# A Collaborative Real Time Drawing System- "Multi User Virtual Drawing Board"

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## ABSTRACT

An application is successful if it provides reliable, scalable, secured and maximum resource sharing. Distributed system is a main concept behind the designing of such applications. According to distributed systems several computers are connected to each other via some communication network and these computers are located at different locations and are referred to as nodes. In this paper, a drawing board is provided that allows various users located at different locations to work on a common design and each user can see other users design by just connecting to the network. Through this drawing board all the users can edit the same drawing at the same time. Apart from this drawing facility, many other facilities are provided by this Multi User Virtual Drawing Board (MUVDB) that are very well discussed in this paper.

## GENERAL TERMS

Distributed Systems, Collaborative Real Time Application.

## KEYWORDS

Message passing, multi user virtual drawing board, synchronization, drawing canvas, client and server window.

## 1. INTRODUCTION

Multi user virtual drawing board is a drawing application that provides various users with the ability to work on a common design. This is a real time collaborative drawing application that is based on the concepts of distributed systems. In distributed system each computer has its own local memory, operating system and clock [1]. A collaborative real-time system is characterized by large number of users or participants that are involved in performing same task and are usually located in distant locations [2]. MUVDB is based entirely on the concepts of distributed systems like message passing [3, 4], synchronization, concurrency etc. MUVDB not only provides drawing facility but also have the option for writing text if required. It also provides the facility of sending messages to other users and also an option to see the number of users currently logged in during a particular session. By seeing each other's design a user can very well reach up to the level of making decision regarding the best design. If a user does not want to participate then he can do so by just disconnecting himself through the connection. The paper is divided into various sections including introduction followed by basic architecture, related work, proposed model, results, conclusion and future scope.
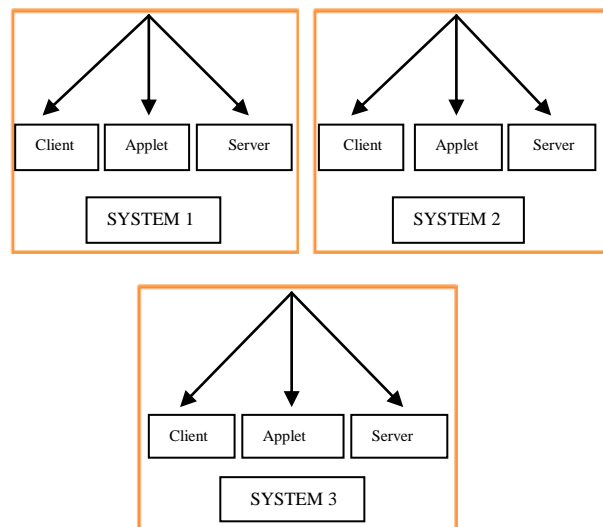
## 2. BASIC ARCHITECTURE



**Fig 1: Basic architecture behind the implementation of the message passing model**

The model shown in the figure.1 is a message passing model that is implemented according to the architecture shown in the figure. According to the architecture shown if we take three systems then in each system three threads will run one for client, second for an applet and the third one for the server. These threads communicate with each other via inter process communication. In all systems for client and server log files will be maintained to send and receive updates.

## 3. RELATED WORK

Multi User Virtual Drawing Board is a collaborative real time drawing system that allows several users to login to the system to get connected and perform collaborative task of drawing and each user can edit the same drawing at the same time.

This collaborative system is based entirely on TCP/IP protocol because it provides reliable and connection oriented services from one computer to another. TCP acts as a mediator between an application program and internet protocol. It works in three steps starting from connection establishment to data transfer stage to connection termination stage.

In the paper by Stephen J.H Yang [5], a ubiquitous learning environment has been provided. It provides an interoperable, pervasive, and seamless learning architecture. Through this paper the author has discussed how this environment supports the needs of peer-to-peer collaborative learning [5]. Through the collaborative real time system that is the multi user virtual drawing board presented, all the above features are provided

like interoperability, pervasive, and seamless environment but in addition to all this MUVDB provides an environment in which a user can very well share their views not only through drawing medium but also through messaging that makes it easier for various users to work without any sort of interruption. Chengzheng Sun [6], in his paper presented a real-time collaborative graphics editing system. This system allowed the group of users to view and edit the same graphics document at the same time from geographically dispersed sites connected via communication network [6]. MUVDB also provide group of users located at different places to view and edit the same drawing at the same time via communication network by allowing the users to communicate through writing simple text messages and allow a user to make his message private to particular user if he wishes to. So this system is not only a simple real time drawing application but also an application that allows a user to share messages and do conferencing with other users.

