

The Idea of Innovative home protection System

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Abstract— Domestic security using IT has recently started making its significant mark on people's lives throughout the world. Hence, more and more advanced systems are being developed every day to enhance domestic security. But most of them are restricted to a certain level. One of the new systems has the basic idea which revolves around 3G/4G enabled cameras and our smart phones that make use of static real time and faster data processing. This system helps us in replacing the conventional CCTV with an advanced surveillance camera, that works using similar technology and which can also be developed to update into the system. This system has advanced features like fingerprints, face recognition etc. The main motive of creating this system is to make domestic security more secure, advanced and accessible.

Keywords—3G/4G , CCDP, ISP, HSPA+, Advance Surveillance Camera.

I. INTRODUCTION

The theory of third generation of mobile telecommunications technology is very modest and fast, despite the technicalities of underlying hardware. The most important feature of this system is an advanced observation camera connected to a 3G router or to be more precise, mobile Broadband modem. Creative use of such technologies, domestic security will reach an optimum level and may provide excellent results in the mere future. The system makes the use of surveillance cameras and a 3G router, both the component completes the entire system, ensuring us to monitor our home from any part of our world from any part of the world. Features include facial recognition system and static real time data processing. The facial recognition system includes both type one and type two error correction that includes false positive as well as false negative. Static real time helps in better image processing and hence yields superior images ignoring both false positives and false negatives. Moreover, making the use of CCDP (Closed Circuit Digital Photography) for capturing and saving high resolution photographs help in monitoring the video at a later stage. Since 3G technology is implemented the transferring of high resolution videos is convenient. The system works in such a manner that the surveillance camera starts recording whenever the calling bell is pressed. The camera is connected parallel with the calling bell. As soon as the bell is pressed the video is recorded up to a specific time and the digital signal is sent to the 3G router which is connected to the camera via USB port. Finally, we can monitor the entire video or the snapshot in our 3G enabled Smartphone. Additionally the system can also be used to capture snapshots as it works on static real time environment.

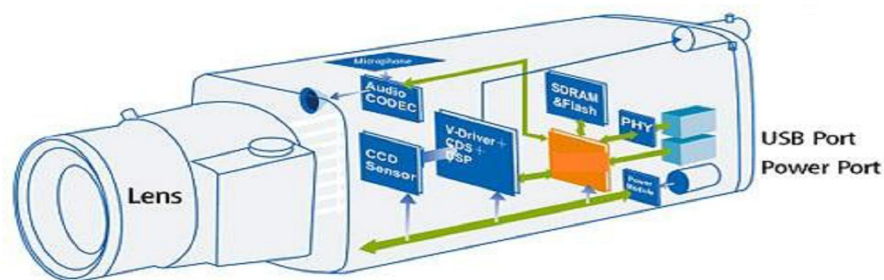


Fig.1: SIM card installed within the circuit for implementing 3G or 4G services

A mobile broadband modem as a connect card or data card, is a type of modem that allows a laptop, a personal computer or a router to receive Internet access via a mobile broadband connection instead of using telephone or cable television lines.

A modem (modulator-demodulator) is a device that modulates an analog carrier signal to encode digital information and demodulates the signal to decode the transmitted information. The goal is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data. The most familiar type is a voice band modem that turns the digital data of a computer into modulated electrical signals in the voice frequency range of a mobile channel. These signals can be transmitted over mobile lines and demodulated by another modem at the receiver side to recover the digital data. A mobile Internet user can connect using a wireless modem to a wireless Internet Service Provider (ISP) to get Internet access. 3G networks have taken this approach to a higher level, using different underlying technology but the same principles. They routinely provide speeds over 300kbit/s

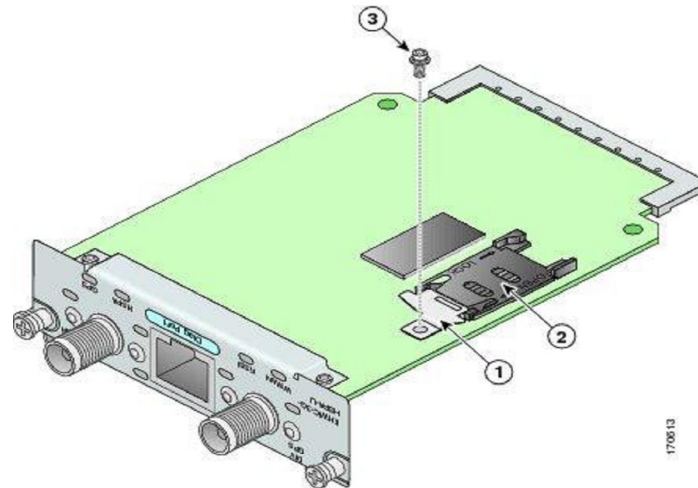


Fig.2: circuit board used in 3G ROUTER 3g system & router.

