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IOT BASED BABY MONITORING SYSTEM

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ABSTRACT

This project presents the design of a baby monitoring system based on the IoT protocol.

A prototype will be developed that provides a reliable and efficient baby monitoring system that can play a vital role in providing better infant care.

This system monitors vital parameters such as body temperature, room temperature and humidity, moisture condition, and the crying of an infant and sends alerts.

Using the IoT network, this information is transferred to their parents.

Measurements of these crucial parameters can be made, and in risky circumstances, the parents can be informed using an alarm triggering system to start the necessary management measures.

The system architecture consists of sensors for monitoring vital parameters, an LCD screen, and a sound buzzer, all controlled by a single ESP microcontroller.

INTRODUCTION

In India, both parents need to work and look after their infant, so in such households, there is more labour to be done and stress to deal with, especially for the female members. Growing female participation in a variety of occupations has created a situation where women must care for their families while also managing the demands of their jobs. Infant care has consequently become difficult for many families in their daily lives.

While at work, a mother is constantly concerned for the welfare of her child. A "Baby Monitoring System" might be created to help parents track their child's health and receive ongoing health updates in order to address this issue. In addition, the system will alert the parents to the unusual circumstance so that they can respond appropriately.

The method will assist the parents in caring for their children while they are not just at home but also at work or elsewhere. When parents are away from their infant, this technology will provide them with peace of mind because they can get updates on the infant's health.

LITERATURE SURVEY

The e-baby cradle is introduced by Goyal and Kumar.

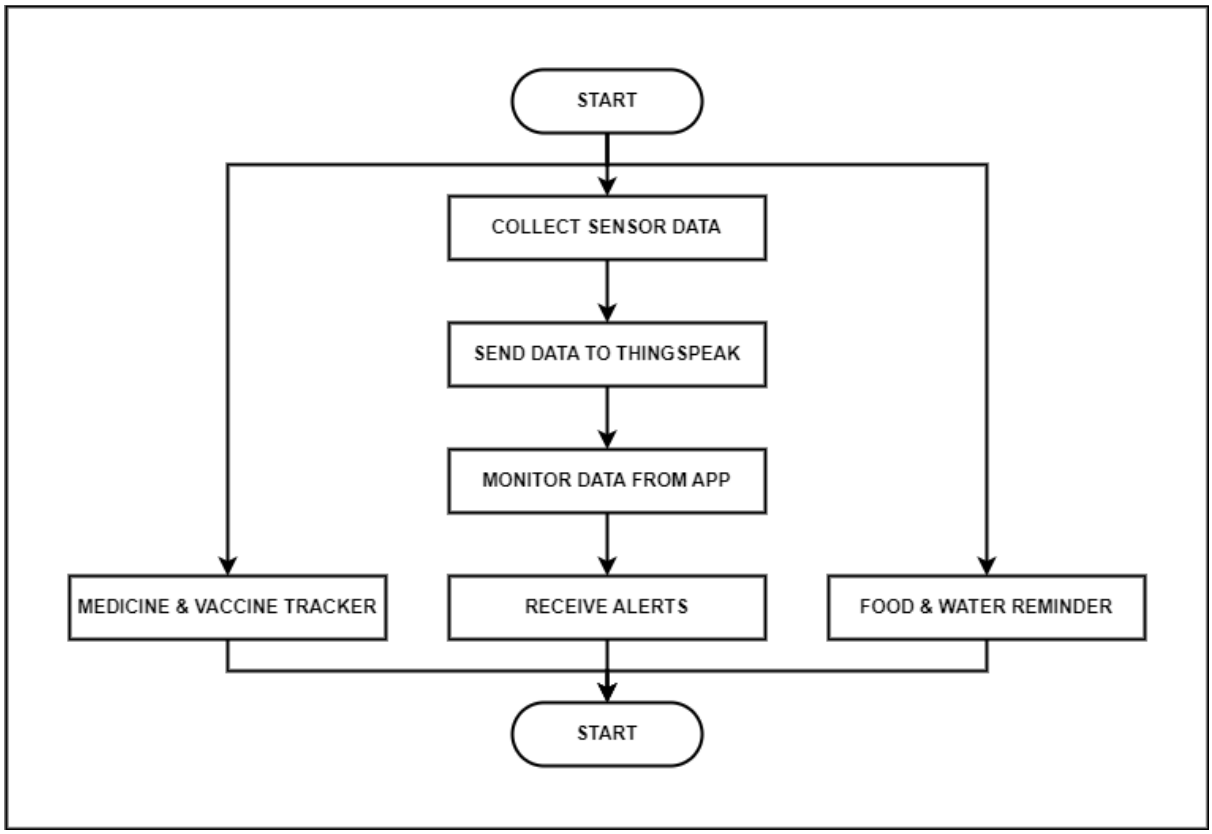
[1] When a baby cries or noise is detected, the cradle begins to rock, and when the infant stops crying, the cradle stops as well. Depending on the user's needs, swing speed can be controlled. Users are alerted in two instances via the system's in-built alarm. First, when the mattress of the cradle is wet, the alarm stops and indicates that it is time to change the mattress of the cradle. Second, an alarm notifies the parent when the baby does not stop crying after a certain time, so that parent should present themselves to their baby to take care. This system only uses a buzzer alarm. The buzzing sound may worry the baby. And even this system is useful only when the parent is near the cradle. The main drawback of this system is that parents are not able to take care of the infant when they are away from home. Like when they are travelling or at work.

