Temperature And Mask Detection

Minor Project -1

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Bachelor of Technology

In

Internet of Things (IOT)

Submitted By

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UNDER THE SUPERVISION AND GUIDANCE OF

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.

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ABSTRACT

To enhance public safety and streamline health monitoring processes, this study introduces a real-time Mask Detection and Temperature Measurement System. The system integrates hardware and software components such as Arduino, temperature sensors, and a Neural Network algorithm to ensure accurate detection of mask usage.

The platform performs dual functions: it measures body temperature and verifies mask compliance. If the temperature exceeds a defined limit or a mask is not detected, the system triggers alerts and restricts access. Conversely, individuals wearing a mask and maintaining a normal temperature gain entry through automated gate control.

This study highlights the technical framework and design of the system, showcasing the fusion of machine learning techniques for mask detection with sensor-based inputs. Challenges such as achieving accuracy under varying lighting conditions and optimizing sensor response times are also addressed, along with the solutions implemented.

Future enhancements include the integration of advanced technologies like AI-based anomaly detection, cloud storage for health data, and real-time notifications across multiple access points. The research demonstrates how IoT and computer vision can effectively address critical health and safety concerns in public settings.

ACKNOWLEDGEMENT

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ACRONYMS

- **IR**: Infrared
- **MLX90614**: Infrared Thermometer Sensor Model
- **I2C**: Inter-Integrated Circuit (Communication Protocol)
- **RGB**: Red, Green, Blue (Image Color Model)

NOMENCLATURE

- **Mask Detection Indicators**

Green Box : Signifies that the person is wearing a mask

Red Box : Signifies that the person is not wearing a mask

- **Temperature Check Indicators**

Green Temperature : The temperature is within the valid range

Red Temperature : The temperature exceeds the average human temperature limit

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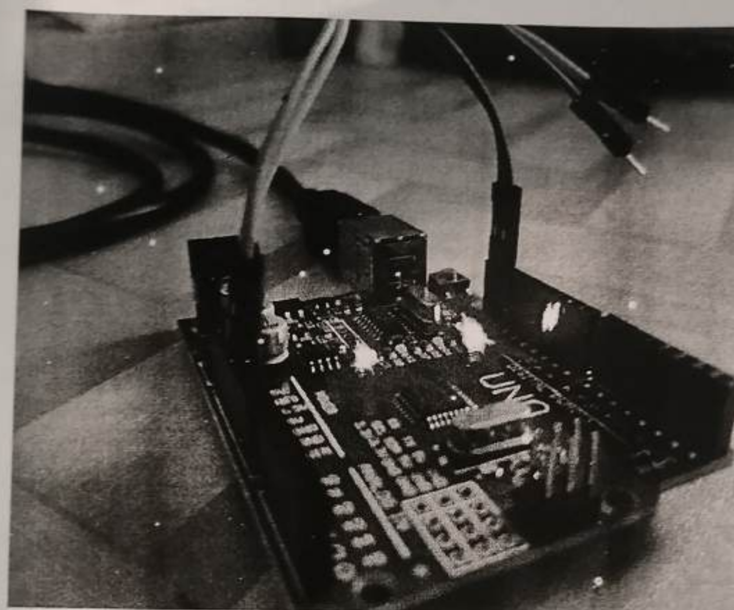

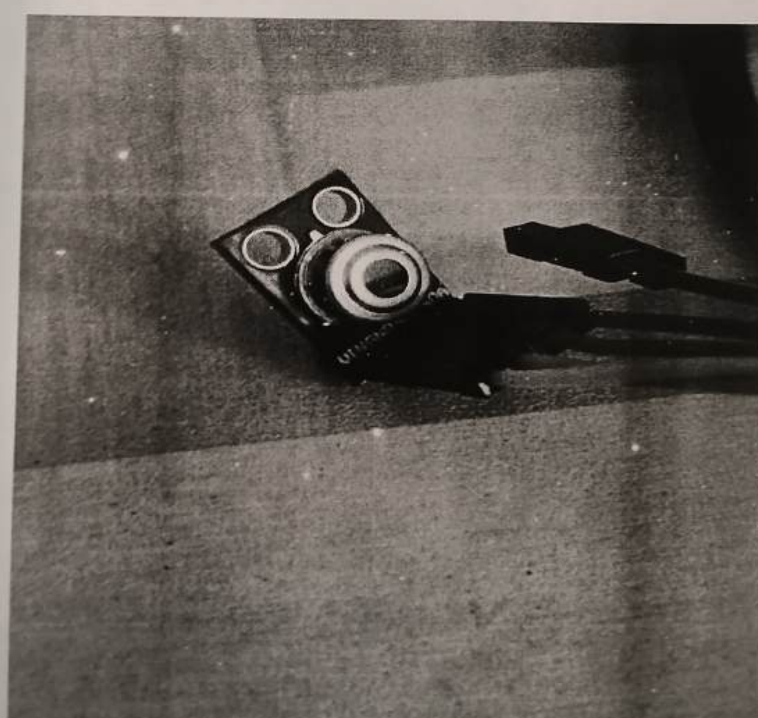

CHAPTER 1: INTRODUCTION

In today's world, especially after the pandemic, quick and accurate health checks have become essential for ensuring safety. In busy places like markets and offices, manually checking temperatures and masks can be slow, tiring, and prone to mistakes. This project offers an automated solution that uses Arduino technology to handle real-time temperature checks and mask detection.

