IMPLEMENTATION OF MOBILE BROADCASTING USING BLUETOOTH/3G

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ABSTRACT

Mobile-PC Multimedia broadcasting aims at developing an application which mainly focuses on image and video live streaming from mobile to desktops/laptops using 3G technology and Bluetooth. Bluetooth is used for one-to-one connection (i.e. from mobile to PC) and 3G is used for one-to-many connections (i.e. from mobile to many PCs and/or other mobile handsets). The Mobile-to-PC solution offers a new level of 3G service to both enterprise and consumer markets. This application can also be used as an in-built feature in mobile phones for entertainment purposes. Paper focuses on the architecture and implementation of broadcasting of images and video live streaming to desktop or laptop using Bluetooth/3G technology.

KEYWORDS: *Multimedia Broadcasting, Wireless communication, 3G, Bluetooth*

I. INTRODUCTION

Wireless Mobile communications has emerged as the most popular and convenient form of communications in the past decade. Mobile networks are increasingly being used to connect to the internet and the demand for faster technologies has never been more. Over the years, mobile technologies have evolved rapidly to provide users with their demands and equip them with advanced tools and provide stronger connectivity. Among all the technologies of today, GPRS remains a popular service and later, with the emergence of 3G, users have been provided with strong and convenient mobile connectivity with enhanced features. Bluetooth is also one of the leading wireless technology and an open source technology standard for exchanging data over short distances (using short wavelength radio transmissions) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. It can connect several devices, overcoming problems of synchronization.

The number of wireless mobile devices is increasing globally. As wireless mobile devices, such as personal digital assistants, smart cellular phones, and mobile media players are getting very popular and computationally powerful, watching TV on the move has become a reality. At the same time, wireless systems are achieving higher data rates to support Internet and other data-related applications.

The various technologies analyzed for implementation of above system are discussed in brief below:

1.1. Multimedia Broadcasting

Multimedia broadcasting [1] or data casting refers to the use of the existing broadcast infrastructure to transport digital information to a variety of devices (not just PCs).

The essential characteristics of multimedia broadcasting include:

1. Digital data stream
2. Asynchronous
3. Bandwidth asymmetry
4. Downstream backbone
5. High speed (up to 20 Mbps)

6. Universal access
7. Low cost
8. Layered architecture
9. Wireless
10. Mobile and fixed service
11. Existing infrastructure

1.2. Bluetooth

Bluetooth[2] is an open wireless technology standard for exchanging data over short distances using short wavelength radio transmissions from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. Created by telecoms vendor Ericsson in 1994, it was originally conceived as wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

1.3. 3G

International Mobile Telecommunications-2000 (IMT--2000), better known as 3G or 3rd Generation, is a generation of standards for mobile phones and mobile telecommunications services fulfilling specifications by the International Telecommunication Union. Application services include wide-area wireless voice telephone, mobile Internet access, video calls and mobile TV, all in a mobile environment. Compared to the older 2G and 2.5G standards, a 3G system must allow simultaneous use of speech and data services, and provide peak data rates of Mobile Broadcasting Using Bluetooth/3G Page 4 at least 200 kbit/s according to the IMT-2000 specification. Recent 3G releases often denoted 3.5G and 3.75G , also provide mobile broadband access of several Mbit/s to laptop computers and smartphones.

1.4. Wireless communication

Mobile computers require wireless network access, although sometimes they may physically attach to the network for a better or cheaper connection. Wireless communication is much more difficult to achieve than wired communication because the surrounding environment interacts with the signal, blocking signal paths and introducing noise and echoes. As a result wireless connections have a lower quality than wired connections: lower bandwidth, less connection stability, higher error rates and moreover, with a highly varying quality.

1.4.1. Issues in networked wireless multimedia systems

Issues which were identified in networked wireless multimedia systems are listed below:

1. The need to maintain quality of service (throughput, delay, bit error rate, etc) over time-varying channels.
2. To operate with limited energy resources, and
3. To operate in a heterogeneous environment.
4. Pre-configuration of system is required.
5. Firewall blocks.

Hence, all above problems using wireless communications can be solved using 3G technology as well as energy efficiency can also be obtained. Thus, Bluetooth/3G technologies are used to implement one to one connection as well as one too many connections between mobile and laptops/desktops. The rest of the paper is organized as follows: In section 2, we have described the proposed system and the applications of the system in various fields, Section 3 describes design consideration for Mobile Broadcasting using Bluetooth/3G , Section 4 and 5 describes the implementation and step wise results for the implementation of the system. Finally Section 6 summarizes the paper.