[2] The developer develops a minimum budget system when a baby's crying sound is found. When the infant stops sobbing, it stops rocking and begins to oscillate in the cradle. This system is developed with a built-in alarm method, and it starts alarming in any one of these two cases: when the baby cries continuously and does not stop after some time, or when it is found that the mattress of the cradle is wet. A video camera is mounted above the cradle for the purpose of keeping an eye on the infant. Parents can only get messages or notification information and can't control the system. Thus, in the present analysis, the introduced system is highly effective; the present technique uses an IoT application that enables real-time remote monitoring and control of the smart cradle from any location.

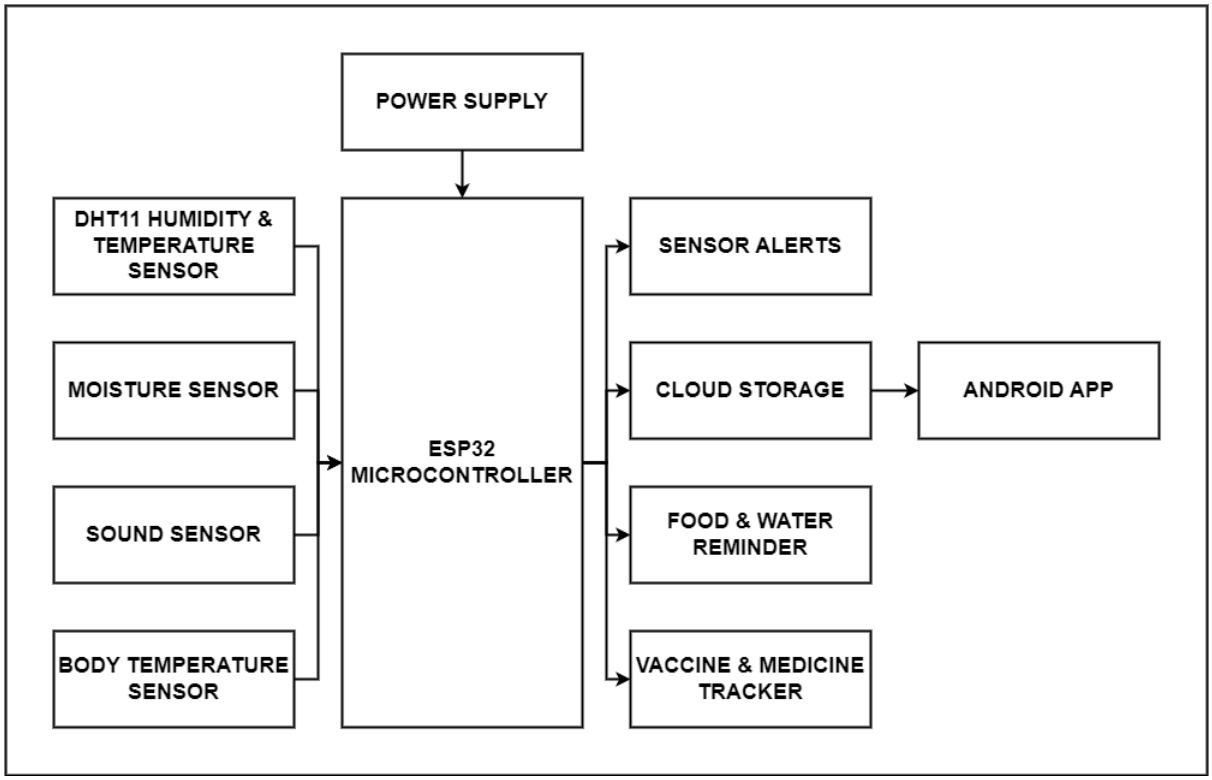
[3] unveiled a resonant cradle powered by an Arduino that can recognise baby cries. The cradle swings freely in the absence of electricity, and ball bearing technology is used to reduce system damping. And also, the status of the cradle swing and angle found by some sensors Parents can collect infant cries because of pain or hunger on an SD card in the SD module, and the author says that their system is power-saving. This system does not support when parents are away from their baby; data is not updated into the Internet of Things server controlling the crib automatically. In

