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IOT BASED BABY MONITORING SYSTEM

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Abstract:

In today's fast-paced world, ensuring the safety and well-being of babies can be a challenge, especially for those who cannot afford traditional childcare solutions. In response, IoT-based smart baby monitoring system designed to ensure the safety and comfort of infants in their cradles. Baby Monitoring system employs force sensors to detect the presence of the baby in the cradle, Additionally, the system incorporates environmental monitoring capabilities to assess the humidity and temperature levels in the baby's vicinity. By considering both room temperature and the baby's body temperature, caretakers can maintain optimal environmental conditions for the baby's well-being. the system includes motion detection features to track the baby's movements within the cradle. By utilizing force sensors, caretakers can receive alerts indicating the direction of the baby's movements, enabling them to promptly respond to the baby's needs. For instance, if the baby attempts to move left or right within the cradle, the system will display corresponding notifications, allowing caretakers to assist the baby as necessary.

Introduction:

The Internet of Things (IoT) refers to the interconnection of everyday objects, devices, machines to the internet, allowing them to collect, exchange, and share data. This inter connected network enables devices to communicate and collaborate seamlessly, leading to increased efficiency, automation, and convenience in various industries and sectors. IoT devices can include everything from household appliances like smart thermostats and refrigerators to industrial machinery, vehicles, and wearable devices. These devices are equipped with sensors, actuators, and software that enable them to gather and transmit data, often in real-time. This data can then be analyzed and used to make informed decisions, improve processes, and enhance user experiences. The IoT has numerous applications, such as smart cities, where sensors monitor traffic, energy usage, and waste management to improve urban planning and sustainability. In healthcare, IoT devices can track patients' vital signs remotely and alert healthcare providers of any abnormalities. In agriculture, sensors can monitor soil conditions and

weather patterns to optimize crop yield and reduce water usage.

Despite its many benefits, the IoT also raises concerns about privacy, security, and data breaches, as the sheer number of connected devices increases the potential attack surface for hackers. As the IoT continues to evolve, it has the potential to revolutionize how we interact with technology and the world around us.

II. Literature Survey:

TSavita P. Patil et al. [1] presented a baby monitoring system based on GSM network. The system monitor's health parameters like temperature, moisture, pulse rate and movement and send these measured parameters to the parent's mobile using GSM network. Soukaina Bangui, Mohammed El Kihal and Yassine Salih-Alj.[2] which is microcontroller based project. The authors have designed a low-cost baby monitoring system which detect sound baby crying sound and is attached to a cradle which swings automatically once the system detects a sound and the cradle does not stop until the baby stops crying. A camera is mounted on the top of the cradle to monitor the video output around the baby. Aslam Forhad Symon et al. [3] designed baby monitoring system to detect baby's activities like motion and cry sound. This system is accomplished with display unit, buzzer and camera module. Whenever baby motion or cry is detected, camera module is turned on to display baby motion on display unit and buzzer to indicate baby's cry Detection. System proposed in [2] is designed using raspberry pi 3, camera, wet sensors, sound sensor, PIR sensor, sound sensor, DC motor and SMS module. This system having different features like camera monitoring, automatic swinging of cradle when baby cries, sensing the wetness condition of baby's bed.

III. Existing System:

The existing baby monitoring system operates on a combination of advanced hardware and software components,designed to monitor the baby's position and activities comprehensively. By integrating cutting-edge technologies, such as sensors and cameras, the system provides live tracking footage that can be accessed conveniently either through local Wi-Fi networks or remotely via the internet.

IV. Proposed System

In addition to existing system we used the DHT 11 sensors and gas sensors and force sensors to detect the presence of the baby in the cradle, to track the baby's movements within the cradle, to assess the humidity and temperature levels in the baby's vicinity.

