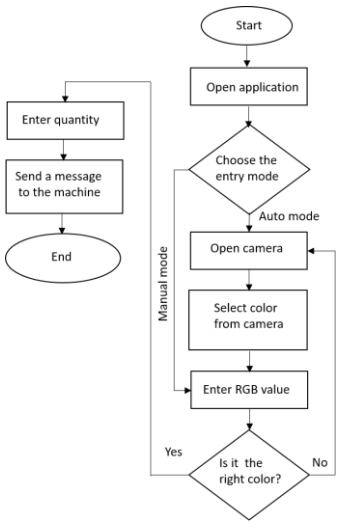


Figure.4 Application flow chart.

Figure 5 shows the layout of the Smartphone application. We have used android studio in the development of the mobile application. In the first page of the application shown in figure 5a, a color wheel icon takes the user to the mode selection page shown in figure 5b, where users can select the entry mode; users can select either the auto mode selection or the manual mode selection.

a. color wheel layout

b. mode selection layout

c. Auto mode layout

d. Manual mode layout

Figure.5 The layout of the Smartphone Application

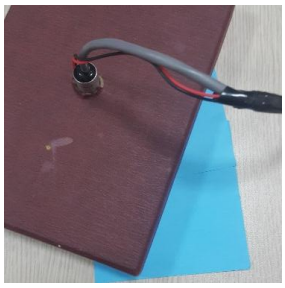
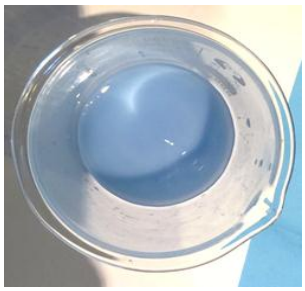
.

- In the auto mode, the chosen color can be selected through the mobile's camera shown in figure 5c. The RGB values of the chosen color is determined by tapping on the screen on the area of that color.

- In the manual mode, the RGB value of the chosen color is selected manually through the manual mode layout page shown in figure 5d. Three seek bars allows the user to choose the RGB values (from 0 to 255). After capturing the RGB values, the user can choose the quantity of the chosen paint color, and then the user can send the values of the RGB color and the desired quantity of that color to the microcontroller for processing.

4. Tests and Results

Several tests have been carried out for evaluating the validity of the system and the correctness of the color match. The system detected the colors under test successfully and an appropriate colors match were generated appropriately. Figure 6a shows the detection of a blue color through the RGB sensor. Figure 6b shows the creation of the color match.

a. Blue color detection. b. Blue color Produced

Figure.6 Color test through the RGB sensor.

Figure 7a shows the detection of a red color through the mobile camera. Figure 7b shows the creation of the chosen color match.

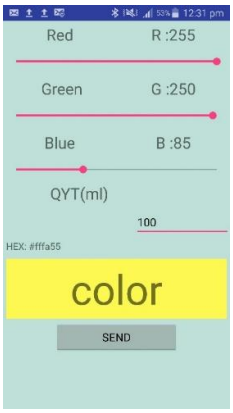
a. Detection of the Red color b. The Red color Produced

Figure.7 Color test through the mobile camera.

Figure 8a show the manual entry of the yellow color. Figure 8b shows the creation of the chosen color match.

5. System capability

The developed system is capable of generating a various collection of colors. User can reproduce chosen colors and quantity using the onboard RGB color sensor, or remotely can use his/her mobile camera. User can set his own color ratio manually to make a range of colors. The system can be used as a tool in different industries such as digital printing, textile, cosmetics, wallpaper, gift-wrap, building materials, etc. [3, 4].



a. Yellow color detection. b. Yellow color Produced

Figure.8 Color test through manual entry.

6. Conclusion

In this paper we have described the design and the implementation of the color detection and mixing system. All the design goals were brought into realization. The system has clearly demonstrated that it's capable of producing the matching color in the color spectrum. In addition to the manual RGB entry, two different implementations have been designed and tested, the first implementation used the mobile camera and second implementation used the RGB sensor. The system can be used as indispensable tool for various industrial application such as digital printing, textile, cosmetics, building materials, etc.

