**Smart and Safe System in Restaurant (SSSR)**

**System Introduction**

People love restaurant. It is the meeting point for so many people, have food together, and for some, it is an escapade from the all too monotonous home cooking. But in this COVID crisis, due to public lockdown, many a business have been hit and generation of income for the state through taxes has become difficult. Even people get restless by staying at home all day and there is no public place that can guarantee safety from this pandemic. Only if there were public places that could also take care of this, the situation might not look too bad.

This project aims to build a smart restaurant which tries to achieve the following objectives:

* Enable customers to get notified about the availability of seats and risk level of Restaurant. (Comfort)
* Enable the Restaurant manager to know if there is a possibility of infection and spread of disease. (Safety)

**System Analysis**

As a customer, a smart restaurant is expected to:

* Provide information about safeness of restaurant through an app.
  + Based on number of customers denied entry, safeness of restaurant is determined if it is a Hotspot for the disease spread.
  + If the number has increased, then Show alert messages to Customers through an app and divert them to an alternate hotel. Also inform and manager.
* Provide information regarding the number of available seats.
  + Display the number of available tables.
  + If all the tables are full, Display ‘No seats available’.
  + If group can be accommodated, allow entry to the group.
* Provide hand sanitizer access.
  + When customer places his/her hand below the sanitizer sensor, hand sanitizer is sprayed for 2 s.

As the Restaurant manager, the smart restaurant is expected to:

* Provide information about potentially vulnerable customers, so that possibility of any spread of any warned disease is determined (in this case, COVID) and health officials can be notified in advance.
  + Check 3 things: Does customer have a face mask? Does customer have normal temperature? Does customer have no record of spreadable disease?
  + If any check fails, Manager is notified. Customer not allowed to enter.
  + No notification if all 3 tests passed.
* Warn him/her regarding any discrepancy created by customer.
  + Check for any erroneous / inconsistent input from customer.
  + Warn manager regarding this and allow manager intervention.
  + In severe cases, also allow access to alarms / notification to Police.
* Based on occupants of a given table, check if disinfectant must be sprayed.
  + If number of occupants on a table is zero and bill has been generated, notify the manager that the table must be cleaned.
  + If either number of occupants on a table is not zero or bill has not yet been generated, do nothing.

**System Architecture**

The system architecture is divided into the following sections:

* ***Restaurant control section***: Comprises of Sensors, actuators and a local controller.

In order to determine the acceptance criteria of a customer, 3 checks done via these sensors:

* + Camera: Check if Customer is wearing a mask or not.
  + RFID scanner: Check via the Customer’s Health insurance card, if there is any recent history of communicable disease.
  + Temperature sensor: Check customer’s body temperature.

A LED is interfaced as output for the inputs gathered from these sensors to allow customer or not. LED ON implies door is opened, else closed.

A Display unit is kept near manager to display if any of the above check failed for a customer.

After the entry, a display unit shall display the customer table number. Hand detection is done, and sanitizer is sprayed.

Based on the occupancy of the table through occupancy sensors and bill generated, a message to the manager for disinfecting the table is issued.

* ***Processing section***: Comprises of Local controller, CPU and server.

The sensor signals sent are all processed by the local controller and suitable commands are sent to actuators. The warning messages to the manager are sent from Local controller to the CPU, which allows the control by Manager.

The number of tables available in the restaurant is updated periodically in the server. Also, the number of Customer denied entries are fed to CPU, to analyze the risk level. The risk level is updated in the server, and on higher risk levels, notify the manager.

* ***Customer interface section***: Comprises of Server and Customer’s mobile interface (Mobile application)

The data updated in the server is periodically polled by the mobile app and 2 information are continuously available: Risk level of the restaurant and the number of available tables in the restaurant. Based on these data, a customer can decide if he/she should really go to the restaurant or not.

**Conclusion and Future scope**:

Although a basic, not too advanced safe and smart system in Restaurant, this project aims to generalize safety system for a pandemic disease. The scope can also be extended to include many other alarm and control mechanisms via CPU such that more control can be bought up within the restaurant and when things get out of control, automatic notification to get external agents support, can be implemented. Also, the safety system can also be extended to many non-residential buildings with some minor modifications, and thus with such a generic platform, many buildings can be merged to form a smart area / city.