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SMART INDIA HACKATHON 2024

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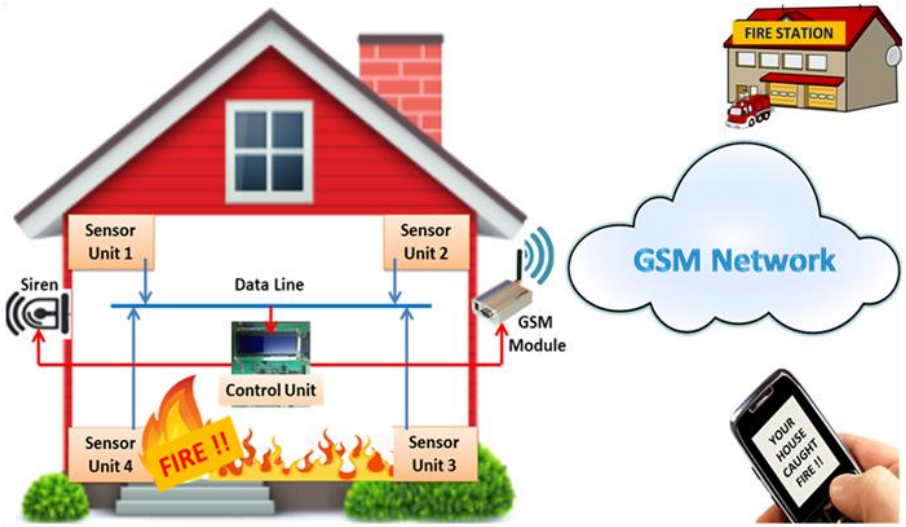
SMART FIRE DETECTION AND ALARM SYSTEM

- **Problem Statement ID –** SIH1527
- **Problem Statement Title-** STUDENT INNOVATION
- **Theme-** DISASTER MANAGEMENT
- **PS Category-** Hardware
- **Team ID-**
- **Team Name (Registered on portal)-** IGNIS GUARDS

SMART FIRE DETECTION AND ALARM SYSTEM

❖ Proposed Solution:

- **Real-Time Detection & Alerts:** Utilizes advanced sensors and **IoT technology** for instant **fire/smoke detection** and immediate alerts to occupants and emergency services.[1]
- **Automated Response:** Automatically activates fire suppression integrates with **smart home appliances** for enhanced safety. [1]
- **Remote Monitoring:** Enables remote **surveillance**, allowing users to monitor and control the system from anywhere using **radar.**[2]
- **Minimized Damage:** Reduces reaction time and potential destruction through **quick alerts** and automated responses.[3]



- **Anomaly detection: ML** teaches the system to identify unusual patterns in sensor data that might indicate a fire, **improving accuracy** and **reducing false alarms**.

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TECHNICAL APPROACH

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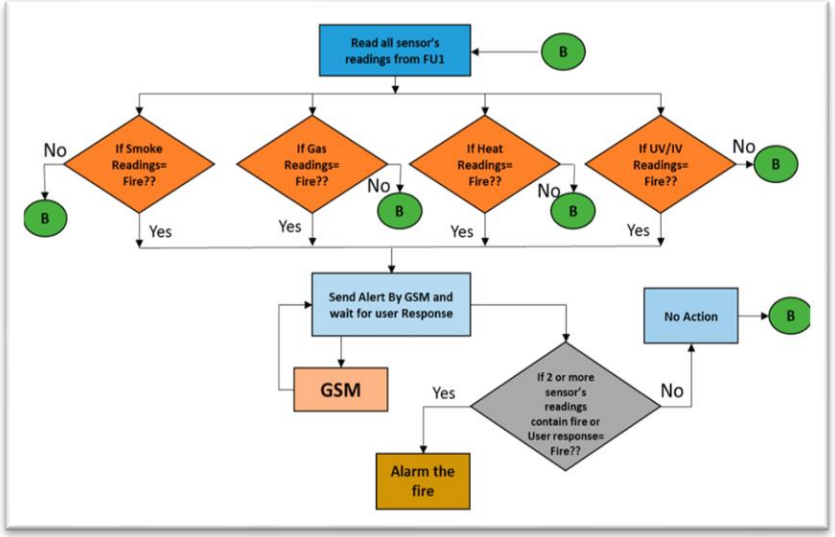
- **Sensor Integration:** Use advanced smoke and heat sensors connected to an IoT platform for real-time monitoring and analysis.
  (Smoke, Heat/Flame, Gas sensors, Temperature sensor)[1]