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An Efficient and Effective Wavelet Transform Methods for OCT, SD-OCT and Secondary Image Compression

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Abstract: Glaucoma is a chronic eye disease that leads to vision loss Glaucoma is caused due to the increase in intraocular pressure of the eye. The intraocular pressure increases due to malfunction or malformation of the drainage system of the eye. A Dual Tree Complex Wavelet Transform (DTCWT) based image compression is proposed to solve factors such as low image contrast, speckle noise, high spatial resolution. DTCWT is used to compress the OCT, SD-OCT and secondary images and it is efficient for detecting glaucoma compared with the existing detection algorithms. Then the compression of OCT, SD-OCT and secondary images are carried out by 2D-oriented Biorthogonal Wavelet Transform (2D-BWT). In this BWT, effective coding performance is achieved by the Windowed All Phase Digital Filter (WAPDF) based on Discrete Cosine Transform (DCT). In BWT, Context-adaptive binary arithmetic coding (CABAC) with Lattice Vector Quantization (LVQ) is presented to encode the wavelet significant coefficients for finding the compressed image. The experimental result has demonstrated the significant improvement of the 2D-BWT with WAPDF gain for OCT, SD-OCT and secondary images with high resolution. Then apply Quincunx mexican-hat-like Wavelet Transform (QWT) with modified Support Vector Clustering (mSVC) proposed to evaluate the OCT, SD-OCT and secondary images. It is used to improve the image quality and reduced the image size for storage, an efficient image compression scheme has been presented by using transform and clustering schemes. The result proves that proposed QWT with mSVC system provides higher CR, correlation, PSNR, SSIM and lower MSE, execution time for OCT, SD-OCT and secondary images significantly.

Key words: BWT, DCT, WAPDF, Glaucoma, OCT, SD-OCT, secondary images.

1. INTRODUCTION

Image compression is an application of data compression that encodes the original image with few bits. The objective of image compression is to reduce the redundancy of the image and to store or transmit data in an efficient form. Image processing usually refers to digital image processing, but optical and analog image processing also are possible [1]. Image processing is a rapidly growing area of computer science. Fields which traditionally used analog imaging are now switching to digital systems, for their flexibility and affordability. Important examples are medicine, film and video production, photography, remote sensing, and security monitoring [2].

Glaucoma is a disease of the retina which is one of the most common causes of permanent blindness worldwide. The disease causes damage to the retinal ganglion cells, resulting in thinning of the retinal nerve fiber layer (RNFL). There is a fluid called aqueous humor that flows through the pupil and is absorbed by the bloodstream [3]. In case of glaucoma the flow of this fluid becomes clogged. This results more intraocular pressure in the eye which damages the highly sensitive optic nerve causing impairment. It mainly affects the portion inside the optic disk where the size of the optic cup increases resulting in a high cup-to-disk ratio. It causes the successive narrowing of the field of view of affected patients.

Abnormalities in the RNFL on long standing optic tract lesions are also characteristic. In such cases, there is a "wedge" or "band" of horizontal RNFL loss and pallor of the optic disc in the eye contralateral to the lesion (the eye with the temporal field loss). This pattern is caused by atrophy of the RNFL originating nasal to the fovea and is identical with that from chiasmal syndromes identified on ophthalmoscope as band atrophy (BA) of the optic nerve [4]. At the same time, there is generalized pallor of the optic disc in the eye on the side of the lesion associated with severe loss of the RNFL in the superior and inferior arcuate lesions that comprise the majority of fibers originating from the ganglion cells temporal to the fovea. The RNFL loss may be evaluated on ophthalmoscope as well as with several instruments including scanning laser polarimetric and optical coherence tomography.

Optical Coherence Tomography (OCT) is a non-invasive measurement method that uses light with low temporal coherence to create two- and three dimensional tomograms of biological tissue in vivo such as the retina, skin, esophagus and coronary artery [5]. An OCT system is built around an interferometer, usually a Michelson interferometer, and consists of a source-, sample-, reference- and detector arm. In the source arm, a broadband source emits light with different wavelengths (low temporal coherence), preferably spatially confined. An optical isolator may be used to protect the source from back reflection. The source light enters the interferometer, where it is split between the sample and reference arms [6].