[4] introduced a system for infant monitoring dependent on a Pi camera and a Raspberry Pi. This newly developed method observes the infant's movements and crying state. This system uses a PIR motion sensor and MIC to identify the infant's movements in the cradle and its crying condition with the help of a Pi camera. When the condenser microphone finds the infant crying sound, this camera switches on and transfers the message to the Raspberry Pi. The main drawback of this system is that parents can only see the information on a few devices within a particular region, and system output is shown only on the monitor display.

FLOWCHART


START
COLLECT SENSOR DATA
SEND DATA TO THINGSPEAK
MONITOR DATA FROM APP
MEDICINE & VACCINE TRACKER
RECEIVE ALERTS
FOOD & WATER REMINDER
START

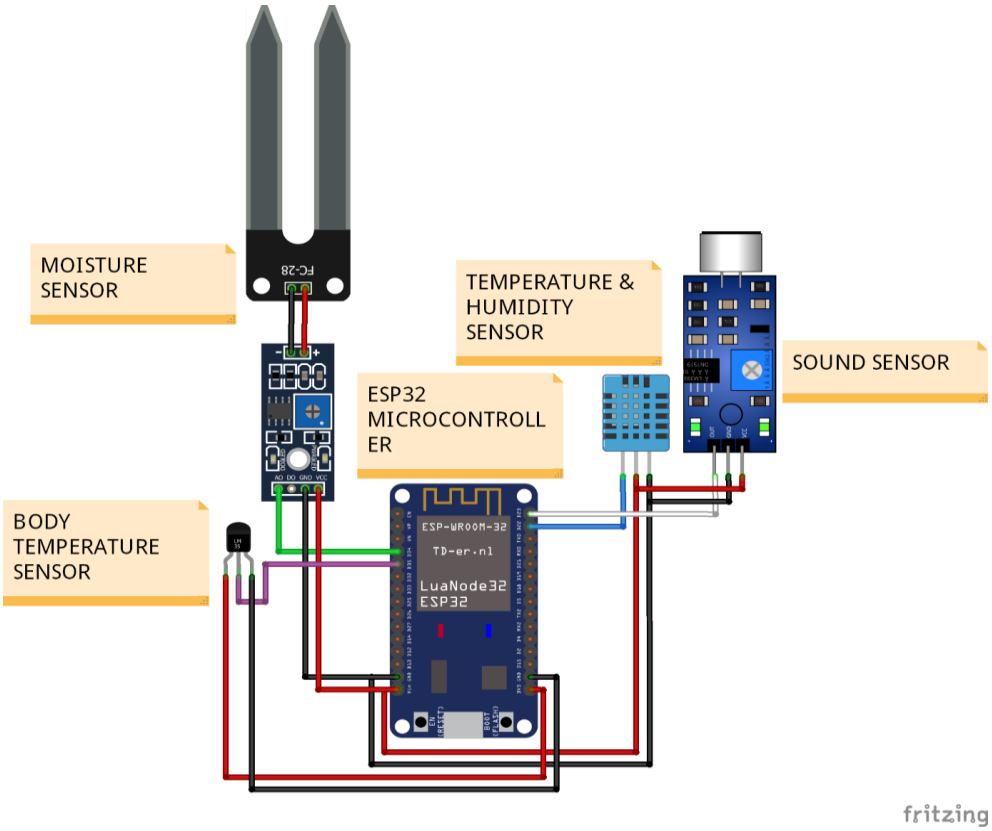
BLOCK DIAGRAM



Block Diagram Description

1. An ESP32 microcontroller is used in the system.
2. A DHT11 temperature and humidity sensor is used to monitor the room temperature and humidity around the baby.
3. A moisture sensor is used to determine whether the bed is wet.
4. It has a sound sensor connected for monitoring whether the baby is crying.
5. A body temperature sensor is also used.
6. Data from these sensors is sent to the cloud and displayed on the app along with alerts.
7. Food and water reminders can be set in the app as per routine.
8. A medicine or vaccine tracker is also added to the Android app so that medical records can be maintained in one place.

CIRCUIT DIAGRAM



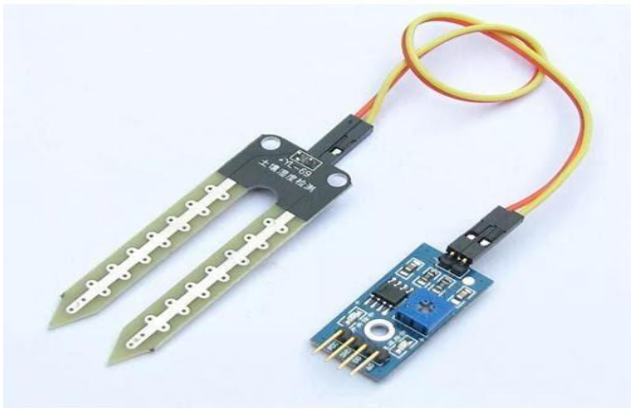
HARDWARE USED

1. ESP32 microcontroller board

The ESP32 is a series of low-cost, low-power system-on-a-chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. Espressif Systems, a Chinese business with its headquarters in Shanghai, designed and developed the ESP32, which is produced by TSMC.