In the paper by Prashant Baheti [7], a distributed pair programming concept has been discussed. The author conducted an experiment and found that it is feasible to develop a software using distributed pair programming and the software so developed is comparable to software developed in co-located or virtual teams. With the help of MUVDB, it is clear that a real time collaborative system can be built very effectively using the concepts of distributed systems that synchronization, message passing, concurrency etc.

Rosenman M.A [8], in his paper presented a real time multi-user collaboration in a 3D virtual world for designers in different locations. A concept of agent technology was used by the author for his work [8]. Through MUVDB, not only the problem of collaborative drawing gets solved but also problems involved in sharing messages gets solved simultaneously while drawing.

Hiroshi Ishii [9], in his paper presented a TeamWorkStation and ClearBoard as an example systems to support real-time collaboration by distributed group members. Through MUVDB, real time collaboration becomes easy as users are able to work on a common task assigned to them in team and also makes it possible for them to handle any issue while working in a team as any delay caused in making a decision regarding their task gets immediately solved by reaching to a level of making right decision.

In MUVDB the participants can do conferencing as well as chatting. Sinchai Kamolphiwong [10], in his paper proposed enhancements of IP conference scenarios based on Session Initiation Protocol (SIP) along with some of the features for interactive real-time communications. Through MUVDB, users can do conferencing also by making their information available to people whom they want to rather than sharing it with all the users currently logged in to the system. This makes it easier to share any private information that is to be shared within a certain group of people.

Katherine M. Everitt [11], provided a shared workspace that allows group of designers to interact. MUVDB allows various mediums of interaction among the users who are working on a common design. The drawing canvas provided by MUVDB is one such medium wherein all the users can see each other's contribution and sending instant messages and conferencing are the other medium provided through MUVDB.

Peter Torlind [12], in his paper focused on two things. Firstly, to allow users to work together who are located in different geographical places. Secondly, to co-ordinate between tasks that is assigned to different users in the virtual organization. With the help MUVDB both the above things are solved but with additional feature that is MUVDB provides other means of communication also apart from providing a drawing canvas.

In the paper by Hyojeong Jin [13], a collaborative publishing design system using networks was proposed. In this system all the users or participants are able to see all the publishing design workflows and can share or exchange their knowledge or any related information with each other on the web [13]. MUVDB is based on TCP/IP protocol and is built entirely on the concepts of distributed systems. Knowledge and information sharing becomes the top priority of MUVDB that is very well addressed by it and helps users by providing a step by step progresss of the task assigned to them by giving them the knowledge about the work completed by other users also.

Mohammad AlRamahi [14], in his paper provided online tool to allow real-time voice and vector-based drawing communication between the students and the instructor [14]. MUVDB is such a system that can be used at any level that is for students training, office purpose, and also in medical purpose to share some very critical information.

Kai Riemer [15], provided the concept of Real-Time Collaboration (RTC). RTC is eCollaboration technology which has its roots in both telecommunications and groupware market. MUVDB is also a real time application that finds its use in various fields due to the type of features it has and the type of facilities it provides.

Saul Greenberg [16], provided the concept of computer as a basic tool in order to enhance the group work process through the support of real time communication. MUVDB is a clear example to show the computer as a tool to enhance group oriented task in a real time environment. Though MUVDB is much more than a tool and all this is very well explained in the following sections of the paper.

# 4. PROPOSED MODEL

Multi User Virtual Drawing Board is a collaborative real time system that allows various users located at different places to perform the same task of drawing at the same time.

Such a system is built by using a client-server model. A client-server model behaves as a distributed application in which a client request for any required service and a server is supposed to provide that service. In other words, a server is defined as the machine that stays at one place and a client is defined as the one that seeks for a connection to a server [17].
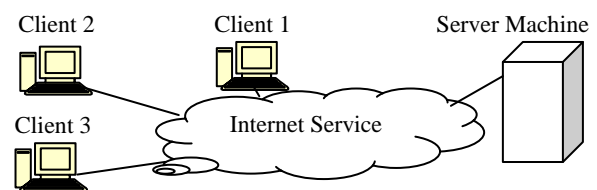


**Fig 2: A general client-server model**

The client-server model used to build the message passing system is built using sockets and threads. Sockets are basically used to represent the terminals of a connection between two machines and for a particular connection there is a socket on each machine [17]. A thread is defined as a single sequential flow of control within a process [18].

