

## Group Name: BRAINIACS

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## Title of the Project : *Alert Mechanism for Smart Toilet Technology*

### Literature Review:

As per the current scholarly sources with the coming of the smart toilet technology has raised various issues regarding hygiene , efficient maintenance and on time alerts during failure of the mechanism.Working on this area,will maximize the benefits of this technology.A crucial aspect of this technology is the implementation of effective alert mechanism that can notify relevant individuals about various failure situations of the system.This review explores the existing literature on alert mechanisms for smart toilets,focusing on malfunction detection.

There exists an automatic flush system for sanitation using micro-controller and IR sensor technology.The system is designed to use pH sensor for identifying the change in the purity of water and activates the controller flushing system. Tsai et al designed and implemented an auto flushing device with ultra-low standby power consumption. The system consumes 10 mW which is very low in comparison to the other systems with 0.5 to 1 W of power consumption when no user is present for 24 hours a day.

As of now there exists no area of disagreement.With this smart toilet failure alert mechanism system we can minimize the potential gaps.

### Problem Statement:

Currently, smart toilets lack an effective alert mechanism to notify if any malfunction detect through sensors.Several challenges faced by the society if an smart toilet mechanism malfunction detected then the user have to face several problem.

### Proposed/ Implemented Solution:

#### *Failure detection sensors:-*

Water level sensor: Detects abnormal water levels indicating potential leaks or malfunctions and notify the individual before using the toilet.

Power sensor: Monitors power fluctuations or outages.

Temperature sensor:Detects unusual temperature changes suggesting component overheating.

Occupancy sensor: Detects user presence and can be used trigger additional alerts in case of prolonged occupancy during a malfunction .

Communication module: Enables the system to send alerts to designated recipients through audio/visual alerts like triggers local alarms or lights to indicate malfunctions within the washroom.

Data processing and decision making: This step is to process this malfunction data and make decision based on it.this could be done using CPU that receives data from all the sensors,processes if all the sensors are working and makes decisions based on it.For a example,if the water level sensors reports that the toilet tank is not filling up and detect a malfunction then the CPU would recognize this is a problem.

Here's a simple code snippet in python that demonstrates how an alert mechanism might work:

```
class SmartToiletSystem:
```

```
    def init(self):
```

```
        self.sensors = {"water_level": 100, "temperature": 25, "humidity": 50}
```

```
        self.alerts = []
```

```
    def check_sensors(self):
```

```
        for sensor, value in self.sensors.items():
```

```
            if sensor == "water_level" and value < 50:
```

```
                self.alerts.append("Low water level detected!")
```

```
            elif sensor == "temperature" and value > 30:
```

```
                self.alerts.append("High temperature detected!")
```

```
            elif sensor == "humidity" and value > 70:
```

```
                self.alerts.append("High humidity detected!")
```

```
    def send_alerts(self):
```

```
        for alert in self.alerts:
```

```
            print(f"ALERT: {alert}")
```

```
# Create a new Smart Toilet System
```

```
sts = SmartToiletSystem()
```

```
# Check the sensors and generate alerts
```

```
sts.check_sensors()

# Send the alerts to the user

sts.send_alerts()
```

This is a very basic example and the actual system would likely be much more complex. The key is to have a system that can monitor the status of all components, generate alerts when problems are detected, and deliver these alerts to the user in a timely and effective manner.

### **Importance and Novelty of the Solution:**

The alert mechanism on smart toilets revolutionizes convenience, hygiene, and maintenance by instantly notifying users of malfunctions and failures. Noteworthy aspects include:

#### 1. Real-time Monitoring:

- The system monitors water supply, flushing, and sensors.
- It promptly alerts users to malfunctions for immediate action.
- Ensures uninterrupted functionality and user satisfaction.

#### 2. Enhanced User Experience:

- Prompt alerts minimize inconvenience.
- Ensure uninterrupted functionality.
- Prioritize user satisfaction.

#### 3. Proactive Maintenance:

- Users receive alerts for potential malfunctions.
- Reduces downtime and repair costs.
- Extends system lifespan.

#### 4. Customizable Alerts:

- Users can tailor notifications to their preferences.

- Enhances usability and engagement.

#### Advantages:

- Timely detection minimizes inconvenience
- It promotes user satisfaction.
- Proactive maintenance reduces costs
- It extends system lifespan, ensuring long-term reliability.
- Customizable alerts cater to individual preferences -It enhance user engagement and satisfaction.
- It can be integrated with smart home systems enhances overall automation and control
- It optimizes user experience and convenience.

#### Disadvantages:

- Initial setup and installation costs may be higher compared to traditional systems, potentially limiting adoption.
- Dependency on technology may lead to occasional false alarms or errors, requiring user attention and potential troubleshooting.
- Regular maintenance is essential for optimal performance, adding to ongoing upkeep costs and responsibilities.
- Complex systems may require specialized training or technical support for effective management and troubleshooting.

#### Additional Features:

- Advanced analytics enable predictive maintenance, optimizing system performance and longevity.
- Compatibility with emerging IOT standards ensures future-proof integration and interoperability.
- Robust security features safeguard user privacy and data integrity, enhancing trust and confidence in the system.

The alert mechanism on smart toilets offers a groundbreaking solution, elevating user experience, promoting hygiene, and streamlining maintenance. Real-time monitoring, proactive maintenance, and customization options render it indispensable in modern hygiene management and smart home automation.

## **Methodology:**

Methodology for Evaluating Smart Toilet Alert Mechanism:

### 1. Sensor for User Presence Detection:

- Incorporate sensors to detect user presence.
- Check infrared rays emitted from the human body to trigger alerts.
- It identifies key features, technological advancements, and user preferences.

### 2. Testing Environment Setup:

- Create controlled testing with simulated scenarios.
- Integrate alerts into various smart toilet prototypes.

### 3. Real-time Monitoring Evaluation:

- Assess water supply, flushing, and sensor monitoring.
- Evaluate promptness and accuracy of malfunction alerts.

### 4. Proactive Maintenance Analysis:

- Simulate malfunctions to test alerting capabilities.
- Measure effectiveness in reducing downtime and repair costs.

#### 5. Customizable Alerts Testing:

- Evaluate customization options for user preferences.
- Assess flexibility in notification methods and threshold settings.

#### 6. Literature Review:

- Review existing smart toilet alert mechanisms.
- It analyzes case studies, research papers

#### 7. Advantages and Disadvantages Evaluation:

- Analyze benefits like timely detection and proactive maintenance.
- Assess drawbacks such as setup costs and false alarms.

#### 8. Additional Features Examination:

- Investigate user interface and advanced analytics.
- Evaluate compatibility with IOT standards and security features.

#### 9. Conclusion and Recommendations:

- Summarize findings, strengths, and weaknesses.
- Provide recommendations for improvement and future research.

This methodology ensures comprehensive evaluation of smart toilet alert mechanisms, considering technical, user-centric, and practical aspects.

#### **Budget:**

The budget will be around 15000