

Smart Kitchen Using Alerting System and IOT

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1. Title of the Paper:

Smart kitchen using the alerting system and IoT.

2. Technical Field of The Research:

1. Internet of Things (IoT)
2. Embedded microcontroller, cloud server, and sensors
3. Low-cost environment
4. Manual sensor Arrangements

3. Objectives:

1. Smaller size and lightweight.
2. It can be used for multiple purposes like Gas sensors, Smoke detection, Motion detection, Temperature and Humidity, and Fire alarm.
3. They are designed with the Indian prospect for usage in the Indian and Abroad market.
4. To solve the existing problem of Kitchen Hazard.
5. The running cost of the device will be minimal.
6. App-based interface and alerting system.
7. Smart gateway for the scalable environment.

Introduction

There is a smart gateway for multiple sensors directly paired and communicating with live data stream over the online database. Users select the available sensor using the app interface and view live data coming from the gateway. The Smart Gateway makes the process seamless by directly communicating with the sensors and making the home network less cluttered. Our app has a login screen and registration screen, with this we can have a layer of authentication and security. Our web app is like our mobile app but also has various debug commands for advanced users. The technologies used are open source and license-free (GNU GPL).

All the components are assembled in a small box the weight of all components including its box is less than 250 grams. We can use this system for multiple purposes. It is designed in such a way that it can be easily installed and used. It is a very cost-effective system.

Hardware specification:

The system proposed consists of five major modules namely, Gas Sensor (MQ4), Smoke Sensor (MQ2), PIR(SR501), Temperature and Humidity (DHT11), and Fire Alarm (Buzzer).

- Gas Sensor (MQ4) - The MQ4 Methane Gas Sensor can detect the presence of methane gas in the atmosphere (proximity) and provides an analog voltage reading. Leak detection is possible with a sensing range starting from 300 ppm and ranging to 10,000 ppm. For example, the sensor will detect if the gas stove is turned on but not lit.

- MQ2 Smoke Sensor - The MQ2 Smoke Sensor senses combustible gases and smoke. It can sense combustible gases and smoke in the atmosphere. The Gas sensor's output voltage tends to rise as the gas concentration rises.
- PIR(SR501) - The PIR Motion sensor module works on an infrared-based automatic control module. It uses the LHI788 probe, which has high sensitivity, high reliability, low voltage operation, and low power consumption. It is suitable for a wide range of automatic induction electrical equipment.
- Temperature and Humidity (DHT11) - The DHT11 is a simple digital temperature and humidity sensor that is extremely low in price. It measures the ambient air with a capacitive humidity sensor and a thermistor and outputs a digital signal on the data pin (no analog input pins needed). It is simple to use, but data collection involves timing.
- Fire Alarm (Buzzer) - A fire alarm is a sounder or a bell that emits an electronic signal. To warn people that there is a fire in the house, the alarm emits a bright, high-pitched sound. Different tones should be programmed into the sounders. In most European countries, fire alarm sounders sound like a siren. A continuous ringing sound is generated by the bell.

Software specifications:

The proposed system consists of an android application. The user can access a variety of functions through this Smartphone program. A remote connection to the home microcontroller is proposed in the given system. Managing the schedules of the instruments and sensors is a critical component of the proposed framework. This is also where system monitoring and control take place.

Software Requirements

Cloud Service-

- Amazon Web Services - Amazon Web Services is a division of Amazon that offers metered pay-as-you-go cloud computing systems and APIs to individuals, businesses, and governments.
- Mosquitto - Mosquitto is an open-source lightweight message broker that supports MQTT versions 3.1.0, 3.1.1, and 5.0. Roger Light wrote it in C, and it is available as a free download.

Database-

- MongoDB - MongoDB is document-oriented database software that runs on several platforms. MongoDB is a NoSQL database software that works with JSON-like documents and optional schemas. MongoDB is a database that was created by MongoDB Inc. and is distributed under the Server-Side Public License.
- Firebase - Firebase is a Google platform for developing mobile and web apps. It started as a stand-alone business in 2011. Google bought the platform in 2014, and it is now their primary software creation platform.

App Designing-

- Android Studio - Based on JetBrains' IntelliJ IDEA software and developed specifically for Android production, Android Studio is the official integrated development environment for Google's Android operating system.
- Java - Java is a class-based, object-oriented programming language with the fewest possible implementation dependencies.

