ASSIGNMENT 3 FRONT SHEET

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Student declaration

I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.

Student's signature	xDuyz

Grading grid

P7	P8	P9	M6	D3

❒ Summative Feedback:	❒ Resubmission Feedback:

Grade:	Assessor Signature:	Date:

Internal Verifier's Comments:

Signature & Date:

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A. Introduction

In this report, I will present the IoT product "Smart fire alarm sensor system". Smart fire alarm systems have wide applications in automating the entire irrigation process. Here, I am developing a smart irrigation system based on several components, including an Arduino controller, Temperature Sensor. The system will measure the ambient temperature. This system will consist of a micro servo, a temperature sensor and a water pump used to pump water. At the same time, I will also discuss the impact of our IoT products on individuals, the economy, society, and end users. Additionally, I will investigate the challenges involved in integrating them into an extended system.

B. Content

I. Review the IoT application, detailing the problems it solves.

1. Problem definition

One particular problem that can be solved with IoT is smart fire alarms in homes. Using IoT, we can set up an automatic fire alarm system. This is an important issue in life because late detection of fire and explosion can lead to very dangerous consequences.

Here's how IoT can help solve the problem of fire alarms in life:

- Early Detection and Real-time Monitoring:

IoT-enabled fire alarms can provide early detection of potential fire hazards by continuously monitoring environmental conditions.

Sensors can detect changes in temperature, smoke, and other relevant parameters in real-time, allowing for immediate response.

- Remote Monitoring and Alerts:

IoT devices can send real-time data to a centralized system or a cloud platform. This enables remote monitoring of fire alarm systems from anywhere.

Instant alerts can be sent to homeowners, building managers, or emergency services, ensuring a quicker response in case of a fire.

- Data Analytics for Predictive Maintenance:

IoT facilitates the use of data analytics to predict potential issues with fire alarm systems.

By analyzing historical data, the system can identify patterns or anomalies that may indicate the need for maintenance, reducing the risk of system failures during critical situations.

- Integration with Smart Devices:

Integration with other smart devices in a building or home allows for a more comprehensive safety network. For example, smart door locks can be programmed to unlock during a fire emergency, enabling faster evacuation.

- Improved Accuracy and Reduced False Alarms:

IoT sensors can provide more accurate information about the nature and location of a potential fire.

Advanced technologies, such as machine learning algorithms, can help reduce false alarms by distinguishing between real threats and common sources of interference.

- Self-testing and Diagnostics:

IoT-enabled fire alarm systems can conduct self-tests regularly, ensuring that all components are functioning correctly.

Diagnostics can help identify any malfunctions or weaknesses in the system, allowing for timely repairs or replacements.

- Emergency Response Optimization:

IoT can enhance communication between fire alarm systems and emergency services. Real-time data transmission allows responders to arrive more quickly and with more accurate information about the situation.

- Integration with Wearables:

Integration with wearable devices can enhance personal safety. For example, smartwatches or health monitors can alert individuals of a fire and provide guidance on evacuation routes.

By leveraging the capabilities of IoT, fire alarm systems can become more intelligent, responsive, and integrated into the broader safety infrastructure, ultimately minimizing the risk and impact of fires on human lives and property.

2. Evaluate of IOT suitability of the Program

The fire reporting system using Arduino and integrating IoT technology brings many advantages and rationality in improving efficiency and safety. Here are some reviews about the suitability of this system:

1. Reduce difficulty in detection:

- The combination of Arduino and IoT helps the system detect early signs of fire through continuous monitoring and online information transmission.

2. Flexible Integration:

- Arduino provides an operating platform and easy installer, allowing for quick integration of sensor sensors and other IoT devices to create a comprehensive system.

3. Reduce Error and Increase Accuracy:

- Using Arduino helps minimize technical errors, while integrating IoT helps improve accuracy in determining the cause and location of a fire.

4. Remote Management and Instant Notifications:

- The ability to connect to the internet via IoT allows remote management and immediate notification to users or management units.

5. Easy to Upgrade and Maintain:

- Large Arduino programming community, helping to simplify the system upgrade and maintenance process.

6. Save Construction Costs:

- Arduino is a cheap and accessible platform that helps reduce system building costs for commercial solutions.

7. Integration with Other Information Systems:

- The ability to integrate other smart devices in the house or building helps optimize the fire system and the overall system.

In total, the use of Arduino and IoT in a reporting system provides easy operation, efficiency and management, making it a suitable solution for many applications in safety and containment work. prevent the risk of fire and explosion.