The system uses an MLX sensor to measure body temperature, while a Python-based machine learning algorithm accurately detects whether someone is wearing a mask. By automating these tasks, it speeds up the process, reduces human effort, and works seamlessly in different environments.

One of the main goals of this project is to create a solution that is both effective and affordable. Instead of relying on more expensive options like Raspberry Pi, it uses Arduino to keep costs low while still delivering excellent performance. This makes it a practical choice for organizations looking to improve safety without breaking the bank.

CHAPTER 2: LITERATURE SURVEY

There are already systems out there for temperature and mask detection that use Raspberry Pi, but they tend to be expensive and complicated, even though they use similar sensors and machine learning techniques. This project takes a different approach by using Arduino, which helps cut down on costs and makes the technology more affordable for small and medium-sized organizations.

While Raspberry Pi systems offer more processing power, Arduino is much simpler to use and way cheaper, making it a perfect choice for real-time applications like this. What makes this system stand out is how it balances cost and performance. It combines an MLX Sensor to measure temperature with a Python script for mask detection, creating an affordable and effective solution that's practical for everyday use.

CHAPTER 3:

Mask Detection

The process begins with training a neural network model using a dataset containing thousands of images of individuals both wearing and not wearing masks. The dataset undergoes pre-processing to normalize the data, and augmentation techniques are applied to expand its size and diversity.

To improve the model's performance, multiple hidden layers in the Artificial Neural Network (ANN) are optimized using the concept of epochs. With each epoch, the model becomes better at identifying features such as the presence of a mask on a face, thereby improving its accuracy. TensorFlow is utilized to handle the computational requirements and to speed up the training process effectively.

Temperature Measurement

The MLX sensor is used to measure the body temperature of the individual. It connects to an Arduino microcontroller, which reads the temperature data and checks if it exceeds a threshold value, typically set at 38°C. If the temperature falls within the normal range, the system proceeds to the mask detection step.

Integration

The system combines the results from temperature measurement and mask detection to provide a final decision. If the person has a fever or is not wearing a mask, an alert is triggered, and access is denied. This seamless integration ensures the process is both efficient and reliable.

The system is implemented by first configuring the Arduino platform to work with the MLX sensor for capturing temperature readings. Following this, a Python script is integrated to process the sensor data and execute the mask detection model. The coding and testing phases ensure smooth interaction between the Arduino hardware and Python software.

One of the main challenges was achieving real-time mask detection while maintaining precise temperature measurements. This was resolved by optimizing the Python script and utilizing efficient algorithms for mask detection, ensuring the system functions effectively.

CHAPTER 5:

The "Face Mask Detection and Temperature Measurement" system offers a practical solution for ensuring safety in public spaces. By combining mask detection with temperature sensing, it addresses two key aspects of disease prevention. Its affordability, straightforward setup, and ability to operate in real-time make it suitable for widespread use across various settings.

Future Scope

- **Enhanced Model Accuracy:** Advanced deep learning models, such as Convolutional Neural Networks (CNNs), are utilized to improve the accuracy of mask detection further.
- **Cloud Integration:** Data storage is moved to the cloud, enabling efficient monitoring and analysis across different locations.

- **Multi-parameter Monitoring**: Adding more sensors to check things like oxygen levels and heart rate, giving a clearer picture of overall health.
- **Hardware Optimization**: Using low-power hardware to make the system more affordable and energy-efficient.

CHAPTER 6:

The system successfully achieved its goals of providing fast and accurate temperature checks and mask detection. Users appreciated the quick processing time and the real-time display of results, which made decision-making much easier. Switching from Raspberry Pi to Arduino proved to be a smart move, saving costs without sacrificing performance. However, there's still room to grow. Adding more sensors could improve accuracy, and expanding the mask detection model could make it more versatile in different situations.

CHAPTER 7:

This project successfully brought together Arduino and Python to design a cost-effective and dependable solution for automatic temperature and mask detection. It streamlines processes, saving time and effort, making it perfect for environments that require continuous monitoring. Moving forward, there's exciting potential for improvement—such as integrating additional sensors for more comprehensive health monitoring, enhancing the machine learning model to identify a wider variety of masks, and optimizing the system for even quicker responses.

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