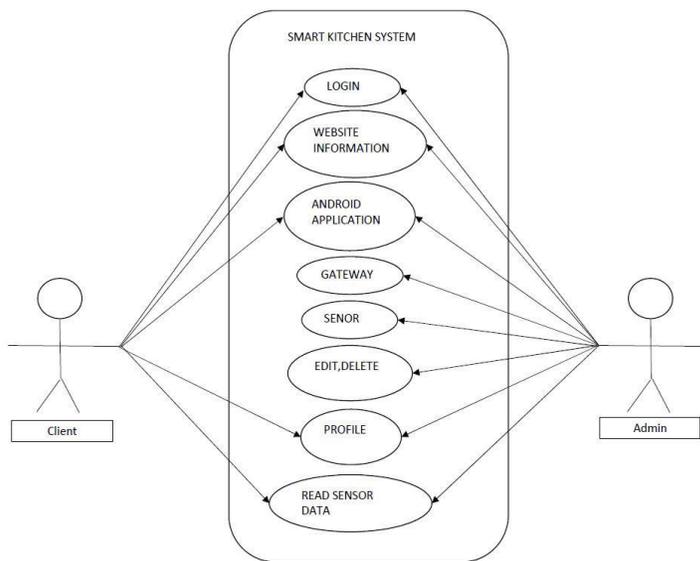
Microcontroller & Sensors-

- C Lang - C is a procedural computer programming language with a static type framework that supports structured programming, lexical variable scope, and recursion. C was created with constructs that map well to common machine instructions.

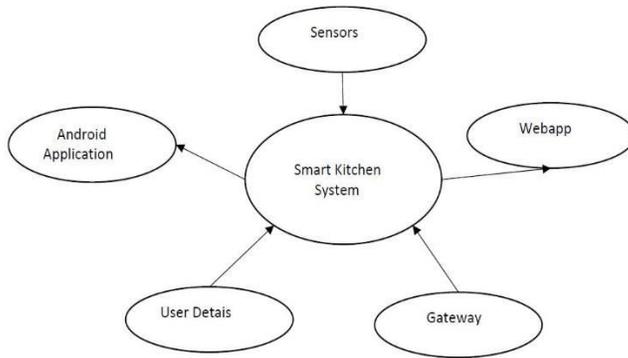
Website –

- HTML (Hypertext Markup Language) is a markup language for documents that are intended to be viewed in a web browser. Technologies such as Cascading Style Sheets and scripting languages like JavaScript can help.
- Cascading Style Sheets (CSS) is a style sheet language used to define the look of a document written in a markup language such as HTML. CSS is an acronym for Cascading Style Sheets. Along with HTML and JavaScript, CSS is a key component of the World Wide Web.
- Bootstrap - Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It includes design templates for typography, shapes, buttons, navigation, and other interface elements that are based on CSS and JavaScript.
- JavaScript - JavaScript, also known as JS, is a scripting language that follows the ECMAScript definition. JavaScript is high-level, often just-in-time compiled, and multi-paradigm. Curly-bracket syntax, dynamic typing, prototype-based object orientation, and first-class functions are all features of this language.

