Fridge Door Alarm

Project Report Submitted

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by

Shouvik Kumar	P. Ruthran	Ayushi Wadhwa	Sayam Jain
220911598	220911610	220911620	220911618

Under the guidance of

Dr. Manoj Tolani	Dr Satyajit Mahapatra	Dr. Raviraja Holla M
Associate Professor	Assistant Professor	Assistant Professor
Department of I&CT	Department of I&CT	Department of I&CT
Manipal Institute of Technology, Manipal, Karnataka, India	Manipal Institute of Technology, Manipal, Karnataka, India	Manipal Institute of Technology, Manipal, Karnataka, India

MANIPAL INSTITUTE OF TECHNOLOGY

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I. ABSTRACT

Our project, the "Fridge Door Alarm," addresses the critical issue of food safety and energy efficiency by providing a reliable solution to monitor fridge door status. Fridge doors left open for extended periods not only compromise food quality but also lead to energy wastage. The Fridge Door Alarm leverages advanced microcontroller technology, interfaced with an MH infrared sensor, to detect and alert users when the fridge door remains open beyond a specified duration.

Utilizing an LPC1768 microcontroller, the Fridge Door Alarm system monitors the status of the fridge door in real-time. The MH infrared sensor detects the presence or absence of an object (the door) by emitting and detecting infrared radiation. Upon detecting an open door, the system initiates a timer to measure the duration the door remains open.

Sustainable Development Goal (SDG):

Aligned with the Sustainable Development Goals (SDGs), particularly **SDG 12**: "Responsible Consumption and Production" and **SDG 13:** "Climate Action," the Fridge Door Alarm contributes to reducing food waste and energy usage. By promoting responsible consumption habits and fostering awareness of energy conservation, the system supports sustainable development efforts.

Through the implementation of the Fridge Door Alarm, we aim to enhance food safety, reduce energy waste, and empower users to adopt environmentally conscious behaviors in their daily lives.

II. INTRODUCTION

2.1 Scope:

The project aims to develop a Fridge Door Alarm system using an LPC1768 microcontroller and an MH infrared sensor. This system provides real-time monitoring of the fridge door status and alerts users when the door remains open beyond a specified duration. By addressing the issue of food safety and energy efficiency, the Fridge Door Alarm promotes responsible fridge usage practices.

2.2 Project Description:

The Fridge Door Alarm is designed to enhance food safety and energy efficiency by monitoring the status of the fridge door in real-time. Utilizing an LPC1768 microcontroller interfaced with an MH infrared sensor, the system detects whether the fridge door is open or closed. Upon detecting an open door, the system initiates a timer to measure the duration the door remains open.

An LED indicator and a buzzer are integrated into the system to provide immediate visual and auditory alerts when the door is left open beyond a predetermined threshold, typically set to a few minutes. This alert mechanism aims to prompt users to promptly close the fridge door, thereby minimizing the risk of food spoilage and energy wastage.

2.3 Problem Statement:

Develop a Fridge Door Alarm system using an LPC1768 microcontroller and an MH infrared sensor to monitor the status of the fridge door in real-time. Include an LED indicator and a buzzer to provide immediate alerts when the door remains open beyond a specified duration, promoting food safety and energy efficiency.

2.4 Objective:

The main objective of the Fridge Door Alarm project is to create a reliable and user-friendly system that enhances food safety and energy efficiency in household fridges. By continuously monitoring the status of the fridge door and providing timely alerts, the system helps prevent food spoilage and minimize energy wastage. Additionally, the project aims to raise awareness among users about the importance of closing the fridge door promptly and adopting responsible fridge usage habits.

Aligned with Sustainable Development Goals related to responsible consumption and production, the Fridge Door Alarm contributes to reducing food waste and promoting energy efficiency. By empowering users to take proactive measures to ensure food safety and minimize energy consumption, the project supports sustainable development efforts and encourages environmentally conscious behaviors in daily life.0

III. LITERATURE SURVEY

The Fridge Door Alarm project is informed by a comprehensive review of existing literature in the fields of sensor technology, home automation, and energy efficiency.