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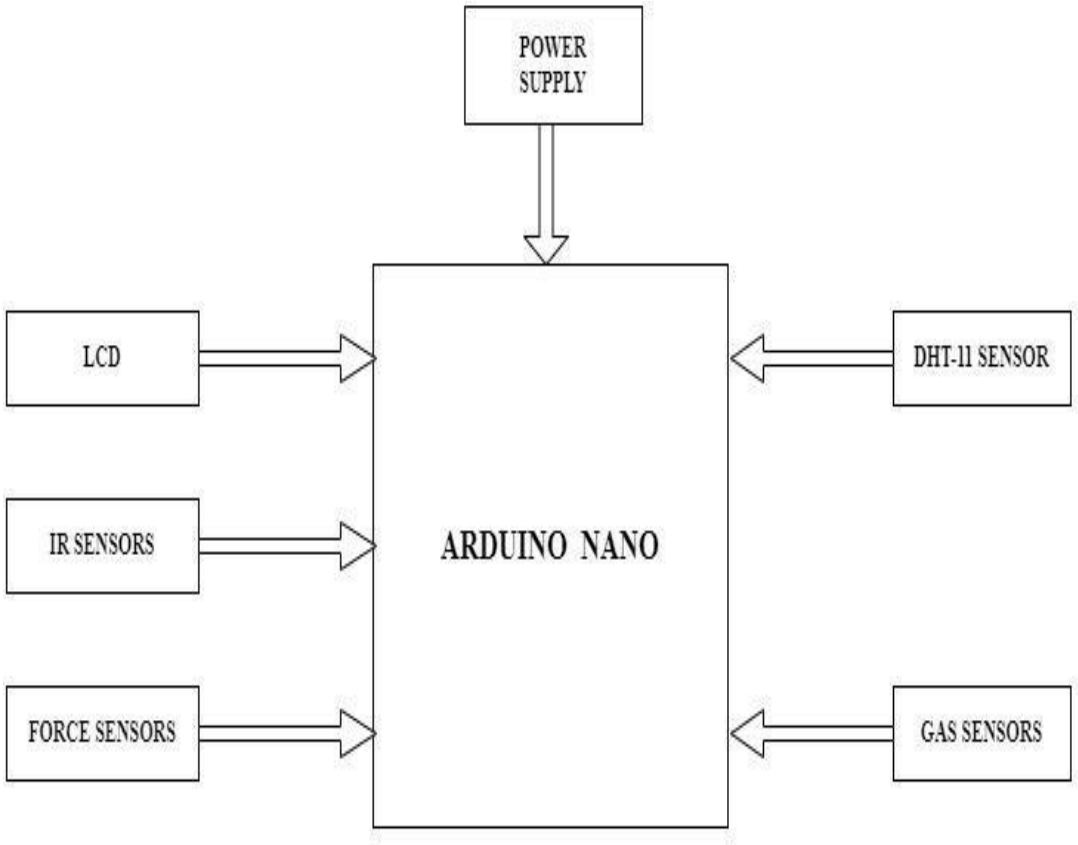

Figure 1: Block Diagram of the Proposed System

V. Hardware Used

Arduino® Nano is an intelligent development board designed for building faster prototypes with thesmallest dimension. Arduino Nano being the oldest member of the Nano family, provides enough interfaces for your breadboard-friendly applications. At the heart of the board is **ATmega328 microcontroller** clocked at a frequency of 16 MHz featuring more or less the same functionalities asthe Arduino Duemilanove. The board offers 20 digital input/output pins, 8 analog pins, and a mini- USB port.

An **LCD** is employed for local display, providing real-time feedback and status updates on the detection process.

Force sensors, also known as load cells or force transducers, are devices designed to measure the force exerted on them. They are widely used in various applications to detect and quantify force, pressure, or weight. capacitive sensing to convert mechanical force into an electrical signal. These sensors come in various shapes and sizes, ranging from small and sensitive sensors for delicate measurements to large and rugged ones for heavy-duty applications.

Infrared (IR) sensors are vital components used in numerous applications across various industries. They operate on the principle of detecting infrared radiation emitted by objects, enabling tasks such as proximity sensing, object detection, and distance measurement. These sensors typically consist of an IR emitter and receiver, with the receiver detecting changes in the emitted or reflected IR radiation. Passive Infrared (PIR) sensors are commonly employed in motion detection systems, such as security alarms and automatic lighting, by sensing changes in heat patterns.

The DHT11 sensor is a widely used component in environmental monitoring systems, renowned for its affordability and simplicity. Primarily designed for measuring temperature and humidity levels, this sensor operates on a digital interface, making it easy to integrate with microcontrollers like Arduino or Raspberry Pi. Its operation relies on a calibrated digital output signal generated by an internal thermistor for temperature measurement and a capacitive humidity sensor for humidity readings.