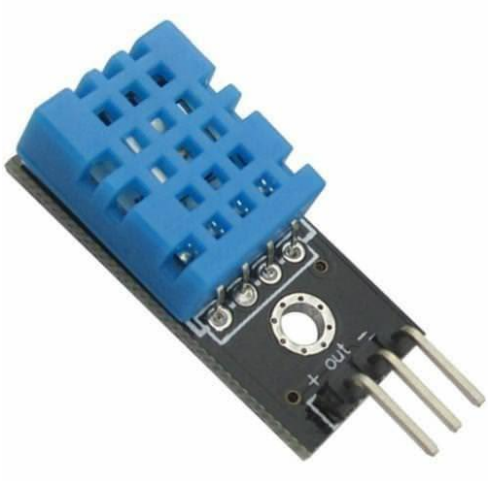
ESP32 may function as a full standalone system or as a slave device to a host MCU, which lessens the burden on the primary application CPU caused by communication stack overhead. Through its SPI/SDIO or I2C/UART interfaces, the ESP32 may connect to other systems to offer Wi-Fi and Bluetooth capability.

2. Soil moisture sensor



This moisture sensor can be used to detect moisture or judge if there is water around the sensor. You may read the data from this sensor by just inserting it into the subject; it is extremely simple to use.

3. Temperature Sensor DHT11



The DHT11 is a commonly used temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated, making it easy to interface with other microcontrollers.

The sensor can measure temperature from 0 °C to 50 °C and humidity from 20% to 90% with an accuracy of 1 °C and 1%.

4. Temperature Sensor LM35

A temperature sensor called the LM35 produces an analogue signal that is proportional to the current temperature. It is simple to interpret the output voltage in order to get a temperature reading in Celsius.

Lm35 has the benefit of not requiring any external calibration of the thermistor. Additionally, the covering prevents it from overheating.

It is well-liked by amateurs, students, and DIY circuit builders because of its low price (about $0.95) and higher accuracy.

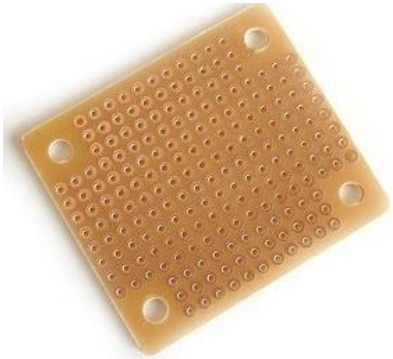
Numerous low-end items employ the LM35 because it is more accurate, cheaper, and available. It's been approximately 15+ years since its first release, but the sensor is still surviving and is used in any products.