3. Define Clear Objectives

Smart irrigation systems have a lot of scope to automate the entire irrigation system. Here I am creating a batch based smart fire alarm system using Arduino Uno Controller and Fire Alarm Sensor. The system will include a water pump and a fire alarm. When there is a fire, the siren will sound continuously and the water pump will pump water into the fire.

4. IOT Architectures

Choosing a centralized architecture for your IoT smart fire alarm project in real life can bring several significant benefits, including:

Efficient Data Management:

Centralized architecture allows for efficient data management as all information from various sensors and devices is collected and processed in a central hub. This enables better control and organization of the data generated by the IoT devices.

Real-time Monitoring and Decision-Making:

Centralized systems enable real-time monitoring of data. This allows for prompt decision-making based on the aggregated information, leading to quicker responses to potential fire incidents.

Scalability:

Centralized architectures are often more scalable as new devices and sensors can be easily integrated into the existing infrastructure. This scalability is crucial for adapting the system to changing needs or expanding the coverage area.

Consistent Updates and Maintenance:

With a centralized architecture, updates and maintenance can be applied uniformly across the entire system. This ensures consistency and reduces the risk of discrepancies or malfunctions in different components of the fire alarm system.

Enhanced Security Measures:

Centralized systems can implement robust security measures, including encryption and access controls, to protect sensitive data. This is particularly important for fire alarm systems, where the integrity and confidentiality of data are critical.

Streamlined Communication:

Communication between various components of the fire alarm system is streamlined in a centralized architecture. This ensures that data flows efficiently, minimizing delays and enhancing the overall reliability of the system.

Integrated Analytics and Reporting:

Centralized architectures facilitate the integration of advanced analytics and reporting tools. This allows for in-depth analysis of historical data, trend identification, and the generation of comprehensive reports for system performance evaluation.

Remote Accessibility:

Centralized systems can often be accessed remotely, providing administrators with the ability to monitor the fire alarm system from anywhere. This remote accessibility enhances convenience and allows for quick response even when not physically present at the location.

Cost-Effectiveness:

Centralized architectures can contribute to cost-effectiveness by reducing the need for redundant hardware and minimizing the complexity of individual IoT devices. This is especially beneficial when deploying and managing a large-scale fire alarm system.

Unified User Interface:

Centralized architectures often offer a unified user interface for system management. This simplifies the user experience and training requirements for those responsible for operating and maintaining the fire alarm system.

In summary, a centralized architecture for your IoT smart fire alarm project provides efficient data management, real-time monitoring, scalability, consistency, security, streamlined communication, integrated analytics, remote accessibility, cost-effectiveness, and a unified user interface, making it a well-rounded and advantageous choice for a comprehensive fire safety solution.

5. Hardware selection

Arduino Uno R3 ATMEGA328P

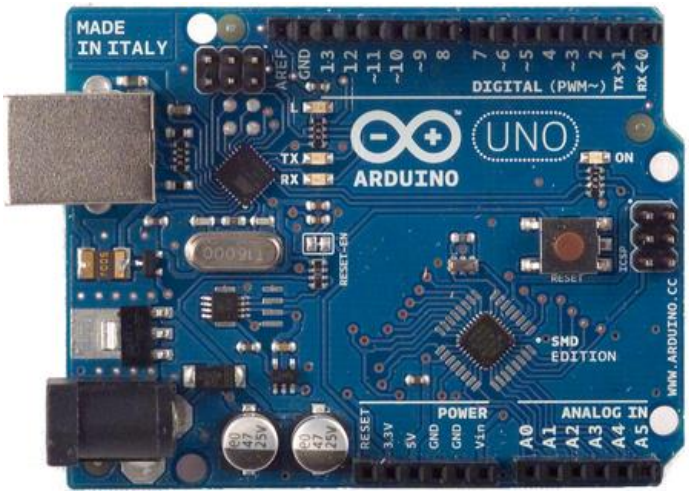


Figure 1 Arduino Uno R3 ATMEGA328P

Arduino Uno R3 SMD uses and loads the same code as the Arduino Uno R3 board. Thanks to the replacement of the Atmega16u2 loading chip with the CH340 IC, changing the plug-in chip to a paste chip, the cost is significantly reduced compared to the Arduino Uno R3 version.

The board has all the functions of the Arduino uno R3 board, in addition the board also has 2 additional Analog pins A6 and A7. It also integrates more power pins, is cheaper than the Uno R3 board and is compatible with all Arduino shields.