Due to the now increased internet speed, internet connection sharing via Wireless local Area Network has become a workable reality. Devices which allow internet connection sharing or other types of routing of cellular networks are called also cellular routers. High Speed Packet Access (HSPA). Packet Access is a technical standard for wireless, broadband telecommunication. High Speed Packet Access (HSPA+) enhances the widely used Wideband Code Division Multiple Access (WCDMA). Universal Mobile Telecommunications System (UMTS) based 3G networks with higher speeds for the end users that are comparable to the new networks.

HSPA+ provides an evolution of High Speed Packet Access and provides data rates up to 168Megabits per second (Mbit/s) to the mobile device (downlink) and 22 megabit/s from the mobile device (uplink).Several mobile broadband modems vended nowadays also have built-in routing capabilities. They provide traditional networking interfaces such as Ethernet, USB and Wi-Fi. Models are available for both consumers and enterprises. Some require the use of an AC adapter, while others are portable and can also be powered by a USB connection or a built-in battery. An RJ45 registered jack is also present on a few of these modems, allowing the connection of a Traditional home phone to make cellular calls.

II. FACIAL RECOGNITION SYSTEM

A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features from the image and a facial database. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. Some facial recognition algorithms identify facial features by extracting landmarks, or features, from an image of the subject's face.

II.1 A GENERIC FACE RECOGNITION SYSTEM

The input of a face recognition system is always an image or video stream. The output is an identification or verification of the subject or subjects that appear in the image or video. Define a face recognition system as a three step process - see Fig3. From this point of view, the Face Detection and Feature Extraction phases could run simultaneously.

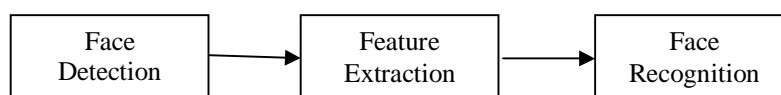


Fig.3: A generic face recognition System.

Face detection is defined as the process of extracting faces from scenes. So, the system positively identifies a certain image region as a face.

II.2 FACE DETECTION PROBLEM STRUCTURE

Face Detection is a concept that includes many sub-problems. Some systems detect and locate faces at the same time, others first perform a detection routine and then, if positive, they try to locate the face. Then, some tracking algorithms may be needed.

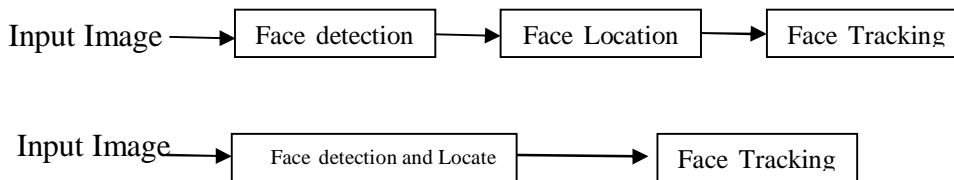


Fig.4. Face detection processes.

Face detection algorithms usually share common steps. Firstly, some data dimension reduction is done, in order to achieve an admissible response time. Some pre-processing could also be done to adapt the input image to the algorithm prerequisites. Then, some algorithms analyse the image as it is, and some others try to extract certain relevant facial regions. The next phase usually involves extracting facial features or measurements. These will then be weighted, evaluated or compared to decide if there is a face and where is it. Finally, some algorithms have a learning routine and they include new data to their models. Face detection is, therefore, a two class problem where we have to decide if there is a face or not in a picture. This approach can be seen as a simplified Face recognition problem. Face recognition has to classify a given face, and there are as many classes as candidates. Consequently, many face detection methods are very similar to face recognition algorithms. Or put another way, techniques used in face detection are often used in face recognition.

II.3 DETECTION METHODS DIVITED INTO CATAGORIES

- Knowledge-based methods. Ruled-based methods that encode our knowledge of human faces.
- Feature-invariant methods. Algorithms that try to find invariant features of a face despite its angle or position.
- Template matching methods. These algorithms compare input images with stored patterns of faces or features.
- Appearance-based methods. A template matching method whose pattern database is learnt from a set of training images.

Knowledge-based methods:

These are rule-based methods. They try to capture our knowledge of faces, and translate them into a set of rules. It's easy to guess some simple rules. For example, a face usually has two symmetric eyes, and the eye area is darker than the cheeks. Facial features could be the distance between eyes or the color intensity difference between the eye area and the lower zone. The big problem with these methods is the difficulty in building an appropriate set of rules. There could be many false positives if the rules were too general. On the other hand, there could be many false negatives if the rules were too detailed. A solution is to build hierarchical knowledge-based methods to overcome these problems. However, this approach alone is very limited. It's unable to find many faces in a complex image.