Use Case Diagram



Context Level Diagram

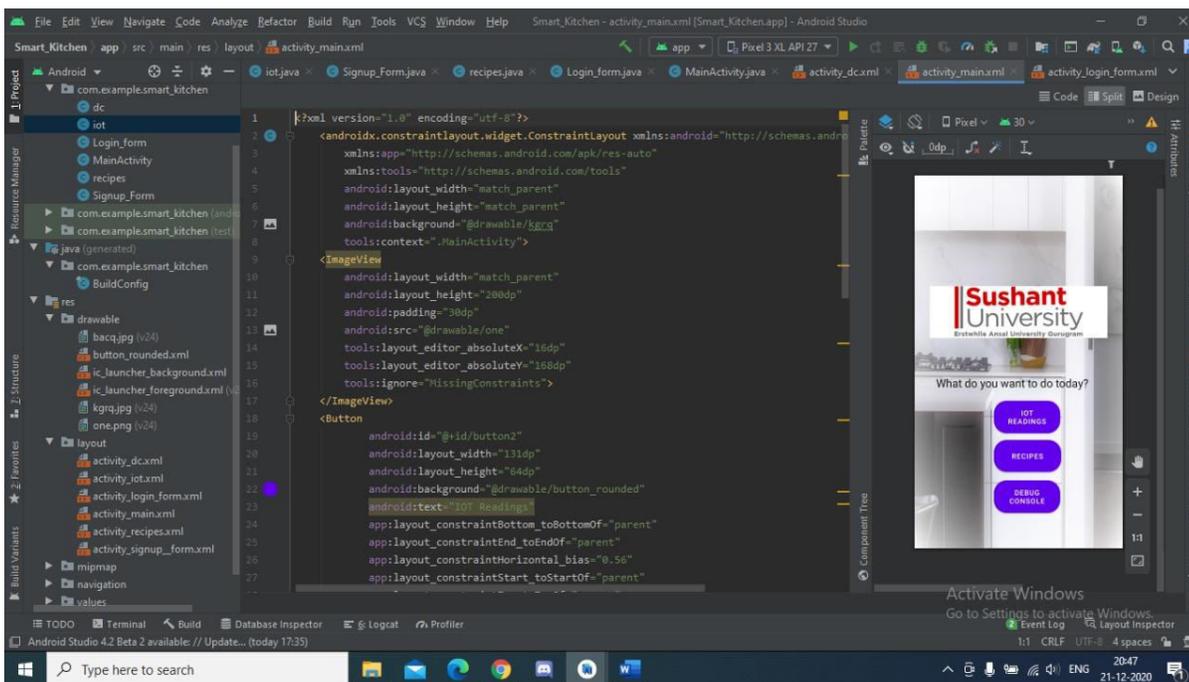
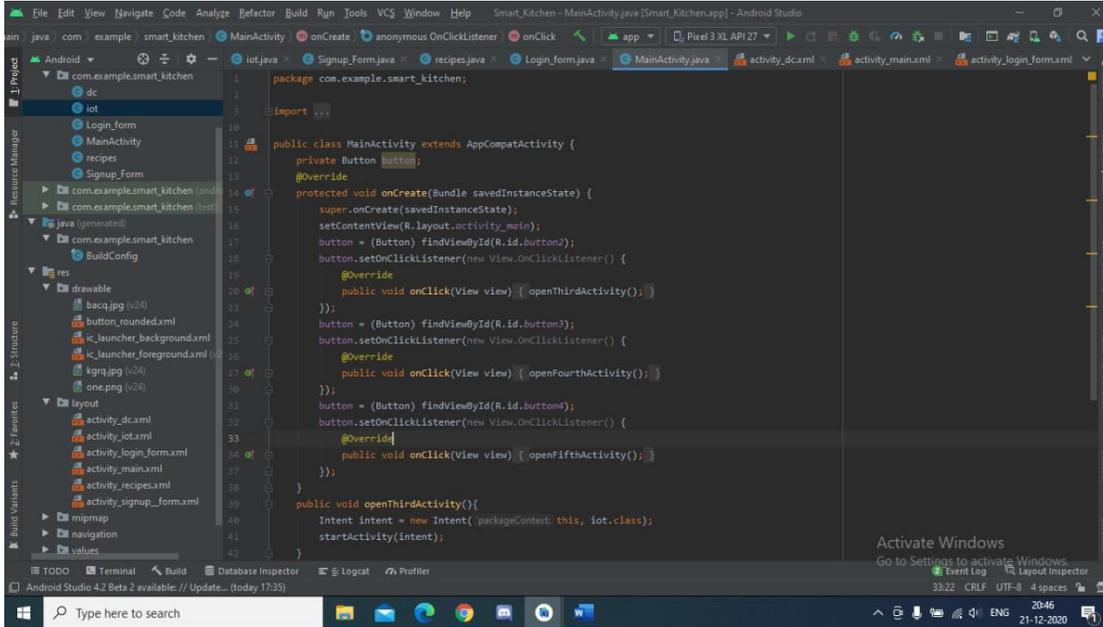