There is a server window named as Intranet Chattingv4.01. Server consists of options such as user management, administrator client, disconnect user, disconnect all and shut down. User management option is provided to create a user that is stored on the server's window. Administrator client is a default client provided by the server. On the server window server can disconnect any user it wants to or it can also disconnect all the users at one go just by clicking on clicking

disconnect all. The shut down option leads to the server getting shut down. The default port used is 12468. In the server window there is also a portion that displays the server's activity log. Whenever a user wants to access the drawing board, user simply needs to connect to the server. This is done by just clicking on the file option present on the user's window and then clicking on the connect option. This results in a small window in which a user needs to enter his name and password leading to a connection to the network. On the top of the users window several options are provided like file, edit, actions, view and help. File menu consist of options like connect that is used to connect to the server, disconnect option used to disconnect with the server, an option to save all the chats made with any user and an exit option to exit from the network. Any number of users can connect to the server. In the edit option provided in the user window, a user can copy and paste a text. A user can also paste a picture from any file. In the actions option provided in the user window, a user can send instant messages to any user and can also clear the drawing board from here.

In actions option a user can also page other users for his/her own convenience and can also ignore any user he wishes to in order to make his own design first and then connecting again to the server in order to make his design available to the users he ignored. In the view option provided in the user window, a user can see his connection settings and can also see the chat room window as well as can check or uncheck the show canvas option by which the user can hide the drawing board if he wishes to. Here user can also have sound facility when he pages specific user that is, whenever he pages specific users a sound is generated or rather we can say whenever a user pings another or group of users a sound can be heard. In the help option provided in the user window, a user can get the information about the Intranet Chattingv4.01 just by clicking on about intranet chatting option. Here a user can also click on manual option in order to get additional information regarding the facilities provided by this system in order to know more. In the users window at the right hand side user name is provided once the user gets connected to the server. And just below this, user's current activity is displayed i.e. whether the user is writing or drawing along with the name of the user.

## 5. EXPERIMENT AND RESULTS

The server window displays all the user activities performed during a session by displaying all the users connected with the time at which the user connected and from where the user connected. The server window displays all the users currently logged in to perform the collaborative task of drawing. At the extreme right hand side of the window there are certain options provided these are user management used to create a user by the server, administrator client i.e the default client provided by the server, disconnect user is used to disconnect a particular user by the server, disconnect all used to disconnect all the users and the shut down option used to shut down the server. The server window also shows the status of the connections made in three categories. Firstly, the current connection, that displays the current connection at a particular time. Secondly, the peak that is the number of connections made including the connections that were disconnected. Thirdly, the total number of connections made. This is very well explained through figure 3.
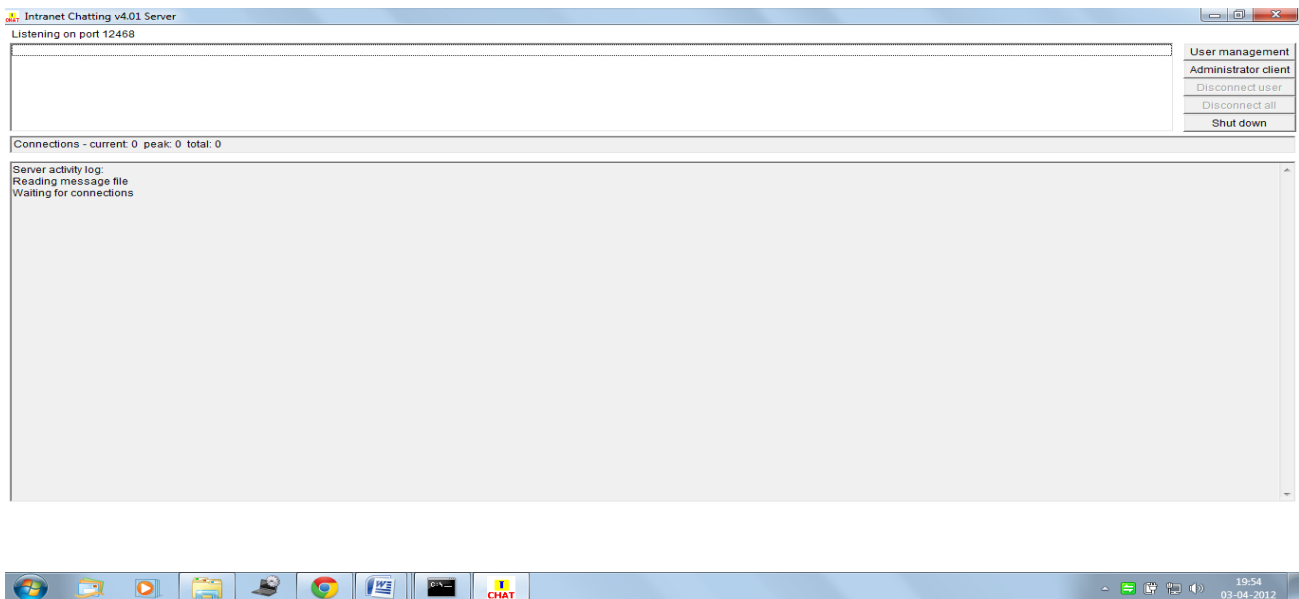


