

Design of Smart Mess Application using Ubiquitous Computing

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Abstract--In this era of technology advancement, everything requires monitoring and controlling. Our project focuses on making a smart mess using ubiquitous computing which includes making an application to keep track of food storage, mess monitoring for maintaining the quality of food and the entire backend like management for workers, gas supply, temperature sensors, and so on. Different sensors are used for sensing the conditions of the food. Considering all the external conditions which will affect the quality of food and use a database for storage of values sensed in real time. Mess Manager gets notified via messages whenever there is a shortage of food or in case of an emergency to take the necessary action.

INTRODUCTION

Ubiquitous computing is an example of associating information processing with each activity or object encountered. It involves connecting electronic devices, including embedded microprocessors to communicate information. Devices that use pervasive computing have constant availability and are fully connected. At their core, all models of ubiquitous computing share a vision of small, inexpensive, robust networked processing devices, distributed at all scales throughout everyday life and turned to distinctly common-place ends^{[1][2]}. There will be an application which has two user interface, one for the manager and another one for mess employees. The manager will supervise all the task performed by mess workers, their salaries including other aspects of the kitchen like gas supply, food storage, food contamination. All the data from the hardware will be sent to database and web application using GSM. Temperature, Humidity, LDR sensors are used to maintain and sense whether the surrounding conditions are suitable for storing the specific food items or not. All these sensors are connected to Arduino. Timely updating whether the kitchen is clean or not that will be done by checking the gases emitted from kitchen using the smoke sensors. A database is maintained which contains all the food items in the warehouse as well as food items to be received from the supplier and its date of expiry and delivery. A user receives an alert of an item name, if any particular food item is in the warehouse even after the expiry date or if the item is not yet received from the supplier. Water purifier maintenance and quality checking assure water purity. Exhaust Fan and Ducts turns on depending upon the temperature and humidity sensor values.

Limitations of this project:

- Each food item has its storage conditions, but only few food items are considered.
- The kitchen is considered dirty only when a sensor senses any foul smell.
- Utensils will be assumed clean if they are washed.

Simplifying Assumptions:

- The number of food items in this list is limited.
- It is safely assumed that power is available all time
- Ducts and exhaust fans are installed at all places.

Food contamination can occur in the food storage process because of insufficient or inappropriate conditions. Many environmental conditions lead to food contamination like a

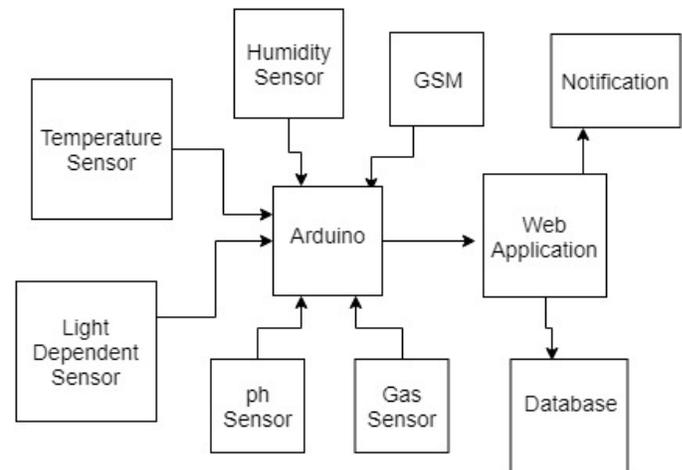


Figure 1. Block Diagram

change in temperature, light, and humidity are the main factors. Global food losses have recently estimated to be in the order 25% to 50% of production quantities depending on the item. A high percentage of consumers only pay attention to the information provided on the packing, but they ignore the environmental conditions in which these items are stored.

PROPOSED SYSTEM

A. Kitchen Cleaning

We have connected the Temperature, Humidity, Light Detecting Resistor (LDR), Smoke Sensor and other gas sensors to the Arduino. We use the smoke sensor to sense all the gas odours emitted from the kitchen and update them on the website whether any gases are emitted or not. If the sensor senses anything then it directly indicates that the kitchen is not clean.