5. Sound Sensor

A sound sensor can detect the sound intensity of the environment. The main component of the module is a simple microphone, which is based on the LM386 amplifier and an electret microphone.

This module's output is analogue and can be easily sampled and tested by a Seeeduino.

6. ZERO PCB



Perfboard, or Zero PCB, is a material for prototyping electronic circuits (also called DOT PCB). It is a thin, stiff sheet with pre-drilled holes spaced uniformly apart over a grid, often a square grid with 0.1 inches (2.54 mm) between each hole.

Although bare boards are also an option, these holes are surrounded by round or square copper pads. While higher-quality perfboard can feature pads on both sides (plate-through holes), less expensive perfboard may only have pads on one side of the board.

All connections are made by the builder using either wire wrapping or small point-to-point wiring methods since each pad is electrically isolated.

Discrete parts, including resistors, capacitors, and integrated circuits, are soldered to the prototype board.

The substrate is commonly comprised of paper laminated with either epoxy resin reinforced with fibreglass (FR-4) or phenolic resin (FR-2) (such as FR-2).

7. Connecting Wires

Since stranded wire is more flexible than solid-core wire of equal size, it can be used when the wire needs to move frequently.

8. Jumper Wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Typically, jumper wires are used with breadboards and other prototype equipment to facilitate quick circuit changes.

9. Male Headers (Burg Strips)

Pin headers are stiff metallic connectors that are soldered to a circuit board and stick up to receive a connection from a female socket.

Pin headers, sometimes known as PH or headers, are by definition male; however, their female equivalents are also quite common, and we refer to them as female headers (FH) or header connectors.

10. Female headers (burg strips)

The *female connector* is generally a receptacle that receives and holds the male *connector*.

USB

USB stands for Universal Serial Bus. It is used as a data cable for programming as well as for supplying power.

SOFTWARE USED

1.Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, and Linux) that is written in the programming language Java.

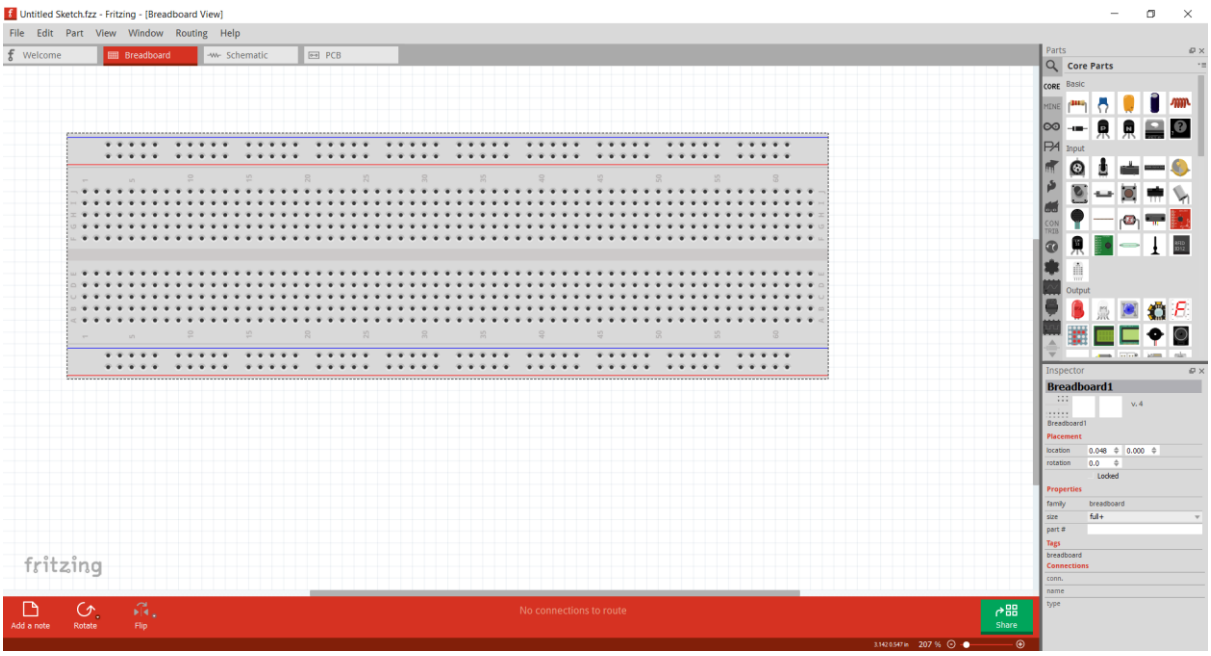
Writing and uploading programmes to an Arduino board are done using it. The source code for the IDE is released under the GNU General Public Licence, version 2.0.