Gas sensors are essential components used for detecting and measuring the presence of various gases in the environment. These sensors play a crucial role in ensuring safety in industrial, commercial, and residential settings by monitoring air quality and detecting potentially harmful gases. Gas sensors operate based on different principles, including catalytic combustion, electrochemical reactions, semiconductor technology, and infrared absorption. Each type of gas sensor is designed to detect specific gases or groups of gases, such as carbon monoxide (CO), methane (CH4), hydrogen sulfide (H2S), and volatile organic compounds (VOCs)

VI. Software Used

Arduino IDE: The Integrated Development Environment (IDE) used for programming Arduino boards. It provides a user-friendly interface for writing, compiling, and uploading code to the Arduino platform.

Embedded C: Embedded C is a programming language that is used in the development of Embedded Systems. Embedded Systems are specialized systems designed to perform very specific functions or tasks.

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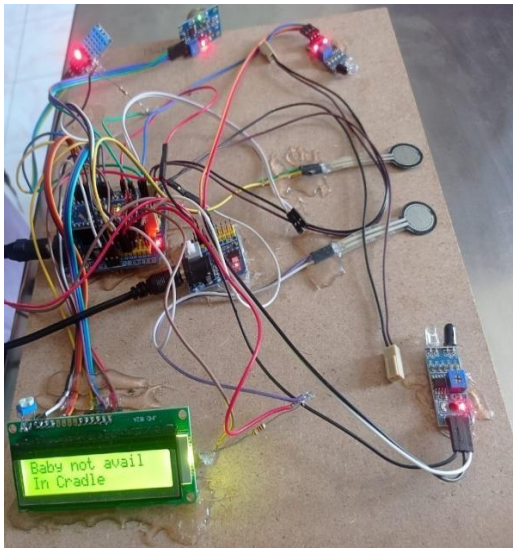
VII. Results and Discussions :



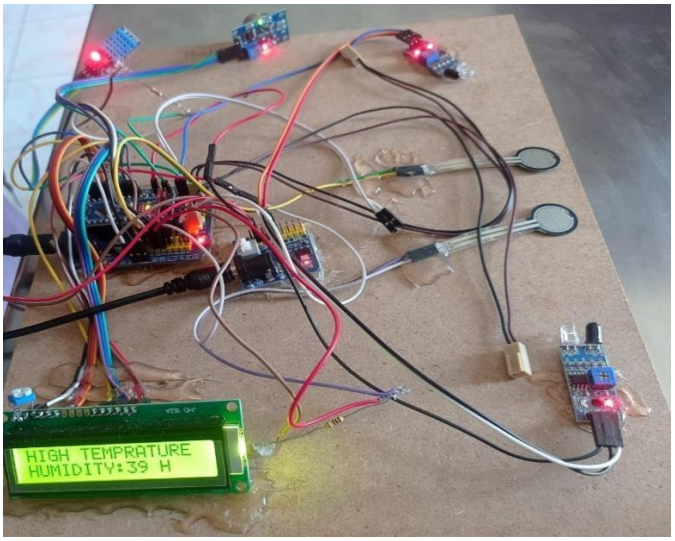


Figure 2: Baby Monitoring System using IoT

VII. Results and Discussions

Initial Setup:

Upon powering on the system, the display indicates that the baby is not detected in the cradle.

Detection Mechanism:

The system incorporates force sensors within the cradle. When force is applied, indicating the presence of a baby, the display updates to show that the baby is now detected in the cradle.

Movement Tracking:

Integrated IR sensors monitor the baby's movements within the cradle. When the baby moves left, the system registers and displays the movement leftward. Similarly, it registers rightward movements when the baby shifts right.

Continuous Monitoring:

Once the baby is detected, the system continuously monitors environmental conditions. This includes real-time sensing of temperature and humidity levels around the baby.

Alert System:

In addition to temperature and humidity, the system also checks for the presence of harmful gases in the vicinity of the baby. If any harmful gases are detected, an alert is immediately displayed to notify caregivers, ensuring prompt action can be taken to safeguard the baby's well-being.