Spectral-domain Optical Coherence Tomography (SD-OCT) is a new, promising variant of OCT, providing superior sensitivity and measurement speed for cross-

sectional imaging of turbid materials. OCT, originally developed for applications in the field of biomedical diagnostics, has shown high potential for other non-biomedical investigation tasks, e.g. within the field of non-destructive testing (NDT) and contactless material characterization.

In wavelet based image coding, a variety of orthogonal and biorthogonal filters have been developed by researchers for signal analysis and compression. The selection of wavelet filters plays a crucial part in achieving an effective coding performance, because there is no filter that performs the best for all images [7]. The Current compression system uses the biorthogonal wavelet filters instead of orthogonal.

2. MATERIALS AND METHODS

2.1 Dual Tree Complex Wavelet Transform Based Compression of Optical Coherence Tomography Images for Glaucoma Detection using Modular Neural Network

In this research, preprocessing is performed on OCT images. Kuan filter is used to denoising and smoothen the image without removing edges or sharp features in the images. In this process, the multiplicative noise model transforms into a signal-dependent additive noise model. After that, the minimum Mean Square Error (MSE) criterion is applied to the model. It makes no approximation to the original form, it can be measured as better to the Lee filter.

Image enhancement technique is used to improve a given image quality. So that the result obtained from image enhancement is additional useful than the original image for RNFL boundaries detection. This method sharpens image features like edges, boundaries, or contrast for making an image with high quality for further processing.

Feature extraction is done by using Grey-Level Cooccurrence Matrix (GLCM). Seven properties from GLCM are computed, i.e., energy measuring uniformity of local grey scale distribution; correlation measuring the joint probability of occurrence; entropy measuring randomness; contrast measuring the local variations; cluster shade that measures a category of pixels having similar values of grey level; homogeneity that measures the closeness corresponding to the distribution and the inverse difference moment measuring local minimal variations. In this system, 28 features are extracted and also the average values of all angles utilized to obtain 7 features.

The feature selection is done by using Principal Component Analysis (PCA). The PCA is for the reason of minimizing the huge data dimensionality. In training phase, the feature vectors are extracted for each image present to produced training set. During the testing period, the feature vector equivalent to the test image and is computed employing PCA.

Improved Artificial Bee Colony (IABC) clustering is used to discover boundaries of the RNFL. This algorithm grouping the glaucoma identical pixels region into one group and natural (normal) value of all pixels reward in that another group. The classification process is done by using Modular Neural Network (MNN). Every component in the collection associates with a MNN among the same structure and it simply defined as five experts with one gating network.

Image compression is performed by using DTCWT method. In this process, a gray scale OCT image is chosen to compress the image more effectively. The actual image undergoes decomposition by using DTCWT. The coefficients received are transformed by threshold for compression further applying arithmetic encoding in the process of entropy.

Wavelet transform has disadvantages like shift sensitivity, absence of directional selectivity and Absence of phase information, hence it does not find its application in several domains. DTCWT surpasses these above mentioned limitations. Two DWT's can generate separately the real and imaginary coefficients, only if, both of the filters design are particularly diverse from each other. Upper DWT generates the real part whereas the lower DWT yields the imaginary part. In case both are the same, then there is no gain. The realization consists of two steps. Initially, the decomposition of an input image is carried out by two branches 'a' and 'b' in which the upper DWT is the Hilbert transform (approximate) connected with the lower DWT [8]. Secondly, the same pass bands of the respective two sub bands are combined in a linear manner either through differencing or averaging.

In compression process, DTCWT is used over the input image that either brings the coefficients nearer or equivalent to zero. Additionally, the threshold λ also produces more zeros. λ is fixed and the value which is below λ is fixed to zero to produce more zeros in the hard thresholding, which, actually needs lesser space for storage and employing the entropy coding, the transmission tends to become more faster. Entropy coding is conducted by means of arithmetic coding for the purpose of compressing the image.