II. PROPOSED SYSTEM

The main aim of the application is to stream live videos and images from any camera compatible mobile device supporting wireless technologies. Steps for broadcasting the images and videos are explained below:

1. First the mobile handset is connected to the PC using 3G or Bluetooth and then the video is transmitted as and when it is captured and simultaneously shown on a PC. This is an exciting step forward in the development of 3G and offers an easy solution for mobile operators to offer 3G visual communications to subscribers on desktops and laptops as well as on 3G handsets. PC-to-Mobile allows operators to immediately increase the critical mass of 3G enabled handsets, encouraging and developing a larger community of 3G users and expanding the boundaries of peer-to-peer visual communications 3G networks.
2. Secondly, the PC to which this live video is transmitted then broadcasts the video to other PCs or mobile handsets depending upon the user's choice using internet. The Mobile-to-PC solution leverages the power of both PCs and 3G mobile devices to fuel 3G proliferation and enable subscribers to use any PC with a broadband Internet connection as an extension of their 3G mobile handsets, subscriptions and accounts.

2.1. Applications of the system

Applications for the system in different fields are given below:

1. **Conferences**-Broadcasting of Business Conferences, News Conferences and educational conferences in minutes without setting up anything.
2. **Premium content** -Expressing interest in recent movies, premium sporting events, and other programming on a subscription or pay-per-view basis.
3. **Advertisements** -Consumers are increasingly willing to view ads as part of a mobile media experience, highlighting the potential for a smooth transition of local broadcastings free-to-air value proposition to mobile. The potential for subscription-based services is also strong with almost 50% of viewers would prefer ads on mobiles.
4. **Critical Delivery of Live, Local Information and Emergency Alerts on Mobile Devices -** The key strength of any broadcaster is its ability to respond quickly to live events and to reach millions of viewers with a single digital broadcast transmission -- a system designed to enable fast, easy, and robust reception on mobile.
5. **Non Real-Time Services -** Enables delivery of content for local storage for playback/display at a later time. For example, local advertiser locations and sales could be sent in advance; when a device determined that it was close, a promo could be displayed. Another example might involve the Mobile receiver in the vehicle gathering content for playback on a trip.
6. **Social Networking Site -** It can allow users to stream video directly to any social networking site. For example they can broadcast videos directly to their Facebook wall

III. DESIGN ARCHITECTURE

3.1. Architectural block diagram

The Architectural Block Diagram for the application is as shown in fig.1

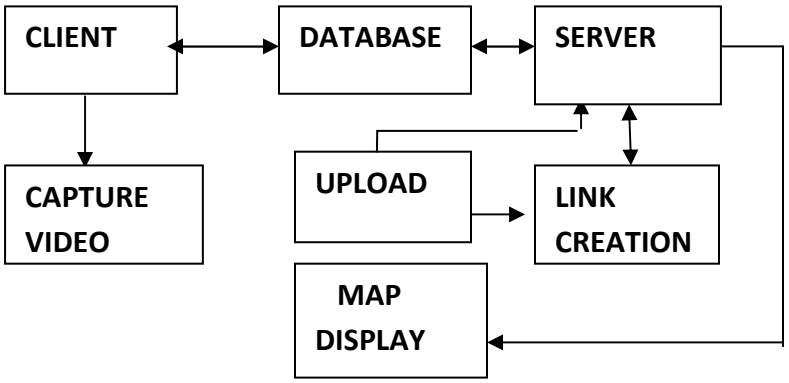

Figure1: Architectural Block Diagram for the system

Various blocks which are involved in the application are explained below:

1. **Client:** This block represents the user interface of a mobile device through which the video is captured. The user is authenticated through this interface with the help of user id and password.
2. **Database:** Database contains user ids and passwords of all the users that have been registered. It also contains videos which were captured from the mobile device.
3. **Capture Video:** The video is captured through the mobile device.
4. **Upload:** The video captured through the mobile device is then uploaded on server. Through server, the video is transmitted to other devices.
5. **Server:** The videos are uploaded on server. Server then links the video to other devices with the help of the database.
6. **Link Creation:** After uploading the video on server, a link is created for each video in order to map the video with other devices on which the video is to be broadcasted.
7. **Map Display:** After mapping, the video is broadcasted on multiple devices such as computer, mobile and other devices