The Arduino IDE has specific code organisation guidelines to support the languages C and C++. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

For launching the sketch and the main programme loop, user-written code simply needs two fundamental functions that are built and connected. with a programme stub main() into an executable cyclic executive programme with the GNU tool chain, also included with the IDE distribution.

The executable code is transformed via the Arduino IDE's use of avrdude into a text file with hexadecimal encoding, which is then loaded into the Arduino board by a loader programme in the firmware. In our project, it is used for uploading code to the NodeMCU ESP12-E board.

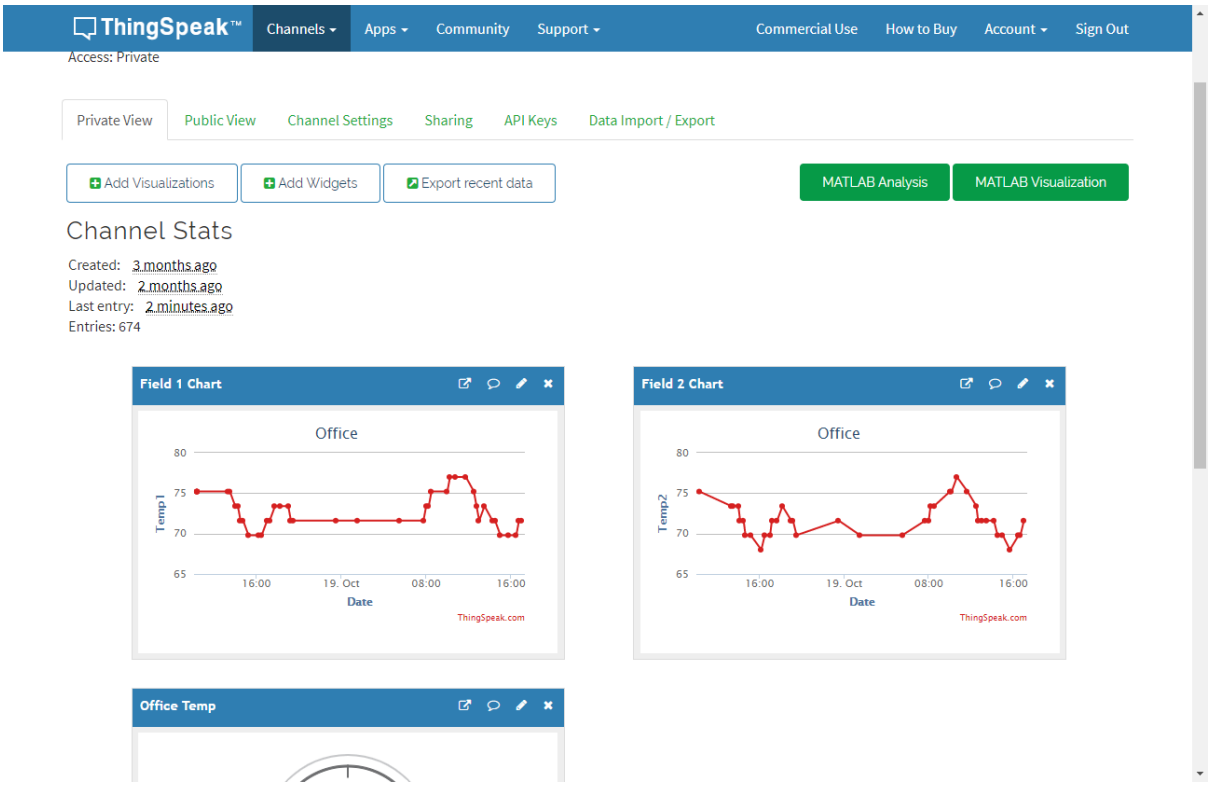
2. Fritzing



Fritzing is an open-source hardware initiative that makes electronics accessible as creative material for anyone. In the spirit of Processing and Arduino, we provide a software tool, a community website, and

services. By establishing a creative environment, we enable users to record their prototypes, share them with others, teach electronics in a classroom, and layout and produce expert PCBs.