**Fig 3: Servers window showing server activity log**

Whenever a user wants to connect to the server, he just needs to go to the file option on his window and just needs to click on the connect option. On doing so a small window appears on his screen as shown in the figure 4 in which he needs to enter his name, password, server name and network port. Network port is 12468 by default and user can also give some additional information about himself or regarding his work if he wishes to in additional information portion provided in the connection settings window to get connected. A user overall window appears in the same way as shown in the figure 5.
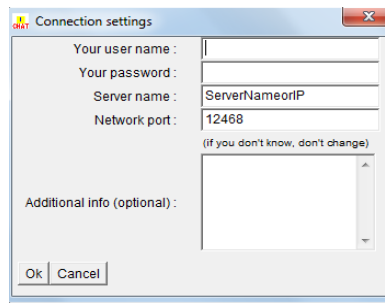
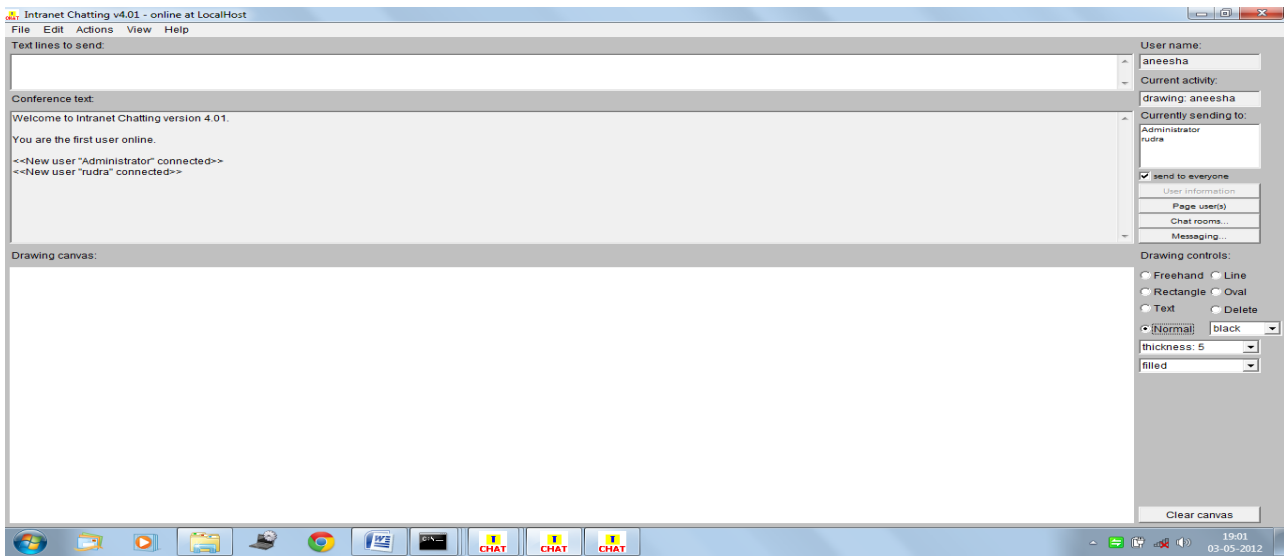**Fig 4:  Connection settings window for a particular user**