IV. IMPLEMENTATION DETAILS

The application is a J2ME application taking advantage of Bluetooth in mobile phones. Bluetooth allows devices to communicate wirelessly and J2ME allows you to write custom applications and deploy them on mobile devices. The implementation details for the system are explained below:

4.1. User Interface

1. The User interface is deployed on the client phone. The application starts with a splash screen "Mobile Broadcasting".
2. The next screen is displayed after a lag which gives the user the options to choose from Image using Bluetooth/3G, Video using 3G.
3. The user can select from the options depending on whether he has to broadcast images, video or chat via Bluetooth.

The User Interface with options is shown in the following figure 2

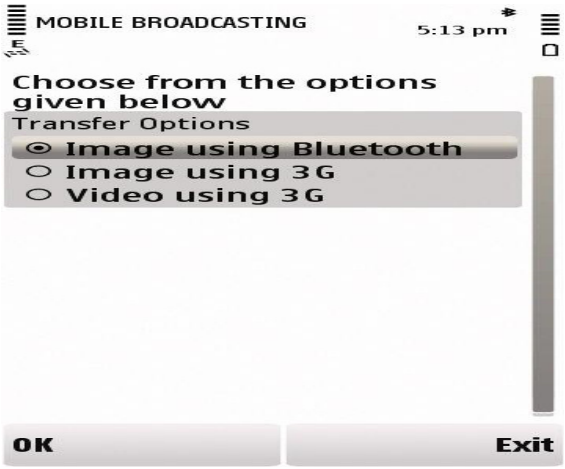

Figure2: Start Screen of the Application

Options from the above figure 2 are explained as follows:

4.1.1. Image using Bluetooth

If the user selects the image using Bluetooth option, user is directed to perform the following operations:
1. Start Bluetooth Device Enquiry
2. Match the service with the device where server is running
3. Transmit the live images to the server

The working of the above procedure is explained in the following part. For the client to match service with the server, the service has to be first started on the server. The live images are taken immediately after the services are matched and the transmit button is clicked.

4.1.2. Video using Bluetooth/3G

If the user selects the video using 3G option, user is directed to perform the following operations:
1. Start Bluetooth Device Enquiry
2. Match the service with the device where server is running.
3. Transmit the video to the server

The working of the above procedure is explained in the following part. For the client to match service with the server, the service has to be first started on the server.

V. RESULTS AND DISCUSSION

Implementation results of the system using Bluetooth and 3G are explained below:

The important features provided by the application are:
1. Broadcast of Images
2. Broadcast of Video

The results for the above procedure are explained in the following part. For the client to match service with the server, the service has to be first started on the server.

5.1. BLUETOOTH

The client side results for the systems are being illustrated by the following figures

1. **Splash Screen** : As the application starts, the splash screen displays “Mobile Broadcasting” at the client side.

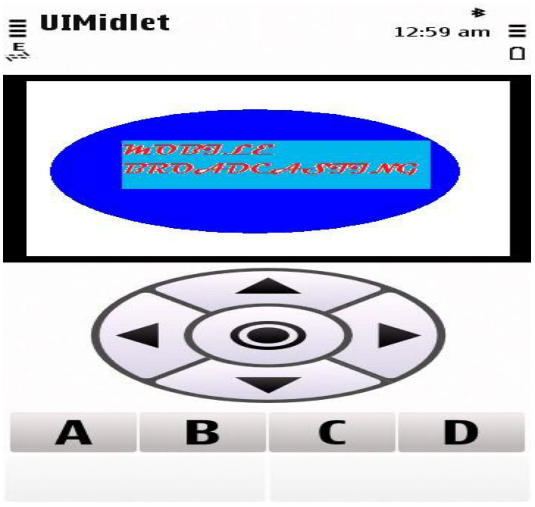

Figure 3: Client UI

2. **Option Screen**: Option screen displays the various options which a client can choose for broadcasting of images using Bluetooth/3G and video using 3G. Figure 4 shows that the user has selected the option Image using Bluetooth