- **Automation & Control:** Integrate with smart home systems to activate fire suppression mechanisms and other safety measures.
  (Arduino UNO/NANO) [1]

- **Mobile Alerts:** Develop a mobile application for real-time alerts, remote system management, and emergency notifications.[1]

- **GPS Integration:** Incorporate **GPS modules** to pinpoint the exact location of the fire or smoke incident, aiding in precise emergency response and resource allocation.[2]

- **Network Modules:** Utilize **Wi-Fi, GSM, or LTE modules** for reliable communication, ensuring real-time data transmission to **cloud** servers and mobile devices.[3]



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FEASIBILITY AND VIABILITY

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Feature/Aspect	Smart Fire Alarm System (IGNIS GUARD)	Traditional Fire Alarm System
Cost*	Cost is **less** in comparison to existing systems.	These systems are generally **expensive**.
Detection Capabilities[1]	Multi-sensor detection (**smoke, heat, gas**).	Single-sensor detection (smoke or heat).
Connectivity	**IoT-enabled**; sends alerts to smartphones, and integrates with home automation.	Operates in isolation, no external connectivity.
Monitoring and Alerts[3]	Real-time monitoring, remote alerts via mobile apps.	Localized alarms; alerts only when nearby.
Scalability	**Easily scalable**, integrates with smart devices and systems.	**Limited scalability**, requires extra hardware.
Maintenance	Remote diagnostics, **self-monitoring** reduces maintenance.	Requires regular **manual inspections.**
User Interface	Interactive, customizable with mobile app support.	Basic interface, usually just an alarm sound.
Power Source	Battery backup and mains power; some **solar-powered.**	Mostly battery-operated, sometimes with mains power backup.

*PRICE EXCLUDING BRANDING

*IGNIS GUARDS	V/S	TRADITIONAL ALARMS
Sim 900a **(₹557)**		Smoke Detector**(₹200 – 600)**
Arduino uno (**₹206)**		Heat Detector**(₹250 – 800)**
Flame sensor**(₹25)**		Manual Call Point (MCP)**(₹300 – 500)**
12 volt 2 ampere adapter**(₹150)**		Fire Alarm Control Panel (FACP)**(₹2,000 - 10,000)**
5 Volts 2 Amps DC Power Supply Adapter**(₹179)**		Alarm Bell or Siren**(₹400-₹1200)**
MQ2 Flammable Gas and Smoke Sensor Module**(₹79)**		Strobe Light**(₹500-₹1500)**
Buzzer**(₹35-₹50)**		Power Supply**(₹400-₹600)**
Mounting Box**(₹100)**		Wires and Cables per meter **(₹50-₹70)**
Battery Backup(12V) **(₹200)**		Battery Backup(12V) sealed lead acid battery**(₹500-₹1000)**
TOTAL- ₹1536-2000		**TOTAL- ₹4600-16500**