In this research work, arithmetic coding is used where the input symbol is substituted by a particular code in a file or message and this particular code is indicated by an integer number ranging between 0.0 and 1.0 of a real number. Short and long code words are allocated to more and less probable events correspondingly. This statistic tends to become accurate when the coding result attains the Shannon's entropy limit for the input symbols in a bigger sequence. Arithmetic coding comprises of three registers in the form of low, high and range.

2.2 A Biorthogonal Wavelet Transform Based Efficient Image Compression for Spectral-Domain Optical Coherence Tomography Optimal Window Sequence of BWT with WAPDF for Image Compression by MCSO

In this method, the first step chooses the SD-OCT source image by which the direction finder is enables finding of the transform direction. The decomposition of the image decomposition wavelet coefficients (w) is based on BWT with WAPDF. The thresholds help in employing the modified coefficients w. Later, is the wavelet significant coefficients is encoded based on CABAC with LVQ. The reconstruction of the image is done using the decoding and inverse of BWT with WAPDF.

In Modified Cat Swarm Optimization (MCSO), the adaptive parameters are considered. The method of optimization in MCSO avoids the use of any gradient information of the objective function and hence it operates on the simple concept making easy and efficient implementation while computing the algorithm. Therefore, MSCO enables to achieve the optimal window sequence of BWT with WAPDF for image compression. In this method, quantization phase is given as the "quality factor" Q as an important parameter in bit rate control.

The optimal Karhunen-Loeve transform (KLT) is given by the robust approximation given by the DCT. Given the assumption of the input signal as a first-order Gaussian-Markov process having zero-mean, unit variance and correlation coefficient$\rho = 0.95$, a good approximation is fixed for natural images by which the coding gain of the DCT is in close proximity with that of the optimal mode of KLT [9]. Hence, the proposed method represents the good decorrelation ability.

The pixel sequences are quantized rather than just the vector quantizer (VQ) for single pixels is used. The derivation of the LQ codebook is given by selecting a finite number of lattice points from the finite lattice. However, the determination of LVQ is given by a truncation, a root lattice and a scaling factor in which the root lattice is defined as the lattice co set from which the actual building of codebook is performed. In root lattice, the finite number of lattice points are chose based on truncation and thereby the input data is quantized with respect to finite energy. In the truncated area, the selection of bit rate of the LVQ is based on the number of points. Hence, scaling is required to truncate the lattice properly forgetting the best accommodation to the source probability distribution. It is must to achieve the information about the number of required lattice points within the truncated area, which can also be stated as the shape awareness of the truncated area.

The method of lossless compression is given as the entropy coding which is further utilized at the last stage of encoding the wavelet coefficients for image reduction which is done to a series of syntax elements. By defining the means using the reconstruction of the image coefficients, the syntax elements are used at the decoder. This is also called as inclusive prediction method given by intra prediction mode in either spatial or temporal prediction and motion vectors and also prediction error are termed as residual. In CABAC, three different functions such as binarization, context modeling, and arithmetic coding are considered. In binarization, the mapping of the syntax elements are given to binary symbols (bins). In case of context modeling, the estimation of the probability of the bins is shown. Finally, the arithmetic coding compresses the bins to bits with respect to the estimated probability.

CABAC employs the Binary Arithmetic Coding in which the binary decisions are specified in terms of encoding in either1 or 0. For example, a transform coefficient or motion vector is considered as a non-binary-valued symbol which is later binarized or modified into a binary code well ahead of the arithmetic coding. This process helps in data conversion showing the data symbol into a variable length code inspite of encoding the binary code after which the arithmetic coder is processed for before transmission. There is a repetition is phases for every bit of the binarized symbol. The non-binary valued syntax element of binary representation given by the binarization process must be close to a least redundancy code. In contrast, the most probable symbols are given easier access through the binary decisions placed in closer to the root node for the next modeling stage. Similar to this process, a code tree enables the reduction of the number of binary symbols for encoding on the average, Hence minimization of the computational workload helps to bring about the binary arithmetic coding stage.