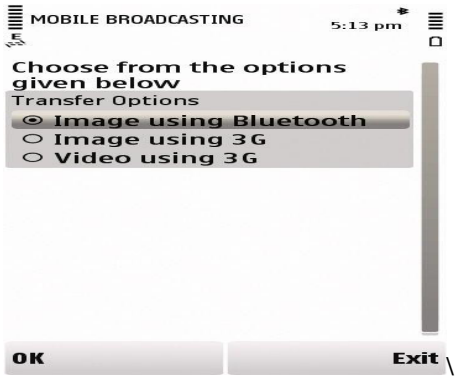

Figure 4: Option Screen

3. Search for Bluetooth Devices: Then the application on the client mobile starts searching for devices which are connected through Bluetooth.

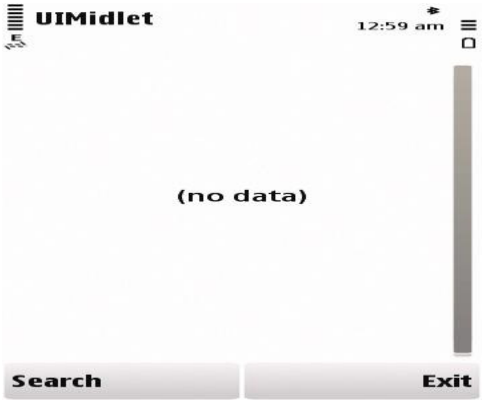

Figure 5: Service Search Screen

4. **Starting Device Inquiry**: Start device Inquiry helps in identifying the devices and initiates the process.

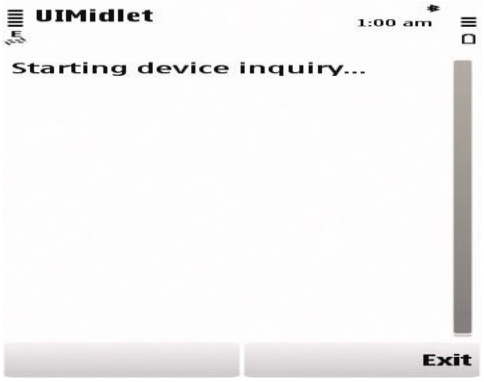

Figure 6: Service Starting Screen

5. **Listing of Devices and Matching Service with Devices found:** Then the application will display the list of devices connected through Bluetooth and match the service with the device where application server is running

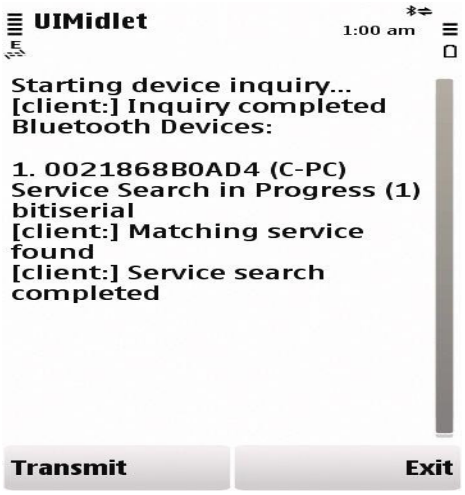

Figure 7: Service Search Completed Screen

6. **Display of Image on the Mobile**: Finally the image which is to be transferred to the server is clicked in mobile.

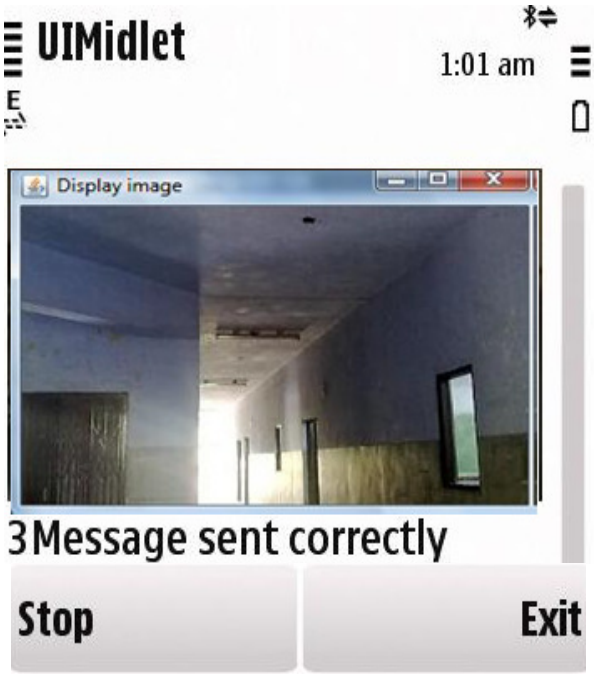

Figure8: Display Image UI on Client

The server side results are being illustrated by the following figures:

1. **Bluetooth Receiver :** To transmit the images on the server, the matched server connected through Bluetooth found in the above steps is selected to transmit the images.