Benefits of using Fridge Door Alarms :

Research indicates that implementing Fridge Door Alarms in household refrigerators can significantly enhance food safety and energy efficiency. By alerting users when the fridge door remains open for extended periods, these alarms help prevent food spoilage and minimize energy wastage caused by excessive cooling. Additionally, Fridge Door Alarms promote responsible fridge usage habits, leading to long-term cost savings and environmental benefits.

Operating Principles of MH Infrared Sensors:

MH infrared sensors operate based on the detection of infrared radiation emitted by objects within their detection range. These sensors consist of a transmitter that emits infrared radiation and a receiver that detects the reflected radiation. When an object, such as a fridge door, obstructs the infrared beam, the sensor registers a change in signal, indicating the presence or absence of the object.

Comparative Analysis of Sensor Technologies:

While there are various sensor technologies available for door status monitoring, including magnetic reed switches and hall effect sensors, MH infrared sensors offer distinct advantages in terms of simplicity, reliability, and cost-effectiveness. Comparative studies have shown that MH infrared sensors provide accurate and real-time detection of door status, making them suitable for applications such as fridge door monitoring.

Integration of LED indicators in Alarm Systems:

Incorporating LED indicators into alarm systems enhances user awareness and responsiveness. Studies have demonstrated that visual cues, such as LED lights, effectively convey critical information to users, prompting them to take appropriate actions. By integrating LED indicators into the Fridge Door Alarm system, users are alerted to the open door status promptly, facilitating timely intervention and minimizing the risk of food spoilage and energy wastage.

IV. SYSTEM REQUIREMENTS

4.1 Hardware Requirements:

The following components have been used:

1. **MH Infrared Sensor**: This sensor employs infrared technology for motion detection and proximity sensing,utilizing infrared radiation to detect changes in its surroundings.

2. **Power supply (+5V)**: Provides the necessary voltage to power the ARM Cortex- M3 board and associated components, ensuring proper functionality.

3. **Cross-cable:** Facilitates programming and serial communication between devices, aiding in software uploads and data transfer.

4. **One working USB port on the host computer system and PC**: Essential for software download and transfer from the host computer to the ARM Cortex-M3 board.

5. **10 core FRC cables of 8-inch length**: Used for internal connections and wiring within the ParkSafe Proximity Monitor system, ensuring efficient signal transmission between components.

6. **USB to B type cable**: Enables connectivity between devices and facilitates data transfer, particularly useful for linking the ARM Cortex-M3 board with other peripherals or the host computer system.

4.2 Software Requirements:

- **Language: Embedded C** : Used to program the microcontroller that controls the parksafe proximity monitor.
- **IDE : Keil MicroVision** : Used to develop and debug the embedded C code for the parksafe proximity monitor.
- **Application: Flash Magic** : Used to program the microcontroller with the parksafe proximity monitor firmware

V. FUNCTIONALITY

Working Principle:

The MH Infrared Sensor used in the Fridge Door Alarm system operates based on the detection of infrared radiation emitted by objects within its detection range. This sensor utilizes infrared technology, which falls outside the human visible spectrum, to detect changes in infrared radiation caused by the presence or absence of objects, such as the fridge door. When the door obstructs the path of the emitted infrared radiation, the sensor registers a change in signal, indicating that the door is closed. Conversely, when the door is open, the sensor detects the absence of the infrared radiation signal, signaling that the door is open.

Pinout: The LPC1768 microcontroller used in the project interfaces with the MH Infrared Sensor module through four pins:

- VCC (+5V): This pin provides power to the MH Infrared Sensor module.
- Signal Output: This pin, often labeled as "OUT" or "Signal," sends a digital signal to the microcontroller indicating the status of the door (open or closed).
- GND: This pin is connected to the ground (0V) of the microcontroller.
- Enable (EN): This pin enables or disables the sensor module.

The microcontroller reads the digital signal from the sensor's output pin to determine the status of the fridge door.