Context modeling represents the accurate estimation of the probability approximate requisite to achieve the fast coding efficiency. This consequently represents the higher adaptive several models to be utilized for various bins and the probability of that context model is simplified depending on the values of the earlier coded bins. Bins having the similar distributions frequently share the similar context model. Based on the type of syntax element, the context model for each bin can be chosen by which bin position in syntax element is given asluma/chroma, binIdx, and neighboring information and so on. The context switch can be attained after each bin.

2.3 An Efficient Image Compression Scheme based on Quincunx Mexican-Hat-Like Wavelet Transform with Modified Support Vector Clustering for SD-OCT Image

In this work, a novel image compression scheme has been presented by using QWT and the modified SVC technique. In QWT, the images are divided into textual significance regions to extract textually important characteristics and employing textural descriptors as criteria. Then, these are including co-occurrence matrices based measures. While glaucoma SD-OCT image compression methodologies utilizing the QWT and applying it to the whole original image, and then applied threshold scheme to involve a more sophisticated scheme. Specifically, different compression ratios are transfer to the wavelet coefficients based on the different Regions of Interest (ROI), in which either each and every wavelet domain band of the image is clustered itself.

In the proposed QWT-mSVC, initially the input image is selected from image database. Then the images are separated into textual regions. These regions are clustered by two classes like significant region and non-significant

region by using mSVC approach. First, the SD-OCT images are scanned with M x M dimensions of sliding windows. Here, 256 x 256 size of images are considered and the dimension is M=8, and it is denoted as size of sliding window. The texture identification analysis is performed by using co-occurrence matrices [10]. The entry of matrices is represented as (m, n) and it denotes the probability is going from one pixel with grey level (m) to another pixel with grey level (n) based on the predefined angle and distance. For specific spatial distance and angles, new matrices are formed.

It checks if cooccurrence matrices derived features are used when a pattern has been marked as texturally significant, after that, the upper-left point of the equivalent sliding window takes on the label of 255, else the label of zero has been taken. Based on this condition, new black-white image (i.e IMP) results show the significant region and non-significant region for each original gray level image. Then QWT compression has been introduced. In this compression, first the original image is decomposed into two images like $OI_1$and OI_2. The wavelet representation is $QWT - OI_1$ and $QWT - OI_2$ and their compression ratio is determined by using quantization procedure. The quantization preferred bit discrete stage for performance compared to common style of applying quantization. After quantization, the results are transferred to run length coding [11]. It is mainly used for reduced the redundancy problem in large data compression.

In Modified Support Vector Clustering (MSVC), handles the arbitrary shape clusters effectively. In discrete dyadic wavelet transform (DyWT) analysis, three families of wavelet are required and it considered as a drawback. This problem has been solved by two successive scales but the cost and loss of filter caused the computation complexity. So to solve these problems, quincunx has been introduced in [12]. In this system, follow this idea the wavelet compression has been done. In this decomposition, onlu fewer subbands only there compared than other decompositions, and that features are may produce lower visual quality of reconstructed image. But, this problem also overcomes in [13]. The simulations show that the quincunx decomposition performs efficiently in many practical applications.

In vector quantization, the Quantizer is used to reduce the number of bits required to store the transformed coefficients through decreasing the precision of those values. It is mainly used for image compression, because it has theoretical benefit over the scalar quantization schemes. Generally, during the encoding phase, the codebook design and the vector lookup is computationally complex. So, the codebook has been generated before encoding process as well as the efficiency of lookup table is more significant. In this work, the encoding values are collected from a multidimensional vector space into a finite set of values, which is collected from a discrete subspace of lower dimension. In addition, the lower space vector needed less storage space, therefore the image compression has been easily compressed.