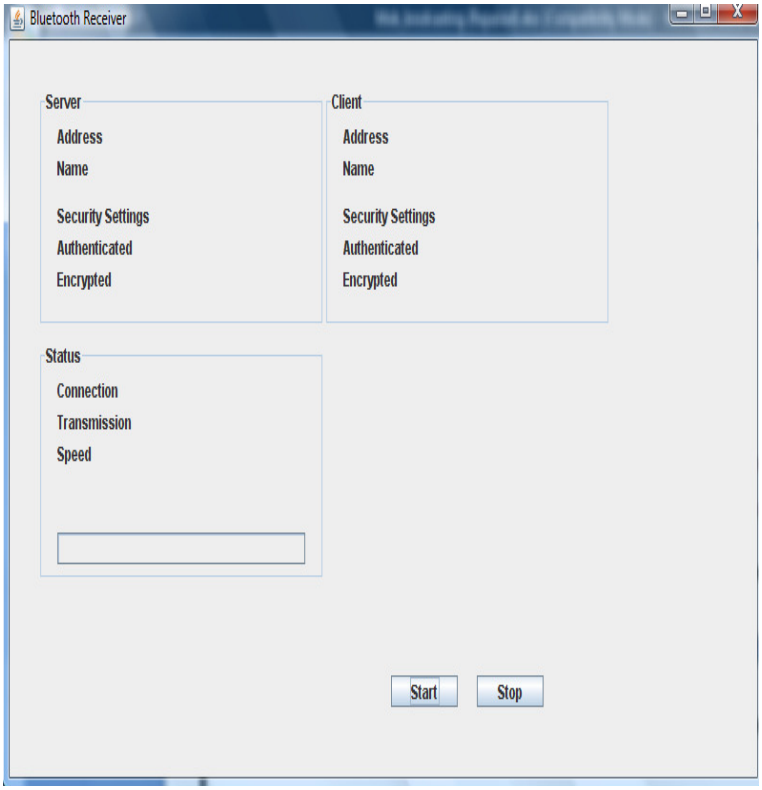

Figure 9: Server UI

2. **Starting service:** For the client to match service with the server, the service has to be first started on the server. The live images are taken immediately after the services are matched and the transmit button is clicked**.**

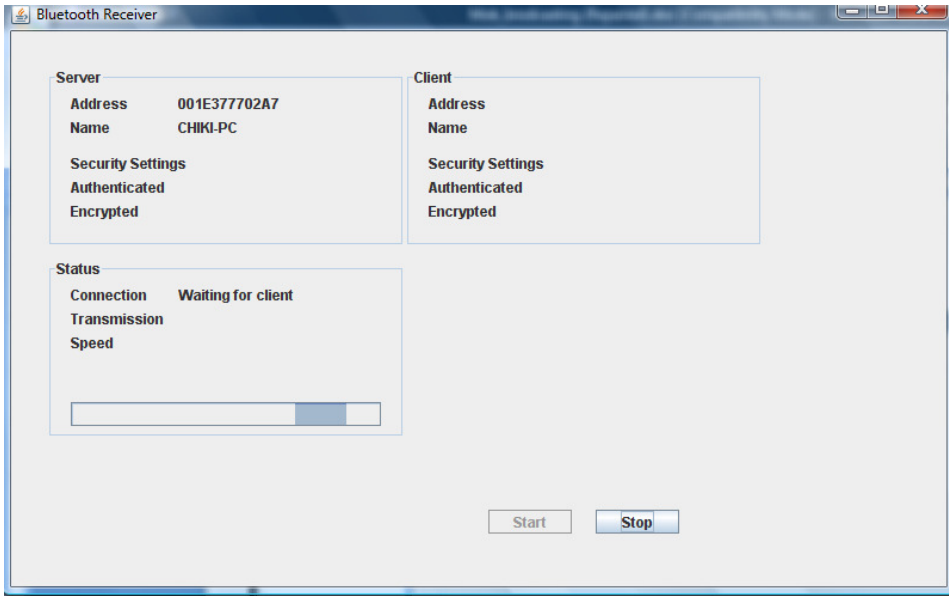

Figure10: Start Service

3. **Display of images on the server**: Thus the image is transferred to the server.