3. ThingSpeak



According to its developers, "ThingSpeak is an open-source Internet of Things (IoT) application and API to store and, using the HTTP and MQTT protocols across a local area network or the Internet, get data from items." "Application development for location tracking, sensor logging, and a social network of things with status updates are all made possible by ThingSpeak."

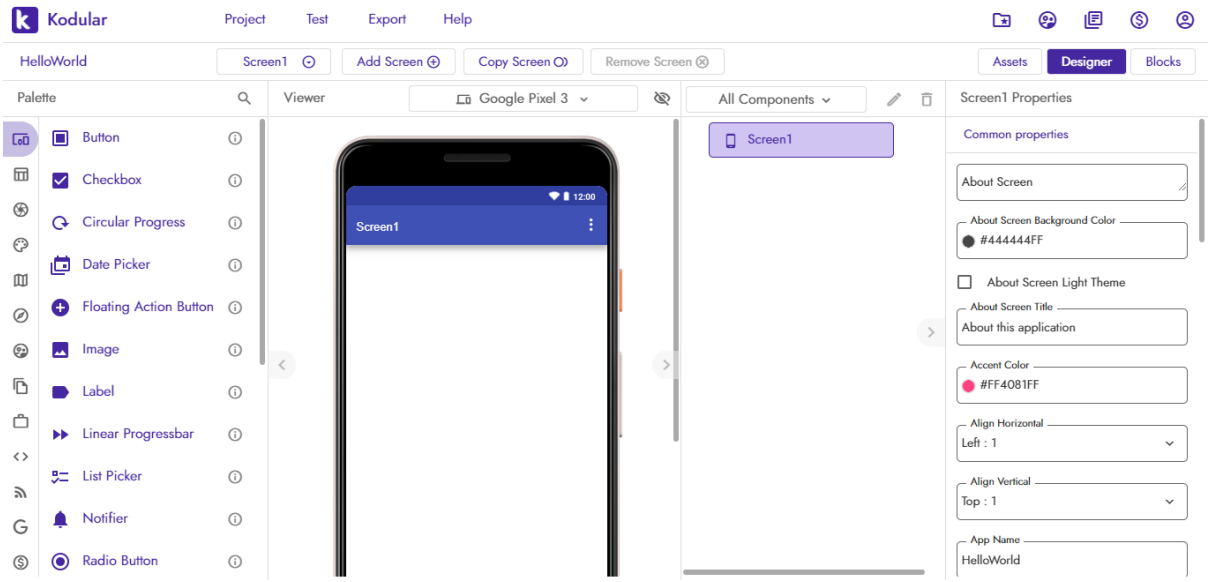
ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

ThingSpeak users may analyse and visualise submitted data using MATLAB without purchasing a MATLAB licence from MathWorks thanks to integrated support from that company's numerical computing tools.

ThingSpeak has a close relationship with MathWorks, Inc. In fact, the whole ThingSpeak documentation is integrated into MathWorks' MATLAB documentation site, and registered MathWorks user identities are even accepted as acceptable login information on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the user and MathWorks, Inc.

ThingSpeak has been the subject of articles on specialised maker websites like Instructables, Codeproject, and Channel 9

4. Kodular



Kodular (formerly Makeroid) is an open-source online suite for mobile app development.

Based on MIT App Inventor, it includes a cutting-edge component and block design that offers a free drag-and-drop Android app developer without scripting.

ADVANTAGES

1. real-time monitoring.
2. monitors various parameters and sends them to the cloud at once.
3. Alerts and notifications from apps make the system more useful.

CONCLUSION

The proposed infant monitoring system is a low-cost, user-friendly tool that can enhance parent-child communication.

This technique effectively in stills a sense of security in the parents. The mother is able to comprehend the baby's interior condition thanks to the ongoing collection of several biological parameters and analysis of the baby's general health.

As IoT technology is used, which makes the users communicate over longer distances. This is a convenient system to monitor the baby's health condition from any distance.

FUTURE SCOPE

1. Camera can be added for live monitoring.
2. Image processing can be added in the system.

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