In run length encoding, when the probability of frequency of the corresponding symbol is higher entropy coding substitutes a series of codes for a sequence of symbols, where the codes are chosen to have fewer bits. In this process, the redundancy has been reduced in the form of repeated bit patterns in the output of the Vector Quantizer (VQ). The RLE scheme only encodes the successive number of same color pixels the probability of occurrence of consecutive same color is very high. It provides competent compression of data, while the data with large number of runs or large number pixel contains same intensity value. Finally, the compressed image is reconstructed. It is efficiently decompress the image. The important and non-important textual region clustering has been discussed in given below subsection. It considers a secondary image which is evaluated by using the QWT with mSVC algorithm.

3. RESULT AND DISCUSSION

The Table 1 and 2 describes that the OCT, SD-OCT and secondary images are implemented by using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT methods efficiently. From the Table 1 and Table 2 observes that the proposed QWT-mSVC method provides better performance metrics than other methods. Compare than OCT image, the SD-OCT and secondary images are obtained higher PSNR, CR, correlation, SSIM and lower MSE, execution time values.

Table 1: DWT and 2D-DTCWT methods for OCT, SD-OCT, secondary images

	DWT						2D-DTCWT					
IMAGES	CR	PSNR	MSE	CORRELATION	SSIM	EXECUTION TIME	CR	PSNR	MSE	CORRELATION	SSIM	EXECUTION TIME
OCT	1.0073	15.9498	53.0413	0.8412	0.6147	0.3483	1.1985	27.5938	15.7144	0.9377	0.8899	0.1281
SD-OCT	1.0492	21.4435	29.1048	0.8761	0.7269	0.3112	1.1999	28.7187	14.2719	0.9399	0.8923	0.1172
Secondary image	1.0361	22.9114	29.4476	0.8832	0.7172	0.2942	1.1966	26.2995	13.4099	0.9456	0.8341	0.1191

Table 2: 2D-BWT with WAPDF and QWT- mSVC methods for OCT, SD-OCT, secondary images

	QWT with 2D- BWT with WAPDF						QWT- mSVC					
IMAGES	CR	PSNR	MSE	CORRELATION	SSIM	EXECUTION TIME	CR	PSNR	MSE	CORRELATION	SSIM	EXECUTION TIME
OCT	1.2256	27.4921	13.3318	0.9582	0.9232	0.1214	1.3512	31.9894	11.9106	0.9670	0.9624	0.1017
SD-OCT	1.2363	29.7381	12.2205	0.9476	0.9643	0.1159	1.4978	37.9004	10.1998	0.9876	0.9796	0.1011
Secondary image	1.2565	31.4687	11.7895	0.9594	0.9600	0.1145	1.4491	38.9594	10.0006	0.9699	0.9674	0.100