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IMPACT AND BENEFITS

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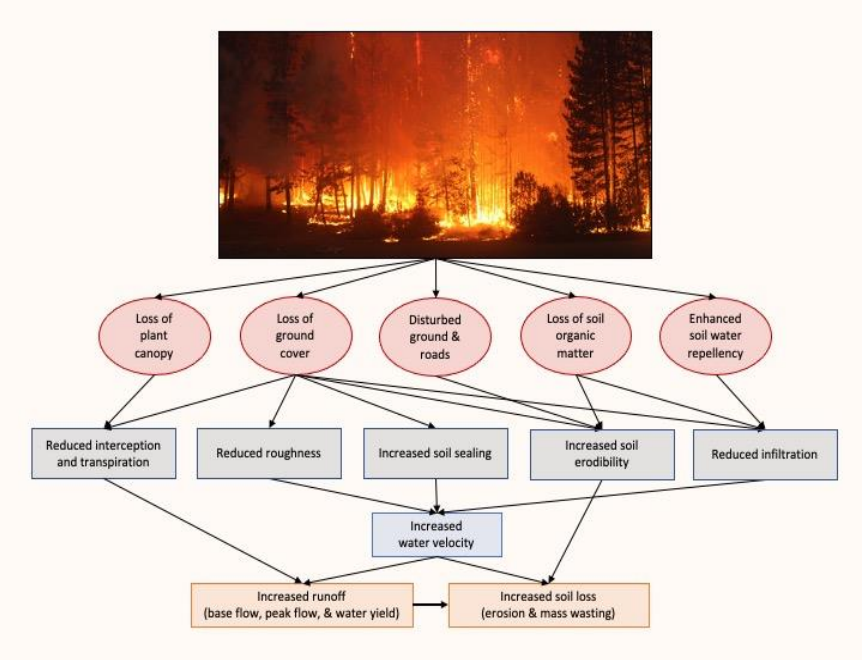
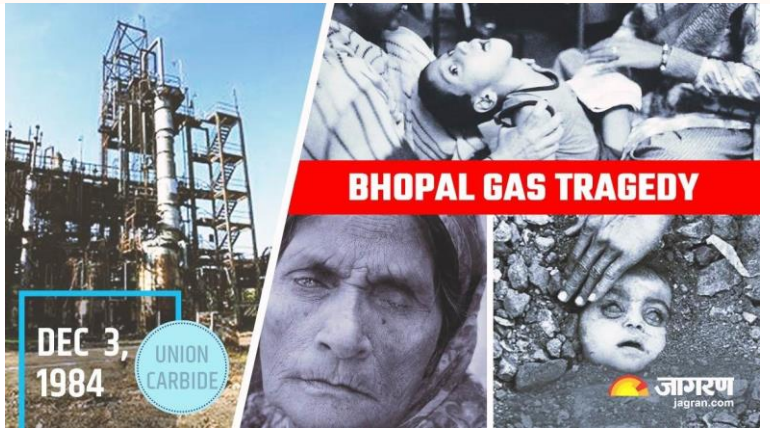
Benefit	Description
Saves Lives	Faster fire detection helps prevent injuries and deaths.
Protects Property	Quick alerts reduce fire damage to homes and businesses.
Environmental Care	Early fire control limits environmental harm.
Peace of Mind	Remote monitoring keeps users reassured and informed.
Better Emergency Response	GPS and real-time alerts improve response times.
Cost Savings	Lower fire damage reduces repair costs and insurance premiums.
Help Vulnerable Areas	Provides crucial protection in places with fewer emergency resources.
Enhanced Safety Features	Integration with other safety systems for comprehensive protection.
Automated Alerts	Automated notifications to authorities and emergency contacts.
Data-Driven Insights	Historical data helps analyze trends and improve safety measures.
Scalability	System can be expanded to cover more areas or integrate with other smart devices.





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RESEARCH AND REFERENCES

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- **Online Articles:** Studied current trends in fire detection and IoT integration.
- **AI Platforms:** Explored AI tools for improving fire detection accuracy.
- **[1]**A. Acakpovi, D. T. Ayitey, and E. N. Adjaloko, "Innovative Fire Detection and Alarm System for Sustainable City Development," in 2021 International Conference on Cyber Security and Internet of Things (ICSIoT), France, Dec. 2021, pp. 1-6. **doi:**10.1109/ICSIoT55070.2021.00015
- **[2]** M. A. Archana, T. D. Kumar, K. Umapathy, S. Omkumar, S. Prabakaran, N. C. A. Boovarahan, C. Parthasarathy, and A. H. Alkhayyat, "IoT-Based Smart System for Fire Detection in Forests," in *Proceedings of the International Conference on [Conference Name]*, Singapore: Springer, 2024, pp. xx-xx. doi: https://doi.org/10.1007/978-981-99-9562-2_32.
- **[3]** J. H. V. Reddy, K. P. Evangelin, S. Evangeline, and B. J. D. Sundar, "IoT-Enabled Fire Detection System for a Smart Home Environment," in *Proceedings of the [Conference Name]*, Singapore: Springer, 2023, pp. xx-xx. doi: https://doi.org/10.1007/978-981-19-6661-3_31.

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