MQ Sensor choice

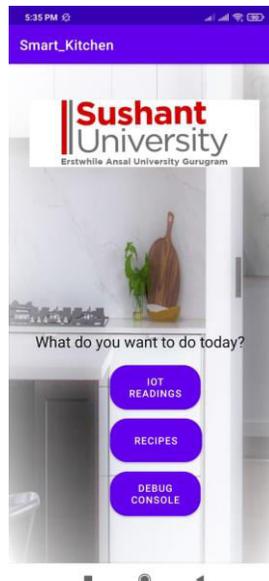
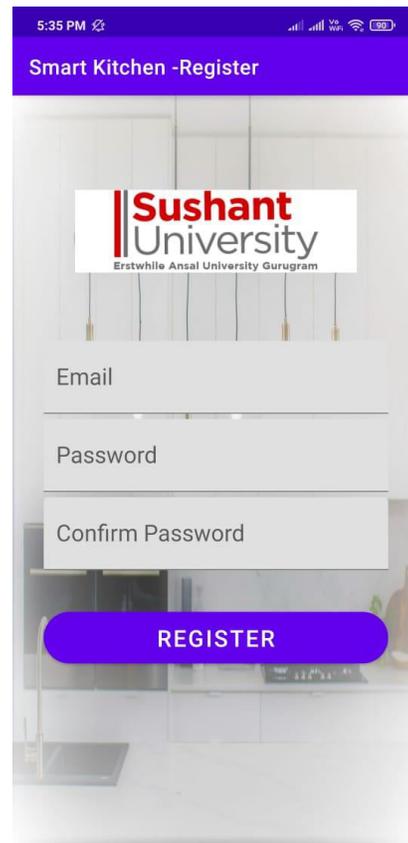
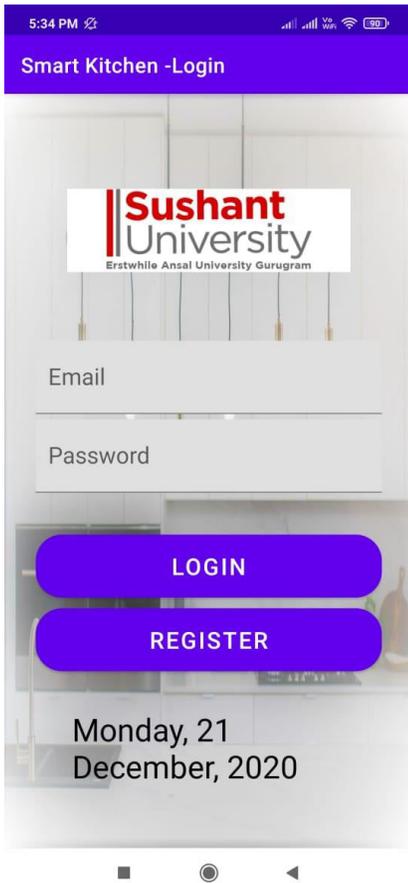
	2	3	4	5	6	7	8	9	135	214	216	303A	306A	307A	309A
Methane	x		x							x					
Butane	x				x								x		
LPG	x			x	x								x		
Smoke	x	x										x			
Alcohol		x										x			
Ethanol		x										x			
CNG Gas			x												
Natural Gas				x						x	x				
Carbon Monoxide						x	x							x	x
Hydrogen Gas							x								
Coal Gas								x			x				
Liquefied Gas								x							
Air Quality									x						
Flammable Gas															x

3. Code Layout

Android Studio



App Layout



Website Layout

objects or things that are embedded with electronics, software, sensors, and networking to enable them to share data with manufacturers, operators, and other connected devices.

It can be described as connecting everyday objects like smartphones, sensors, and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. IoT allows objects to be sensed and controlled remotely across the existing network infrastructure. It also provides efficiency, accuracy, comfort, and economic benefit.

Anyone, at any time and from any place, can now connect to something, and it is anticipated that these connections will develop to form a highly advanced complex network of IoTs. Our research aims to combine an Internet-oriented approach with a semantic-oriented system, both of which are essential for developing realistic, complex IoT applications that are expected on rich embedded devices.

We are going to propose a system that will sense if the gas is leaking, fire can be prevented, and smoke sensing and will immediately inform the owner. We are going to present a low-cost control and monitoring system using an embedded microcontroller, cloud server. We will use a case study to test our method and demonstrate how our architecture can be used to incorporate functional IoT applications.

Working:

The functionalities of the app, we have given a login page to the user and if the user is not registered, the user can simply tap on the register button and be directed to the signup page which is linked to firebase. The app is coded using java in android studio and the sensors are coded in C language using Arduino, Lastly, the web app was built over HTML5 and CSS3 using WebSocket and JavaScript.

When the user will click on Live Readings, he or she will be redirected to the next screen containing the live readings for the sensor namely, Gas Sensor (MQ4), Smoke Sensor (MQ2), PIR(SR501), Temperature and Humidity (DHT11) and Fire Alarm (Buzzer). All in a common log form.

Moving on to the next button called Recipes,

Here the user will be redirected to an open-source website called myfridgefood.com this is an open-source website and we found it to be a perfect fit as the user can select the ingredients he or she has in the kitchen and get a recipe accordingly with all the steps.

Last but not least live readings will not be visible to all users, but only registered users can operate that button. We also have the master key to all the server databases and sensors as well, and is available as an opensource on GitHub, only for developers and admin.

So basically, the need to create an app after making a fully functional website which has everything possible from readings to the explanation about our product is, because a user cannot carry his or her laptop or Tab around the kitchen for cooking purpose and what good is a smart kitchen project without having a basic feature consisting of food recipes, this app will be made available to the people who will use this project in their day to day lives.