

IoT based Online Home Surveillance System with Motion Detection

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Abstract— Presently, Home Automation is among all the sectors embracing Internet of Things, and is very appealing to the developers. Home Automation is the latest technological wave that can unleash wide range of new opportunities and new products into the market. "Smart Homes" is one such application of IoT under Home Automation which is a combination of all smart appliances, safety and security systems and energy equipment integrated by large number of newly emerging applications of phone and web. With the advent of new technologies every day, there is emerging demand for safety and security of the physical environment (homes, offices). Moreover, growing popularity of smart phones has increased the demands of using the web services to best. We are working for one of such application i.e. Online Home surveillance. The paper talks about our proposed design for the application and its features.

Keywords:- Internet of Things (IoT), Online Surveillance System, IP camera, security

I. INTRODUCTION

Today, Internet of Things is a multidimensional market that has found its implications and applications in every aspect of our lives starting from our homes to industry. A network of huge number and types of devices embedded together and connected to the network making our life more and more advanced. In this each object has its own identifier and they possess ability to transfer data over a network. This eliminates requirement of human intervention. It comprises of physical objects embedded with electronics, software, sensors, and network connectivity. These objects interact with each other by exchange of data collected by them. The objects can interact remotely thereby creating an interface between them. This improves accuracy and efficiency.

With the emergence of IoT, technology has moved towards the concept of smart homes. Idea of smart homes have brought new innovations like remotely locking or unlocking of doors, controlling the appliances (microwave, refrigerator, coffee maker etc) and devices (sound systems, washing machines etc.) of the home by smart applications and sensors. The concept of 'smart homes' is all about cobbling the existing devices through internet and making the world a more global village in terms of connectivity.

Large number of physical devices, sensors, equipment are being connected and embedded with each other to create a virtual network for extensive data collection and monitoring of this data for the statistical studies. IoT exploits this virtual network for automating the functions of our lives to maximum possible limits and bringing technology in every sphere of the human existence varying from homes to offices, hospital to entertainment sources, food to health etc. This virtual network is gaining importance day by day in the sector of 'Housing' or the 'Home Automation'.

Home Automation has a number of components from automatic lighting to changing music to baby monitoring [1]. A number of applications exist in the field of home surveillance. Web of Cam by Alfred Labs Inc. is an application which provides video and audio streaming and 2-way audio. CameraFi by Vault Micro Inc. provides video and audio display from a USB camera connected to the phone. Certain other applications like MX Player by J2 Interactive and VideoShow by EnjoyMobi Creative Studio provide video filtering and styling features.

Our application is different from these in the sense that the live feed is not stored anywhere. Whenever the user will login, he/she will see a live video from the IP camera. Moreover, we have included a motion detection system

which will sound an alarm in case of unexpected movements. This can be used both for surveillance system and baby monitoring. It can also be used in areas where high security is the need but the storage of the feed is not desired due to security reasons.

II THE PROPOSED SYSTEM

Online Surveillance System is the application of IoT in the field of Home automation. The motive of the project is to provide the user with the live video feed of the camera installed at his home on a wireless personal device i.e. mobile phone through an android application. Android platform was chosen because of its wide popularity and usage. Application will continuously stream the live data from an IP based camera installed at the door of the house. It will be intelligent enough to detect any unexpected movement at the door and raise an alarm. This will enable the user to feel safe on the go as he/she can view the live feed anytime and anywhere thus giving him a sense of security.

2.1 Proposed Design

Following is the proposed design of the android application

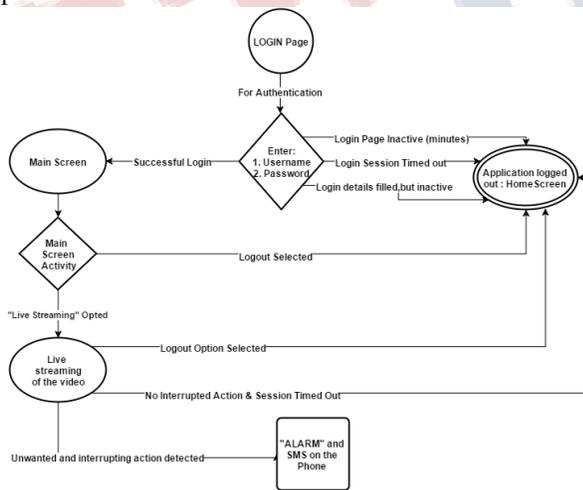


Fig. 1. Proposed Design of the Online Surveillance System application

III IMPLEMENTATION AND WORKING

Our work includes fundamentals and principles of video streaming and image processing applied to the Android application. The application is being developed using Android Studio.