Flame Sensor

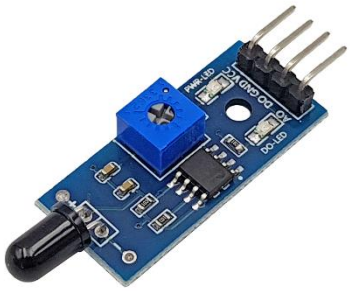


Figure 2 Flame Sensor

The fire sensor circuit has the function of detecting fire or light sources with wavelengths from 760nm to 1100nm and outputs a digital signal at the DO output, suitable for use in relay switching modules or as a trigger signal on the pins. IO of the microcontroller circuit.

In addition, the sensor's sensitivity can be adjusted by adjusting the potentiometer integrated on the circuit. The sensor's detection range is about 80cm with a scanning angle of 60 degrees.

The fire sensor circuit is compactly designed for easy installation and use in many different applications.

Motor RC Servo MG995

Figure 3 Motor RC Servo MG995

RC Servo Motor MG995 is a type with large torque, smooth running, suitable for control models with large loads such as robot arms, airplane models, spider robots....

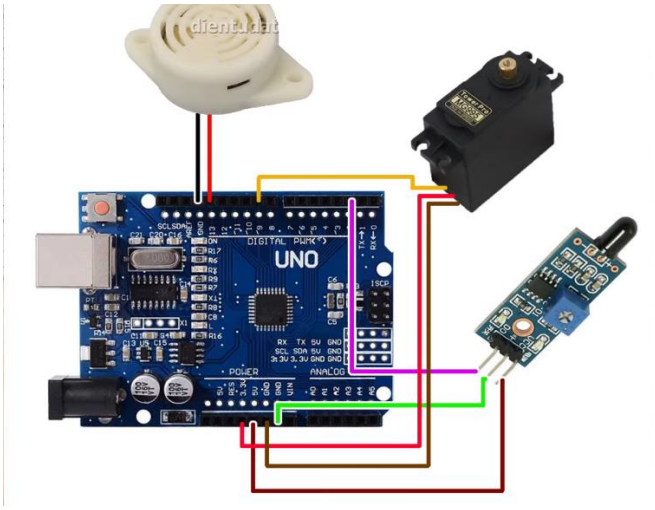
The motor uses highly durable materials and has copper gears to help the motor achieve high durability. Servo rotation angle 180 degrees.

The MG995 RC Servo motor has dimensions corresponding to motors from brands: Futaba, Hitec, Sanwa, GWS,...

DC water pump 5v

Figure 4 DC water pump 5v

6. Design model



7. Source code

```
#define servoPin 9
int goc=0;
int tong=0;
int thuan=1;
```

```
int nghich=0;
int sensor=2;
int coi=13;
void setup ( ) {
 pinMode (servoPin, OUTPUT) ;
 pinMode (sensor,INPUT_PULLUP);
 pinMode (coi, OUTPUT) ;
 }
void loop ( ) {
if(digitalRead(sensor)==LOW){digitalWrite(coi, HIGH);delay(2000);}
  digitalWrite(coi, LOW);
  digitalWrite(servoPin, HIGH);
  delayMicroseconds (goc) ;
  digitalWrite(servoPin, LOW);
  delayMicroseconds (tong) ;
if (goc>=2300){thuan=0;nghich=1;}
if (goc<=600){thuan=1;nghich=0;}
if( thuan==1){goc++;}
if(nghich==1){goc--;}
tong=20000-goc;
}
```

8. Video

Link video demo:
https://drive.google.com/file/d/12DMjrA4S67EEsjU91RRpttI2vER8yL9b/view?usp=sharing

II. Assess the potential impacts of your IoT application on people, business and society and the end user

1. People:

Safety Improvement: If your IoT fire alarm system effectively detects and responds to fires, it can significantly enhance the safety of individuals within homes, offices, and public spaces.

Peace of Mind: Reliable fire detection provides people with peace of mind, knowing that they have a proactive system in place to safeguard against potential threats.

2. Business:

Property Protection: For businesses, the IoT fire alarm can protect valuable assets, equipment, and facilities, potentially minimizing financial losses in case of a fire.

Regulatory Compliance: Depending on the industry, compliance with fire safety regulations is essential. Your IoT application can help businesses meet these standards more efficiently.

3. Society:

Reduced Fire Incidents: A widespread adoption of IoT fire alarm systems has the potential to contribute to a reduction in the number and severity of fire incidents, benefiting society as a whole.

Emergency Services Efficiency: Quick and accurate fire detection enables more efficient use of emergency services, potentially reducing response times and minimizing the impact of fires on communities.

4. End-Users:

Early Warning: End-users benefit from early warnings provided by the IoT fire alarm system, giving them more time to evacuate or take appropriate actions to mitigate the impact of a fire.

