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SMART PUBLIC RESTROOM (Using IOT)

INTRODUCTION:

- Smart public restrooms use the Internet of Things (IoT) to monitor and maintain cleanliness and hygiene. IoT is a network of objects that are connected through the internet and have sensors, software, and other technologies embedded to enable data transfer.

- After using the toilet, the flush system will start automatically. Then there are two sensors first is Ammonia sensor and another one is odour sensor measure odour into the washroom. If odour is present more than natural odour then room freshener system will ON automatically it maintain good smell in washroom.

To build a mobile app for real-time smart public restroom availability using Python and Flutter, we can follow these steps:

1. Set up the development environment. Install Flutter and Python on our machine.

2. Create a new Flutter project. Use the following command to create a new Flutter project:

```
CODE:

    flutter create smart_public_restroom
```

3. Add the necessary dependencies. Add the following dependencies to the pubspec.yaml file:

```
CODE:
        dependencies:
        flutter:
        sdk:flutter
        http:^0.13.4
        convert:^3.0.1
```

4. Create a new class to handle the CONVERT connection. This class will be responsible for connecting to the Raspberry Pi and receiving restroom availability data

CODE:

```dart
import 'package:http/http.dart' as http;
class ConvertConnection {
  final String _baseUrl =
'http://{YOUR_RASPBERRY_PI_IP_ADDRESS}:8080/api/v1/restroom-availability';
Future<String> getRestroomAvailability() async {
  final response = await http.get(_baseUrl);
   if (response.statusCode == 200) {
     return response.body;
  } else {
    throw Exception('Failed to get restroom availability');
}
}
}
```

5. Create a new class to display the restroom availability data. This class will be responsible for receiving restroom availability data from the convert client and displaying it to the user.

```
CODE:
class ConvertDisplay extends StatefulWidget {
 final ConvertConnection convertConnection;
const ConvertDisplay({Key? key, required this.convertConnection}) :
super(key: key);
```

6.Update the main.dart file to connect to the CONVERT client and start displaying the restroom availability data

```
CODE:

import 'package:mqtt_client/mqtt_client.dart';

import 'package:flutter/material.dart';

class MQTTDisplay extends StatefulWidget {

    final MqttClient client;

    const MQTTDisplay({Key? key, required this.client}) : super(key:
key);

    @override

    State<MQTTDisplay> createState() => _MQTTDisplayState();
}

class _MQTTDisplayState extends State<MQTTDisplay> {

    String _parkingAvailability = 'Unknown';

  @override

    void initState() {

    super.initState();

// Subscribe to the parking availability topic.
```

```
widget.client.subscribe('parking_availability', MqttQos.exactlyOnce);
// Listen for incoming messages.
widget.client.published.listen((MqttPublishMessage message) {
 // Update the parking availability data.
 setState(() {
    _parkingAvailability = message.payload.convert.utf8String;
  });
 });
}
@override
 Widget build(BuildContext context) {
 return Text(_parkingAvailability);
 }
 }
```

7.Run the app. To run the app, use the following command

CODE:
```
    flutter run
```

8.Sample output:

Smart Public Restroom

Nearby Restrooms

* **Restroom 1:** 0.2 miles away. All stalls available.

* **Restroom 2:** 0.3 miles away. 2 stalls available.

* **Restroom 3:** 0.4 miles away. 1 stall available.

Directions

To get to Restroom 1, tap here.

To get to Restroom 2, tap here.

To get to Restroom 3, tap here.

Ratings and Reviews

* **Restroom 1:** 4.5 stars out of 5 stars.

* **Restroom 2:** 4.2 stars out of 5 stars.

* **Restroom 3:** 3.8 stars out of 5 stars.

Dependencies:

- Sensors
- Actuators
- Networking
- Software
- Data analytics

Testing and deploying the app:

- To test the app, we can run it on a mobile device or in a simulator. To deploy the app, we can use the Flutter SDK to build an APK or IPA file.

Additional features:

Here are some additional features that could be implemented in a smart public restroom:

- **Wayfinding:** Users could use their smartphones to navigate to the nearest available restroom.
- **Personalization:** Users could create and save their own preferences, such as the desired temperature and lighting level.
- **Feedback:** Users could provide feedback on the cleanliness and condition of the restroom.
- **Emergency call:** Users could make an emergency call from the restroom if needed.
- **Entertainment:** Users could listen to music or watch videos while using the restroom.
- **Security:** Restrooms could be equipped with security cameras and other security measures to deter crime and vandalism.
- **Accessibility:** Restrooms could be made more accessible to people with disabilities by installing features such as automatic doors, grab bars, and raised toilets.
- **Sustainability:** Restrooms could be made more sustainable by installing features such as low-flow toilets, waterless urinals, and energy-efficient lighting.

Conclusion:

- Smart public restrooms are still in their early stages of development, but they have the potential to revolutionize the way we use public restrooms. By using IoT technology to monitor and automate various aspects of the restroom, smart restrooms can help to improve hygiene, reduce costs, and improve the user experience.
- As the technology continues to develop and become more affordable, we can expect to see more and more smart public restrooms popping up in cities and businesses around the world.
- In conclusion, smart public restrooms using IoT are a promising technology that has the potential to make public restrooms cleaner, more efficient, and more user-friendly