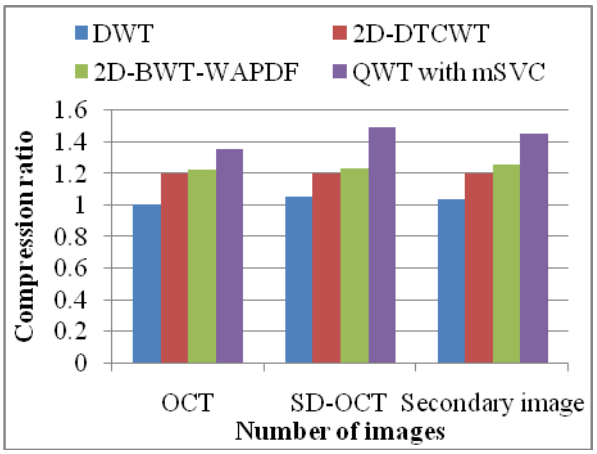

Fig. 1: CR performance Comparison

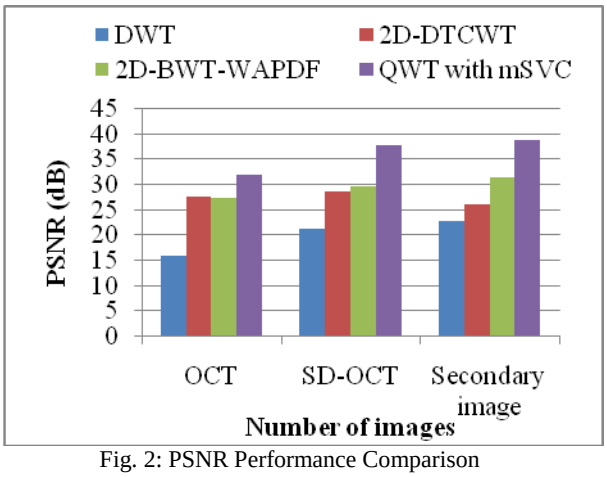

Fig. 2: PSNR Performance Comparison

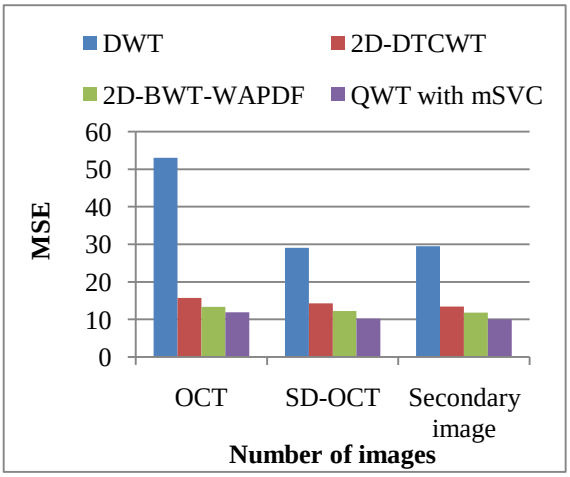

Fig. 3: MSE Performance Comparison

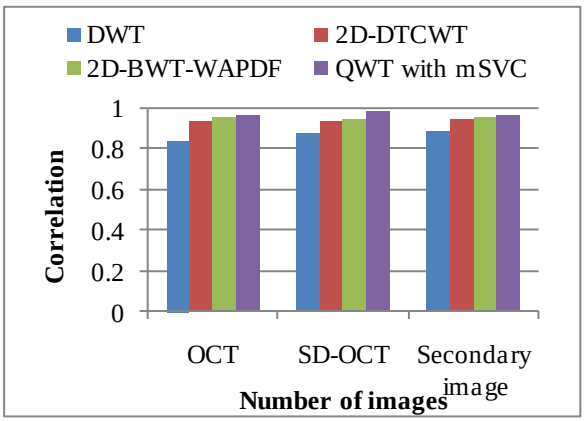

Fig. 4: Correlation Performance Comparison

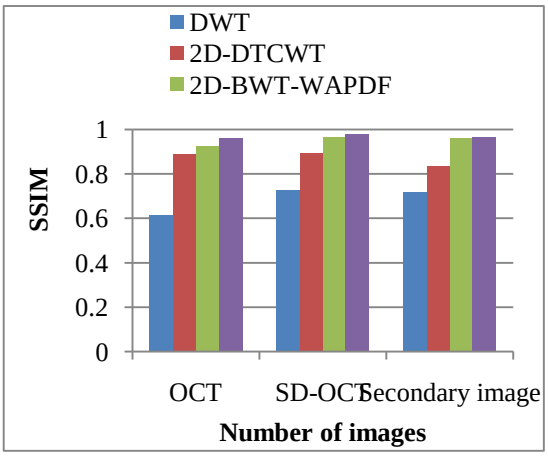

Fig. 5: SSIM Performance Comparison

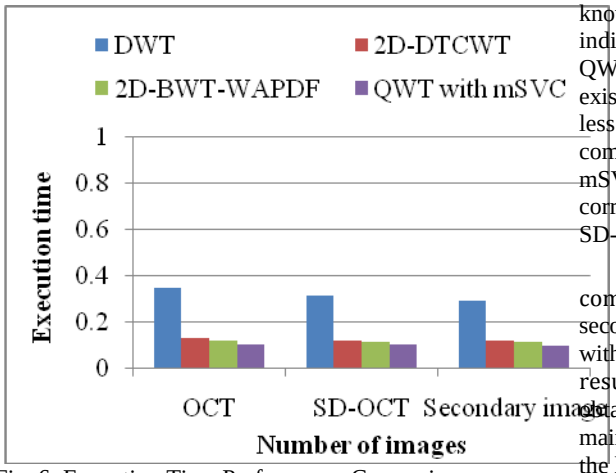

Fig. 6: Execution Time Performance Comparison

Fig. 1 shows that the CR performance comparison results between OCT, SD-OCT and secondary images using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT. From the results, it is well known that proposed QWT - mSVC obtain high CR indicating the good purity of retrieved image. The main reason is that the clustering of large coefficients resembles that of the QWT; hence it concludes that QWT is a viable for SD-OCT images. The proposed QWT-mSVC method is more efficient for achieving higher CR values for all three images and it proves that the SD-OCT has higher CR than other images.

Fig. 2 shows that the PSNR comparison results between OCT, SD-OCT and secondary images using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT. From the results, it is well known that proposed QWT-mSVC obtain high PSNR indicating the good reconstructed image. The proposed scheme is based on a various principle which does not need any factorization of the dilation matrix and also more stable from a wavelet designer point of view. The proposed QWT-mSVC method is more efficient for achieving higher PSNR values for all three images and it proves that the secondary image has higher PSNR than other images.

Fig. 3 shows that the MSE performance comparison results between OCT, SD-OCT and secondary images using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT. From the results, it is well known that proposed QWT-mSVC obtain less MSE indicating the good reconstructed image. The importance of proposed work lies in the likelihood of decreasing the rates for which the image quality remains acceptable. The proposed QWT-mSVC method is more efficient for achieving lower MSE values for all three images and it proves that the secondary image has lower MSE than other images.

Fig. 4 shows that the correlation comparison results between OCT, SD-OCT and secondary images using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT. From the results, it is well known that proposed QWT-mSVC obtain less MSE indicating the good reconstructed image. The proposed QWT with mSVC obtain better performance compare then existing methods. It is an effective way of getting rid of the less informative part of this redundancy without compromising perfect reconstruction. The proposed QWT-mSVC method is more efficient for achieving higher correlation values for all three images and it proves that the SD-OCT has higher correlation than other images.

