

# Remote Sensing with Internet Based Patient Condition Observing System

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## Article Info

### Article history:

Received Nov 30, 2017

Revised Jan 29, 2018

Accepted Feb 17, 2018

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### Keywords:

Diagnostic

Medical

Video

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## ABSTRACT

This Paper aims to design and demonstrate an innovative web-based remote healthcare diagnostic system that provides vital medical data and live video images of a patient situated in the rural area accessible to a health professional available elsewhere in urban centres resulting in better diagnosis and treatment of that patient.

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## 1. INTRODUCTION

Automation is recently used in vast areas of industries, performing multiple tasks. Robots, a model of automation, are faster, more productive and more accurate, and show a significant number of tasks that are either too dangerous or undesirable for humans to do. Their applications cover a broad range from manufacturing, cleaning and maintenance, to bomb disposal. They are presently very specialised, only being able to perform a few pre-planned tasks and are widely used in industrial and defence applications [1]-[2]. However, they are starting to be used more for civil applications. Personal robots like the ones found in many futuristic novels and movies are intelligent, can perform a set of tasks, to make decisions on the fly allowing them to adjust to and interact with their environmental surroundings. For this to become reliability, robots need to be not only smarter but must be enabled to be more aware of their environment surroundings [3].

## 2. EXISTING PROBLEMS

One of the key challenges India is facing today is Rural versus Urban divide in Healthcare. World Health Organization ranks India's healthcare system at 112 out of 190 countries. For those living in urban areas, high-quality healthcare is readily available. But a staggering 70% of our population lives in rural India and don't get the same healthcare facilities as their urban counterparts [4]. In contrast, urban centres have specialist doctors and high-quality clinics to provide quality healthcare. In this scenario, how the country should transform its healthcare system is the biggest question that needs an answer.

### 3. PROPOSED METHOD

Various medical sensors are used to collect patient medical data and sent to the monitoring station for interpretation. The sensors are 3-channel ECG, Blood pressure, Pulse rate, Respiration rate, Body temperature, Body position. The system does include an advanced camera sensor to provide live video images of the patient.

#### 3.1. Embedded Web Server

The project uses an ARM Cortex-M4 based microcontroller that acts as a web server that sends data to the client-side application. Any device with an Internet browser such as the smartphone or PC/Laptop can be used to monitor the data feed [5]. The client-side user authenticated with a unique username and password before accessing streaming content. The web server is responsible for serving the web pages, servicing the client request and for maintaining the TCP/IP connection until the user ends the session. Web pages are constructed with HTML language. The device uses the LwIP open source TCP/IP protocol stack for its internet connectivity.

#### 3.2. Medical Sensors

A 3-channel analogue signal conditioning circuitry based on AD8232 is used to measure ECG signal. ECG represents the electrical activity of the heart and helps to diagnose various heart conditions. The chip is designed to extract, amplify, and filter the tiny bio-potential signals generated from the heart. Three pins RA (Right Arm), LA (Left Arm), and RL (Right Leg) are used to attach the sensor leads to the weak body.

A digital blood pressure sensor is used to measure patient blood pressure. It consists of an inflatable cuff and an analogue pressure sensor circuitry. Pulse rates the measures from the ECG signal design and performance analysis of the MIMO-OFDM system using different antenna configurations discusses the [6]. Respiration rate sensor calculates a patient's breathing rate by detecting changes in temperature when the patient breathes in and out. A 3-axis MEMS accelerometer sensor measures the body position and an analogue temperature sensor measures body temperature.

#### 3.3. Live Video Feed

The system consists of a camera sensor to stream a live video feed. When the request is made the onboard microcontroller captures the JPEG images from the camera using the built-in DCMI peripheral and starts to stream it over the web in MJPEG compression format at an acceptable rate between. The image resolution is fixed at 470 x 272. The microcontroller has a large RAM area, about 256KB, which is a must for this kind of application Reactive Power Pricing Using Group Search Optimization in Deregulated Electricity Market explain in [7]. Research and Application of Development Model of Information Service for LOT of Oil and Gas Production Based on Cloud Architecture describe the [8]. Cloud Connected Smart Gas Cylinder Platform Senses LPG Gas Leakage Using IOT illustrates the [9].

#### 3.4. Security

Before connecting with the system, the user has to enter the login username and password which is a much-needed security measure to prevent others from accessing the content. Once logged in, the user allowed accessing all the data including the video feed.

#### 3.5. Embedded RTOS

A real-time operating system is necessary to handle the timely events and other multitasking requirements of the project. Here FreeRTOS is chosen to provide this ability. FreeRTOS is the number one real-time operating system in the world.

4. IMPLEMENTATION & RESULTS

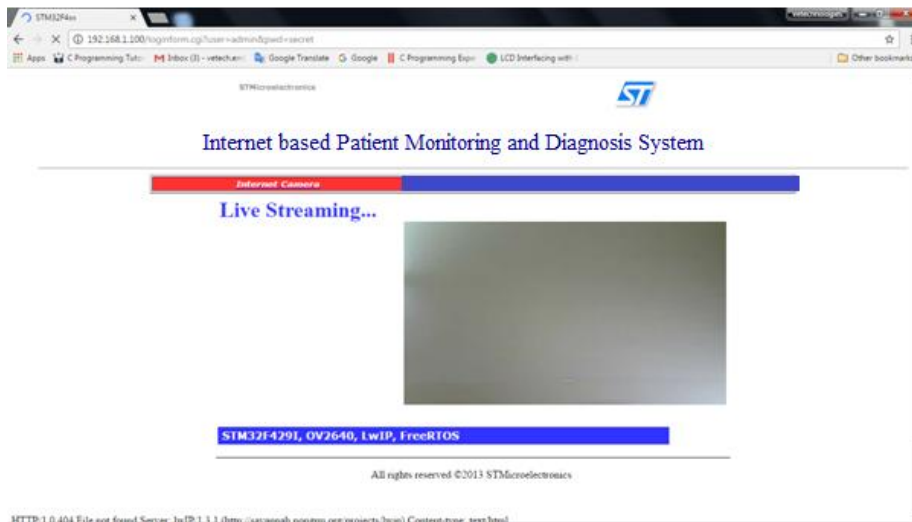


Figure 1. Live Streaming Video



Figure 2. Real-Time Patient Health Status

5. CONCLUSION

The real-time based with remote health monitoring system which seamlessly renders real-time ECG data and blood pressure and other sensors. The sensor reading helps the doctor to assess the patient's condition from any remote location with ease. In this system can help most of the scenarios like as clinical/home/outdoor care. In-home scenario, this system can assist in post-surgical surveillance of patient condition to monitor recovery process. In a clinical setup, this system can be used for pre-surgical monitoring and during a transitory period when a patient has shifted from ICU to the regular ward.

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