**Fig 5:  A typical users window**

A user can draw anything he wants to. If two or more users want to work on a commom design they can do so with the help of drawing board. They can correct eachothers drawing also if they want to make changes. A user can select the users he want to make his drawing available to by using ignore users option provided in the actions option on his window. The drawing board implemented in this paper is applicable only for two dimensional figures though three dimensional figures can also be added but in this paper only two dimensional figures are taken into account in order to represent the idea behind collaborative drawing process. If the user wants his drawing to be available to all other users he can click on the send to everyone option provided on the extreme right hand side of his window. By doing this whatever he draws is simultaneously displayed on other users screen. And at the same time other users can edit this drawing according to their own thinking and this can be achieved by ignoring other users so that whatever changes other users make does not become an obstacle for the user who is editing at the same time. Once the changes are done the users can again connect to the system in order to show the changes he made to the original drawing. This makes the task of collaborative drawing very easy and fast. If two or more users are working on a common design then there window will appear in the same way as shown in the figure 6.
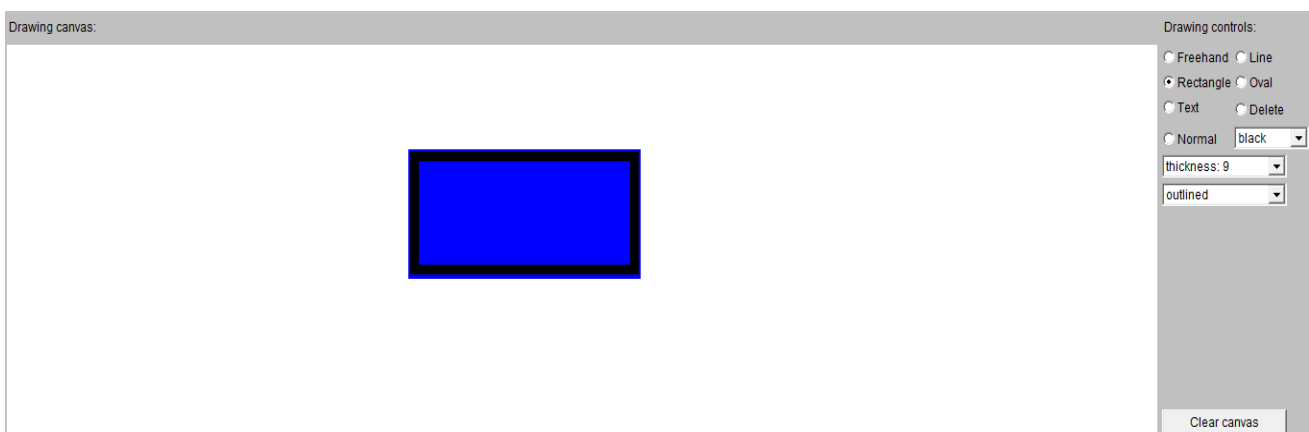


**Fig 6:  When three users are working on same design all will have the same view as shown**

When three users are working on the same design they can edit each others work at the same time. This allows all of them with a fast mode of reaching to a common decision for their drawing.

If suppose three users are working on the same design then on their window their details will be displayed as shown in the figure 7.
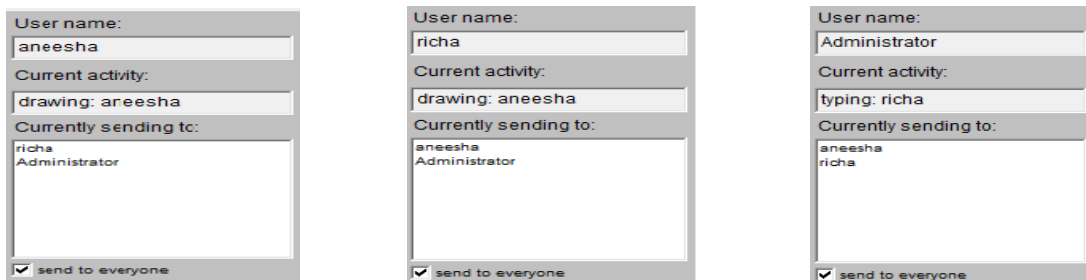


**Fig 7: Three users working on the same design will have their details displayed on their respective windows in the same manner as shown through figure**