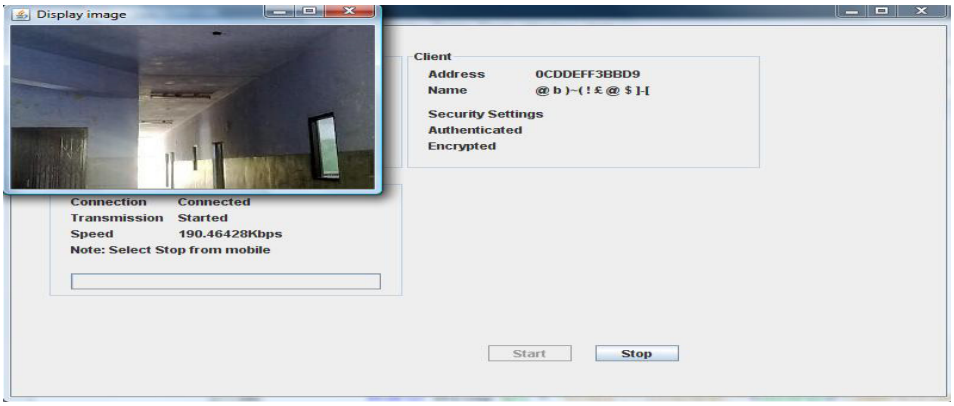

Figure 11: Display Image UI on Server

4. **Broadcast to multiple computers**: In the same way image can be broadcasted to multiple computers.

Figure 12: Image UI on Multiple Devices

5.2. 3G

The client side results for transferring of images using 3G are being illustrated by the following figures:

1. **Option Screen**: Again Option screen displays the various options which a client can choose for broadcasting of images using Bluetooth/3G and video using 3G.The option selected is Image transfer using 3G.

Figure 13: Option Screen

2. **Capture image on mobile**: The image is live captured through mobile

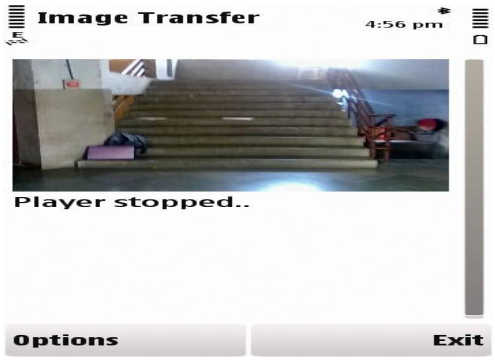

Figure 14: Capture Image

3. **Transfer image to the server**: Using the same above procedure image is transferred to the server.

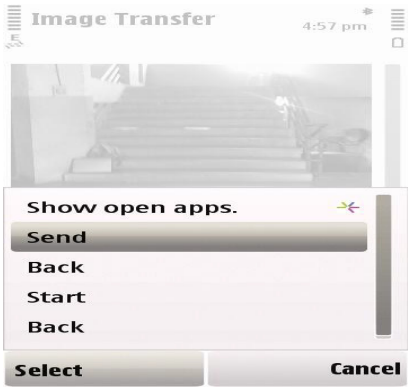

Figure 15: Transfer Image Screen

The server side results are being illustrated by the following figures:

1. **Display the Image or the Video on the server side:** Thus the image/video is finally transferred to the server as shown.

Figure 16: Display Image UI on Server

VI. CONCLUSION

Mobile Broadcasting using Bluetooth/3G is a mobile application which can broadcast images and videos to multiple devices such as computers or any other mobiles using Bluetooth / 3G.
This application can be used as an in-built feature in mobile phones for entertainment purposes and also for other personal uses. It can also offer advertisers and companies new opportunities to reach mobile consumers. As, most of the mobile devices are equipped with a camera, and are enabled with Bluetooth and 3G, which helps user in capturing and broadcasting live image/ video. Thus this is an advantage for the application.

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