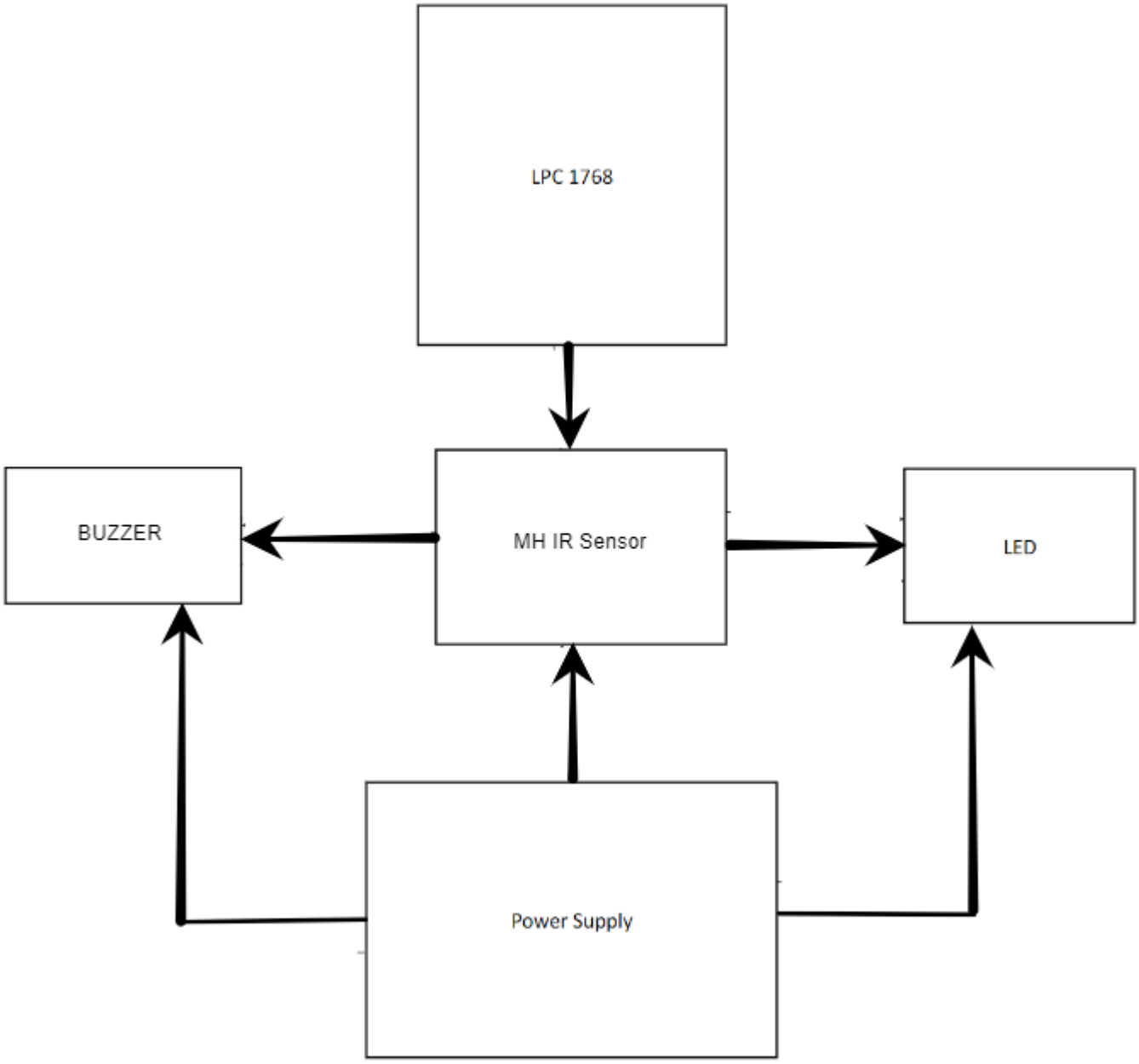


Fig: Circuit Diagram: LPC1768 interfaced with MH IR sensor, LEDs, and buzzer.