Fig. 5 shows that the SSIM performance comparison results between OCT, SD-OCT and secondary images using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT. From the results, it is well known that proposed QWT with mSVC obtain better SSIM compare then existing methods. The main reason is that the proposed quincunx transform has the least redundancy. The proposed QWT-mSVC method is more efficient for achieving higher SSIM values for all three images and it proves that the SD-OCT has higher SSIM than other images.

Fig. 6 shows that the execution time comparison results between OCT, SD-OCT and secondary images using proposed QWT-mSVC, 2D- BWT with WAPDF, 2D-DTCWT and existing DWT. From the results, it is well known that proposed QWT - mSVC obtain less execution time compare then existing methods. The proposed QWT-mSVC method is more efficient for achieving lower time complexity values for all three images and it proves that the secondary image has fast execution time than other images.

4.CONCLUSION

In this research, the OCT, SD-OCT and secondary images are considered to analyze using proposed QWT-mSVC, 2D-BWT with WAPDF, 2D-DTCWT and existing DWT methods. The DWT method provides lower PSNR, CR, correlation, SSIM and higher MSE, execution time values. 2D-DTCWT method is used to compress the image efficiently and it provides experimental results better than the DWT method. The OCT, SD-OCT and secondary images are evaluated by using 2D-DTCWT method but it

still has issue with lower quality in image compression results. To overcome the above mentioned issues, 2D-BWT with WAPDF is used which helps to improve the image compression performance. This approach provides better performance metrics rather than the previous DWT and 2D-DTCWT methods. However it has problem along with time complexity and compression ratio performance. to avoid this problem, QWT with mSVC is introduced. It evaluates the OCT, SD-OCT and secondary images more effectively and provides higher PSNR, CR, correlation, SSIM and lower MSE, execution time values rather than the 2D-BWT with WAPDF, 2D-DTCWT and DWT methods. The experimental result proves that the proposed QWT with mSVC method has superior image compression performance than the other methods.

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