B. GSM Module

It is required to connect GSM Module with Arduino to send the data to the server. For the GSM module, we will use SIM900 GSM Module. Different companies manufacture GSM Module. They all have different input power supply specifications. For example, some GSM Module requires 12 volts input; some require 15 volts whereas some need only 5 volts. In this project, 12 volts input is used.

Connecting GSM Module to Arduino:

The communication between Arduino and GSM Module is serial in both the ways. So, we will use serial pins of Arduino that is Rx and Tx. If we are going with this method, we will connect Tx pin of GSM Module to Rx pin of Arduino and Rx pin of GSM Module to Tx pin of Arduino.

Tx of GSM Module → Rx of Arduino

Rx of GSM Module → Tx of Arduino

Ground of GSM Module → Ground of Arduino

Only above three connection is required. The problem with this connection is that, while programming Arduino uses serial ports to load the program. The hardware serial ports which are referred here, are Universal Asynchronous Receiver Transmitter (UART) ports. They may be referred to as Universal Synchronous Asynchronous Receiver Transmitter (USART) ports in the microcontroller documentation if they are configurable in both synchronous and asynchronous modes. With these connections, the program will not be loaded successfully to Arduino. Further, this will require disconnecting the wiring in Receiver and Transmitter each time we burn the program to Arduino through the burner. Once the job of the burner is done, or the program is successfully loaded, then we can reconnect these pins.

To get over this problem, we used an alternate method in which we used two digital pins of Arduino for serial communication. We have to select two Pulse Width Modulation (PWM) enabled pins of Arduino for this method. So we choose pins **9** and **10** (which are PWM enabled pins). This method is possible with using SoftwareSerial Library of Arduino. This library enables serial data communication through other digital pins of Arduino. This library handles the task of serial communication.

C. Food Inventory and Kitchen Cleaning

- Track the current status of inventory.
- Notification of the expiry for an item.

We use the weight sensor for each of the items to sense the weight of a particular item in our inventory and send the notification to the manager if any particular item is below the required level^[3]. Most of the Kitchen items have an expiry date; we can set an expiration value so that the server can track the expiration date and send a notification. Smoke sensors will be used to sense all the gas odors emitted from the kitchen and update them on the website whether any gases are emitted or not. If the sensor senses anything, then it directly indicates that the kitchen is not clean. The person in charge will manually update the application, whether the kitchen is cleaned or not, which will be further crosschecked by the manager.

D. Water Purity, Leakage Detection, and Gas Supply

The PH value of any liquid is a measure of alkalinity and acidity. The neutral value for PH is 7. The value of PH for a good quality of water is in between 6 and 8.5. Sensors will also maintain the water level^[4]. Using both the temperature sensor and PH sensor, we retrieve the values and show them in the application used by the manager, and send a notification if the values above the threshold. This paper also focuses on the application of wireless sensor networks in the detection of groundwater pipeline leaks to overcome the water distribution network problems. Leakage and breakage in distribution networks are the basis for making full use of natural resources^[5]. Record of all the previous details related to the date of gas-filled, gas completed, and the gas supplier will be maintained in that application, so that we will have, a rough estimate based on previous data, of when is the gas going to complete and send a notification to the supplier regarding the same.

E. Mess Employees

Database of all the mess employees will be maintained and will update his/her attendance using biometric attendance on a daily basis to get an idea of whom all are working in that particular day^[6]. The application will also have a field of work description like floor cleaning, tables, and chair cleaning, and salary details of all mess employees to maintain the details. Keeping track of this will help in finding which particular person has cooked or cleaned or worked on the particular day when any particular complaint is registered. The application will also keep track of, number of remaining leaves for an employee.

CONCLUSION AND FUTURE WORK

The work mentioned above is done in a web application. In future, we will try to make an Android/iOS application^[7] so that it will be more convenient for the user(Mess Vendor) to keep track of all the activities going on or will take place in future in a more systematic way.

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