User-Friendly Interface: A well-designed user interface enhances the user experience, making it easier for individuals to interact with and understand the IoT application.

5. Privacy and Security Considerations:

Data Privacy: Consider the privacy of individuals whose data is collected by the IoT application. Ensure that data is handled securely and in compliance with privacy regulations.

System Security: As the IoT application involves the transmission and processing of sensitive data, robust security measures are essential to prevent unauthorized access and potential misuse.

6. Economic Considerations:

Cost Savings: Businesses and individuals may experience cost savings in terms of reduced property damage, lower insurance premiums, and potentially more efficient use of emergency resources.

Job Creation: The development, installation, and maintenance of IoT fire alarm systems can contribute to job creation in the technology and safety industries.

7. Environmental Impact:

Resource Efficiency: If the IoT application incorporates energy-efficient components, it can contribute to resource conservation and a lower environmental impact.

Reduced Emissions: Minimizing the impact of fires can also contribute to a reduction in environmental pollution caused by fire incidents.

8. Accessibility:

Inclusivity: Ensure that the IoT application is designed with inclusivity in mind, making it accessible to individuals with varying abilities and needs.

By thoroughly assessing these potential impacts, you can not only refine and optimize your IoT fire alarm system but also ensure that it aligns with ethical standards, regulatory requirements, and societal expectations.

III. Investigate the potential problems your IoT application might encounter when integrating into the wider system

1. Compatibility Issues:

Hardware and Software Compatibility: Ensure that the IoT fire alarm system is compatible with existing hardware and software components in the wider system. Mismatched interfaces or protocols can lead to integration issues.

2. Interoperability:

Communication Protocols: Verify that the communication protocols used by your IoT application align with those of other devices or systems in the environment. Incompatibility may hinder seamless data exchange.

3. Security Concerns:

Data Security: Assess the security measures in place to protect data transmitted between the IoT application and other components. Weak security can expose sensitive information to unauthorized access.

Integration Points: Identify potential vulnerabilities at integration points and implement robust security measures to prevent exploitation by malicious entities.

4. Scalability:

System Expansion: Consider how well your IoT application can scale to accommodate an expanding system. Ensure that the architecture and infrastructure can handle an increasing number of devices and users.

5. Reliability and Redundancy:

System Reliability: Investigate the reliability of the IoT application and its components. Downtime or system failures can have cascading effects on the wider system.

Redundancy Measures: Implement redundancy measures to ensure continuous operation even if certain components of the IoT application experience failures.

6. Data Management:

Data Flow and Storage: Examine the flow of data between your IoT application and other system components. Ensure that data storage and retrieval processes are efficient and do not cause bottlenecks.

7. Regulatory Compliance:

Industry Standards: Ensure that your IoT application complies with relevant industry standards and regulations. Failure to meet compliance requirements may hinder integration or lead to legal issues.

8. System Latency:

Data Transmission Time: Investigate the latency of data transmission within the system. Excessive delays can impact the real-time nature of fire alarm responses.

9. Maintenance and Updates:

Software Updates: Plan for regular maintenance and updates to address software vulnerabilities and ensure ongoing compatibility with the wider system.

Hardware Maintenance: Consider the maintenance requirements of the IoT devices and ensure that they align with the overall maintenance schedule of the wider system.

10. User Training:

User Familiarity: Evaluate how easily users can adapt to the new IoT fire alarm system. Provide adequate training and documentation to minimize user-related issues.

11. Cost Considerations:

Integration Costs: Assess the financial implications of integrating your IoT application into the wider system. Unforeseen integration costs can impact the overall budget.

By thoroughly investigating and addressing these potential problems during the integration process, you can enhance the reliability, security, and effectiveness of your IoT fire alarm system within the broader ecosystem. Regular testing and collaboration with stakeholders are essential for successful integration.

C. Conclusion

In summary, the development of the “Smart Fire Alarm System” illustrates the potential of IoT technology to automate and enhance fire safety measures. By combining components such as the Arduino Uno controller, Smoke Sensor and Heat Sensor, the system can proficiently detect fire-related indicators, providing important data for quick decision making. quickly.

The implementation of this smart fire alarm system brings significant impact across many different sectors. At the individual level, it ensures quick response and reduces manual effort, potentially saving lives and minimizing property damage. Economically, the system contributes to the efficient use of emergency resources, leading to cost savings and improved overall safety. Furthermore, its emphasis on sustainability aligns with social goals, addresses concerns related to fire incidents and promotes responsible safety management.

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