Template matching:

Template matching methods try to define a face as a function. We try to find a standard template of all the faces. Different features can be defined independently. For example, a face can be divided into eyes, face contour, nose and mouth. Also a face model can be built by edges. But these methods are limited to faces that are frontal and unconsulted. A face can also be represented as a silhouette. Other templates use the relation between face regions in terms of brightness and darkness. These standard patterns are compared to the input images to detect faces. This approach is simple to implement, but it's inadequate for face detection. It cannot achieve good results with variations in pose, scale and shape. However, deformable templates have been proposed to deal with these problems.

Appearance-based methods:

The templates in appearance-based methods are learned from the examples in the images. In general, appearance-based methods rely on techniques from statistical analysis and machine learning to find the relevant characteristics of face images.

Some appearance-based methods work in a probabilistic network. An image or feature vector is a random variable with some probability of belonging to a face or not. Another approach is to define a discriminant function between face and non-face classes. These methods are also used in feature extraction for face recognition

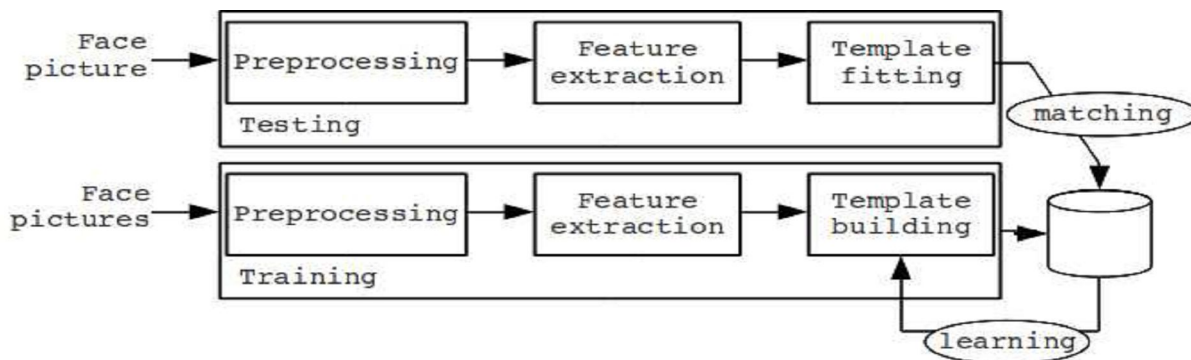


Fig.5 Template-matching algorithm diagram

III. FALSE POSITIVE ANALYSIS

False positive mainly deals with face recognition system. False positives are of two types. Type I, Type -II. False positive and false negative are the two main distortions that disrupts the proper image output That is sometimes they detect image when no image actually presents which is better known as T1 and vice versa. A type I error is one that looks at information that should not substantially change one's prior estimate of probability, but does. A type II error is one that looks at information which should change one's estimate, but does not. Both types of errors are problems for individuals, corporations, and data analysis.

IV. ADVANCE SURVEILLANCE CAMERA

The advance surveillance camera is a "self-designed" camera that has a USB port connected to a 3G router. The camera is also connected parallel to the calling bell, so that it takes a real time snap of the person near the camera. The basic block diagram of the surveillance camera has been just like CCTV, with an advance recording system that supports high resolutions in motion as well as still images that can be easily transferred to the 3G router.

V. LITERATURE REVIEW

Described an advance surveillance camera that can be connected to a 3G cellular router, also known as a mobile broadband modem. The router is connected to a 3G enabled Smartphone. With the help of this Smartphone application, a person can view his home, from any part of the world, with the 3G cellular service. The advantage is, that it is much easier and convenient for a person to detect any sort of robberies or theft, as they can monitor it, & with a face recognition system they can identify the real criminal, without actually being physically present. This makes security much more advance and safe. There is no need to appoint a security person or use a CCTV. But there are some disadvantages of this system too. Disadvantages like the battery consumption due to the access to the 3G router. The system is not very cost effective as a 3G router will not come at a cheaper price and 3G enabled Smartphones with data connection may be an expensive affair.

VI. CONCLUSION

The main idea of innovative home protection system is to run the smartest and the most Innovative way of domestic security and at the same time making it a product that has good Value for money and of multiple use. Because here we not only can use the router for security purposes, but also for our domestic broadband purposes. 3G is the fastest medium and is supported worldwide and it reaches its desired locations within seconds, making use of 3G for surveillance purposes can bridge a huge gap of insecurity among domestic environment as well as commercial cases. The idea makes use of a "self-defined setup" that includes a camera, the resolution depends upon its user, a 3G router and our mobile device or 3G enabled Smartphone. Using such means we can easily locate any visitors at our doorsteps or this technology has also paralleled application and similar domains and security fields. The block setup has been up keeping in mind of conserving electricity and making the entire system even smarter with its parallel and series connection with its setup constraints.

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