3.1 Login

The user having the android phone, accessing the application needs to be a trusted user. For that purpose, authentication has to be done using a username and a password. For security purposes, cryptographic hash functions have been used and login session time out has been added. To prevent the misuse by third party of the previously fed information of valid user, login inactivity (minutes) timeout feature has been added along with the user login status window refreshes every (minutes). Following are the screen shots of the same.

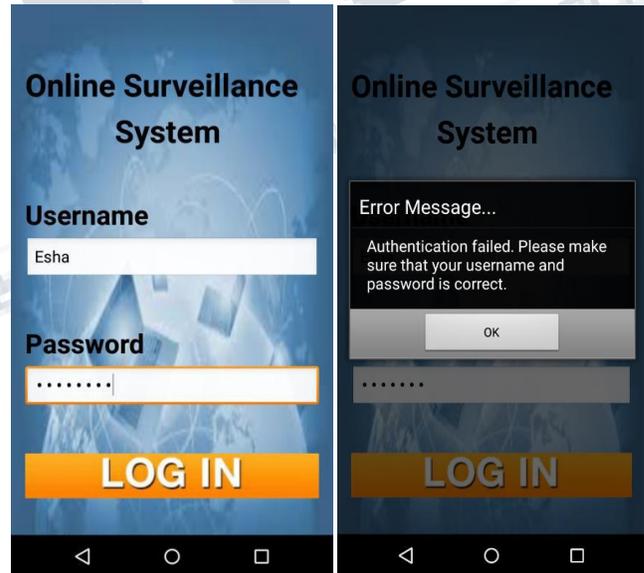


Fig.2. The first part of the figure shows the login page of the application and the second part shows the failed login due to wrong username or password

3.2 Streaming

The application requires a working internet connection to connect to the camera using its IP address.

After the authentication, the live video is being streamed directly from the IP camera in MJPEG (Motion JPEG) format. In this format each video frame is compressed separately as a JPEG image [2]. This format was preferred as with JPEG image of each frame available, we will be able to compare successive images for changes in pixels [4] and thus detect movement. Depending on the internet connection, there might be some lag in the live feed. Video frames i.e. the quality of the video will also vary according to the available network speed to the user. Following are the screen shots.

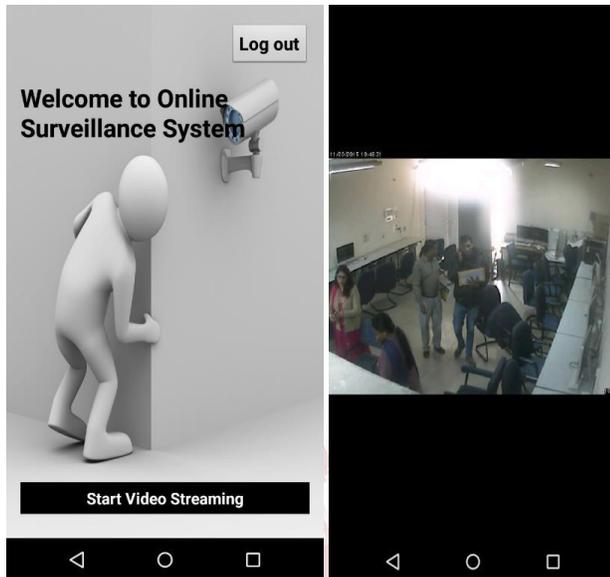


Fig.3. The first part of the figure is the main screen of the activity with the log out button where user will be opting for live streaming of video. The second part of the figure is the live video stream of an IP camera displaying the date, time and the frames per second (fps)

3.3 Storing

To reduce the maintenance and storage cost and considering the low bandwidth of internet of 2G/3G services, recordings of the camera are not stored on the cloud.

3.4 Detection

On detection of any unexpected movement or intrusion near the camera, pop up is given by the application

if the user is logged in. In addition an alarm [3] will be raised by the application to alert the user.

3.5 Assumptions

The following are the assumptions based on which system has been designed:

- ♣ The IP camera supports the MJPEG format
- ♣ We are currently working on Axis 210A/211A Network Cameras which have this feature. So, the application will work for cameras having similar features to it.
- ♣ The IP address of the camera is not a private one i.e. it can be accessed on the internet and is not specific to organisation intranet.

IV CONCLUSION

The Online Surveillance System has widespread applications. It can be used for home and office security, and for baby monitoring. It can be used in ATMs and in areas where high security is required. The system does not store the live video so, it is highly useful for government security agencies whose video feed can be misused if stored.

REFERENCES

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3. <http://developer.android.com/guide/index.html>
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