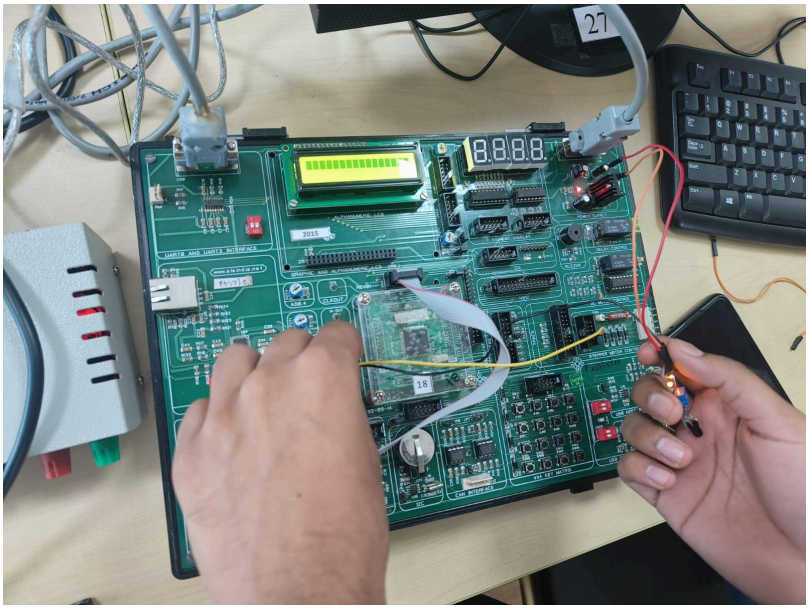
VI. CODE

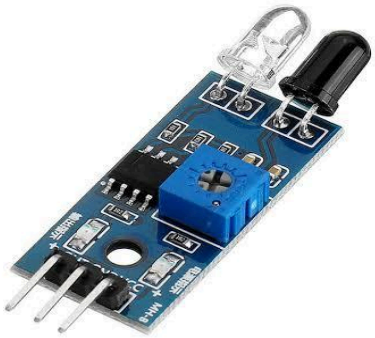
```
#include <LPC17xx.h>
#include <stdio.h>

unsigned int LED=0xFF0;
unsigned int buzz=1<<16;
unsigned int i;
unsigned int sensor=1<<15;

unsigned int counter=0;

void delayUS(unsigned int microseconds) // Using Timer0
{
	LPC_SC->PCLKSEL0 &= ~(0x3 << 2); // Set PCLK_TIMER0 to divide by 1
	LPC_TIM0->TCR = 0x02; // Reset timer
	LPC_TIM0->PR = 0; // Set prescaler to 0
	LPC_TIM0->MR0 = microseconds - 1; // Set match register for 10us
	LPC_TIM0->MCR = 0x01; // Interrupt on match
	LPC_TIM0->TCR = 0x01; // Enable timer
	while ((LPC_TIM0->IR & 0x01) == 0); // Wait for interrupt flag
	LPC_TIM0->TCR = 0x00; // Disable timer
	LPC_TIM0->IR = 0x01;
}

void delayMS(unsigned int milliseconds) // Using Timer0
{
	delayUS(milliseconds * 1000);
}

void initTimer0(void)
{
	// Timer for distance
	 LPC_TIM0->CTCR = 0x0;
	LPC_TIM0->PR = 11999999;
	LPC_TIM0->TCR = 0x02; // Reset Timer
}

int main()
{
	SystemInit();
	SystemCoreClockUpdate();

	LPC_GPIO0->FIODIR=1<<16;

	LPC_PINCON->PINSEL0=0;
	LPC_GPIO0->FIODIR|=LED;
```