Users can also send instant messages to eachother just by clicking messaging option at the extreme right side of the window or by going on the actions option on the top of the user window and then clicking on messaging option.this is very well illustrated through Figure. 8. By this users can not only share

their drawing but can also talk to eachother by sending instant messages. The feature of sending instant messages to other users help in easy communication between various users and makes the task of collaborative drawing more easier.
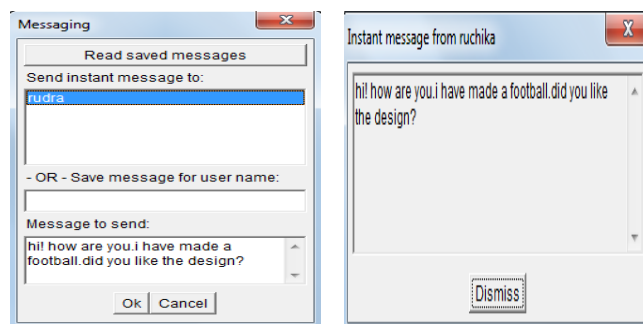


**Fig 8: Two users sending and receiving instant message to eachother**

Apart from this one user can see other users information by clicking on the user information option provided at the extreme right side of the users window that is above messaging option or by going on the view option at the top of the window and then clicking on user information option (Fig. 9). This feature helps the user to know about other users currently logged. Along with the name certain additional information about specific user can be gathered by user information option.
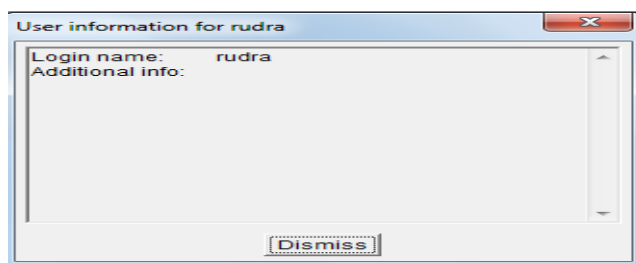


**Fig 9: User Information**

A user can also see the number of users currently available for chatting just by clicking on chat rooms option and then clicking on chat room information. With this option it becomes easier for a particular user to gain information about a specific user for chatting purpose. This is shown through figure 10.
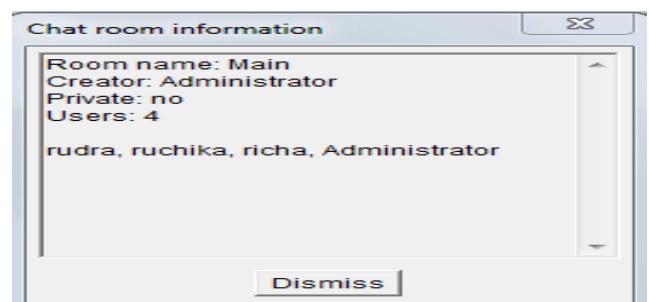


**Fig 10: Chat Room Information**

Apart from all these features the user can also page other users. Paging is basically for the ease of a user in order to keep a track of other users. For paging a particular or group of users a user just needs to click on page users option present on the extreme right side of the user window or by going on the actions option at the top of the window and clicking on the page users option (Fig. 11). Users can also perform conferencing by just writing the required text in the text lines to send area provided in the users window. This is shown through figure 12.

**Fig 11: Paging Users**



**Fig 12: Performing Conferencing**

## 6. CONCLUSION

Multi User Virtual Drawing Board is a collaborative real time system that allows users to perform collaborative task of drawing effectively and efficiently. The design of such a system uses many concepts of distributed system like message passing, synchronization, sending updates to other users. Synchronization is handled in this system in such a way that the various threads used to represent various processes occurring in the system allows the events to occur in a step by step manner. Resources are efficiently shared amongst all the users and no user finds problem while gaining access to any resource. It provides many other features apart from drawing like sending instant messages to other users, sending text to other users, allows to see users information currently logged in. Therefore, this type of a system is an integration of both chatting as well as drawing system. Thus, solving many purposes and finds application in wide variety of fields like cooperate offices, banks, chatting purposes or to share some important information to group of users.

## 7. FUTURE SCOPE

As future work the developed system can be expanded to fit other tasks. Much enhancement can be done in this system like using the concept of watermarking that is used to verify the authenticity of a digital signal. Also when writing an alphabet on the drawing board we can include the nearest match of the alphabet that we intend to write. All this work can be done on this system so we think that that there may be a better solution to illustrate this. Therefore, we let this open to discussion.

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