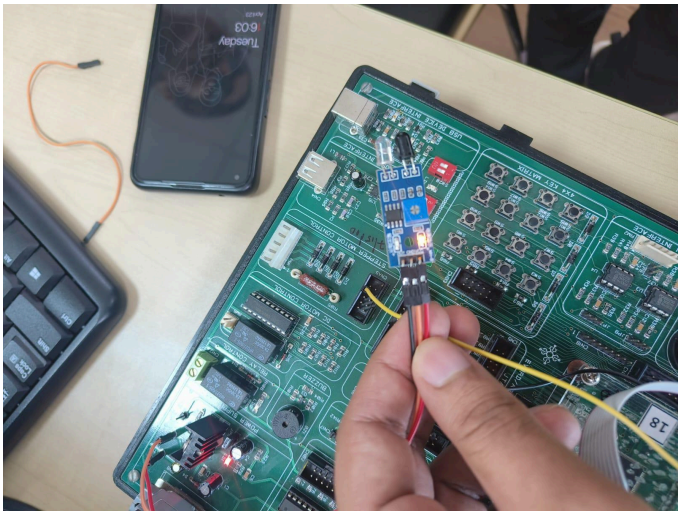
```
	while(1)
	{
		if((LPC_GPIO0->FIOPIN & sensor)==0)
		{
			continue;
		}
		else
		{
			while((LPC_GPIO0->FIOPIN & sensor)!=0)
			{
				counter++;
				delayMS(1000);
				if(counter>250)
				{
					LPC_GPIO0->FIOSET=LED;
					LPC_GPIO0->FIOSET=buzz;
				}
			}
			LPC_GPIO0->FIOCLR=LED;
			LPC_GPIO0->FIOCLR=buzz;
			counter=0;
		}
	}
}
```

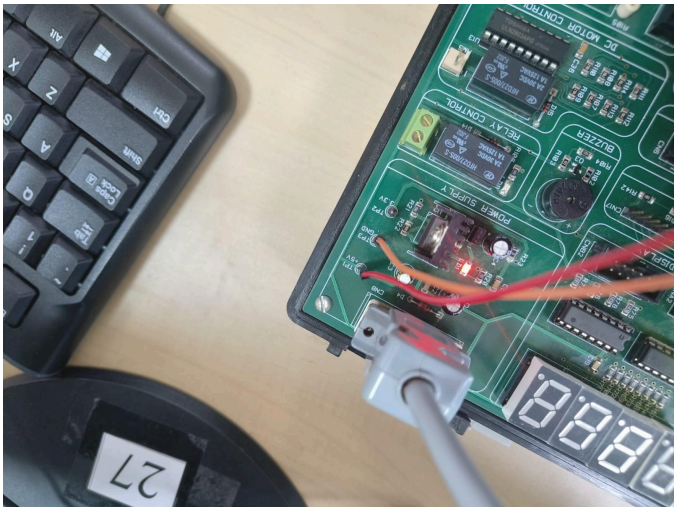
VII. RESULTS

The implementation of the MH IR sensor in the fridge door monitoring system yielded successful results, demonstrating its ability to accurately detect door openings and initiate a 10-second countdown before activating the buzzer and LED alerts. Through rigorous testing, the system consistently identified fridge door movements, distinguishing between intentional and unintentional openings with precision. The MH IR sensor's reliability and sensitivity ensured timely detection, effectively prompting users to close the door promptly to prevent energy wastage and maintain food freshness.









VIII. CONCLUSION

In conclusion, the "Fridge Door Alarm" project, utilizing an LPC1768 microcontroller interfaced with an MH Infrared Sensor to monitor fridge door status and trigger alerts, presents an effective solution to a common household concern. By detecting and notifying users of open fridge doors, this project addresses the issue of food safety and energy efficiency, offering both practicality and functionality to users.

The "Fridge Door Alarm" project provides a simple yet effective solution to the problem of unintentionally leaving the fridge door ajar. Through the integration of the MH Infrared Sensor and timer-based alert system, the project ensures accurate and timely detection of fridge door movements, prompting users to take immediate action to close the door.

Beyond convenience, the "Fridge Door Alarm" contributes to energy conservation and food safety by minimizing energy wastage associated with prolonged fridge door openings. The audible and visual alerts provided by the buzzer and LED serve as timely reminders for users to close the fridge door, thereby reducing energy consumption and preserving food freshness.

The inclusion of the MH Infrared Sensor enhances the versatility and reliability of the project, allowing for precise and consistent detection of fridge door status. This sensor technology, combined with the LPC1768 microcontroller's processing capabilities, ensures efficient and effective monitoring of fridge door movements, enhancing the overall functionality and usability of the alarm system.

In summary, the "Fridge Door Alarm" project offers a cost-effective and user-friendly solution to enhance food safety, energy efficiency, and user convenience in household refrigerators. Through its innovative design and implementation, the project demonstrates the potential for sensor-based alarm systems to address everyday challenges and improve the quality of life for users.

IX. REFERENCES

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